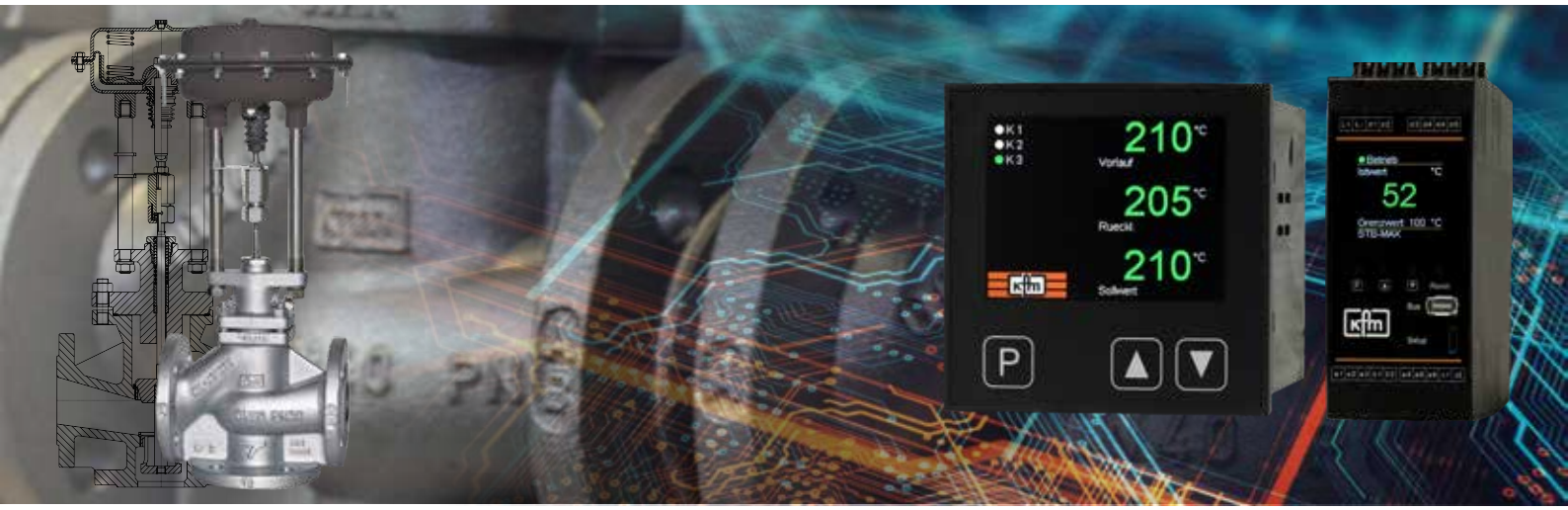
Regelungstechnik nach Maß

Custom-fit control engineering



Strainers 1

Manual operated valves 2

Pneumatic control valves 3

Electric control valves 4

Valves with emergency functions 5

Other valves 6

Primary elements 7

Monotoring and switching devices 8

Digital controllers and systems 9

Instruction manual 0

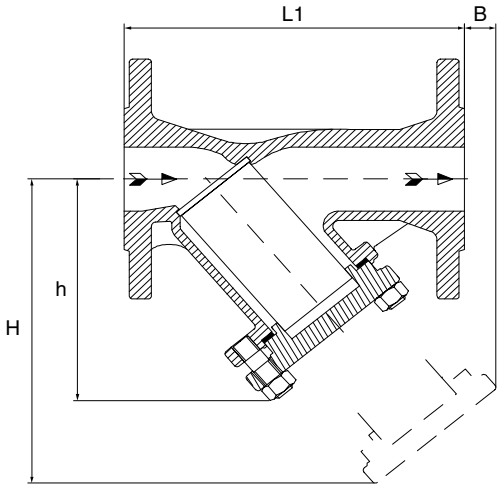
Overview Group 1
Strainer

Strainer with flange connection ..... 150 4...
PN 16, EN-GJS-400-18-LT (GGG-40.3)

Strainer with flange connection
GGG 40.3, PN 16

150 4.. E

Strainer with flange connection,
for water, steam and heat transfer oil
Filter screen: made of alloy steel wire,
if desired with supporting basket
(from DN 200 onwards standard equipment)
and/or fein screen (mesh size 0,25 mm)
Body: GGG 40.3, PN 16
Flanges acc. to DIN 2533



Order text:
Strainer GGG 40.3, PN 16, DN . .
filter screen made of alloy steel,
Flanges acc. to DIN
List-No. 150 4 . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	List-No.	Weight	Immersion lenght	Height opened		Measure	Screen	Wire gauge x mesh size
		kg	L	h	H	B	∅ x height	
15	150 400	3,5	130	90	135	10	23 x 57	0,5 x 1
20	150 401	4	150	100	150	10	28 x 69	0,5 x 1
25	150 402	5,5	160	115	180	25	36 x 83	0,5 x 1
32	150 403	7	180	125	205	35	42 x 99	0,5 x 1
40	150.404	9	200	150	235	45	50 x 115	0,5 x 1
50	150 405	12	230	160	250	45	61,5 x 120	0,5 x 1
65	150 406	16	290	180	285	25	78,5 x 135	0,63x1,25
80	150 408	21	310	215	330	40	89,5 x 150	0,63x1,25
100	150 410	28	350	235	365	55	109,5 x 170	1,0 x 1,6
125	150 412	41	400	275	425	65	137,5 x 200	1,0 x 1,6
150	150 415	58	480	305	480	50	160 x 225	1,0 x 1,6
200	150 420	115	600	390	610	80	210 x 285	1,0 x 1,6

Overview Group 2
Manual operated valves

Manual operated stop valve in two way form ..... 246 3/4/5...a
PN 16, EN-GJL 250
PN 16 / 25, EN-GJS-400-18-LT
Spindle sealing with bellow
Form A

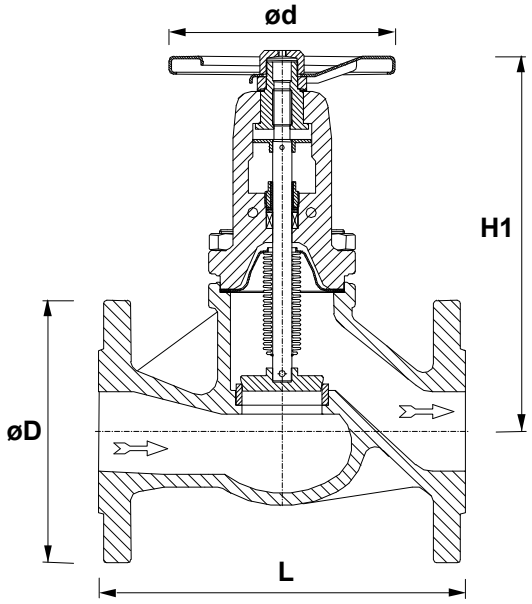
Manual operated stop valve in two way form ..... 246 3/4/5...
PN 16, EN-GJL 250
PN 16 / 25, EN-GJS-400-18-LT
Spindle sealing with bellow
Form B

Manual operated control valve in three way form ..... 2631 …
PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

Manual operated control valve in three way form ..... 2661 …
PN 16 / 25
Spindle sealing with bellow

Manual operated stop valve in two way form with bellow sealing, PN 16/25 Form A

Valve body: two way form
for heat transfer oil, water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel
Plug with marginal seat
Non-rising handwheel
Position indicator, locking device and
lubricating nipple as standard



Accessories, special types**:**
Regulating plug (appendix ...d)
Plug with soft seal, temp. max. 200 °C, (appendix ...w)
Hood valve design acc. to DIN EN 12828 (appendix ...k)
Limit switch
Travel limiter

Material/nominal pressure:

EN-GJL-250	(GG-25)	PN 16	DN 15-300	List-No.: 246 **3**..a.
EN-GJS-400-18-LT	(GGG-40.3)	PN 16	DN 15-350	List-No.: 246 **4**..a.
EN-GJS-400-18-LT	(GGG-40.3)	PN 25	DN 15-150	List-No.: 246 **5**..a.

Pressure-temperature ratings acc. to DIN EN 1092-2:

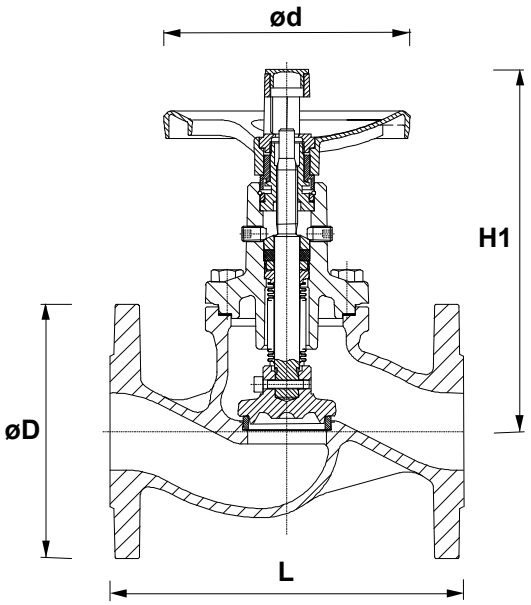
by:		-10...120	150	200	250	300	350	°C
EN-GJL-250	PN 16	16	14,4	12,8	11,2	9,6	---	bar
EN-GJS-400-18-LT	PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
EN-GJS-400-18-LT	PN 25	25	24,3	23,0	21,8	20,0	17,5	bar

Order text:
Manual stop valve, material . . ., PN . ., DN . .
in two way form with bellow sealing
List-No. 246 . . . a ., accessories . . .

DN	List-No.	Kvs m³/h		Stroke mm	Weight kg	Length L	Height H	Handwheel Ød	Flange ØD	
		Stop	Regulating						PN16	PN25
15	246 .00a.	5,3	3,8	6	3,7	130	205	125	95	95
20	246 .01a.	7,2	4,3	6	4,5	150	205	125	105	105
25	246 .02a.	12,0	7,8	8	5,6	160	210	125	115	115
32	246 .03a.	16,0	9,0	8	6,9	180	210	125	140	140
40	246 .04a.	28,5	22,0	13	8,9	200	225	150	150	150
50	246 .05a.	43,0	30,0	13	11,0	230	230	150	165	165
65	246 .06a.	75,0	55,0	16	15,3	290	245	175	185	185
80	246 .08a.	105,0	85,0	20	21,1	310	265	175	200	200
100	246 .10a.	170,0	125,0	25	32,4	350	365	300	220	235
125	246 .12a.	270,0	225,0	32	51,6	400	395	300	250	270
150	246 .15a.	405,0	350,0	40	74,0	480	430	400	285	300
200	246 .20a.	725,0	570,0	50	140,0	600	550	520	340	---
250	246 .25a.	1145,0	945,0	70	240,0	730	720	520	405	---
300	246 .30a.	1635,0	1635,0	80	265,0	850	775	520	460	---
350	246 .35a.	2220,0	2220,0	90	360,0	980	975	640	520	---

Manual operated stop valve in two way form with bellow sealing, PN 16/25 Form B

Valve body: two way form
for heat transfer oil, water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel
DN 15-100: throttling plug
DN > 100: shut-off plug
Non-rising handwheel
Position indicator, locking device and
travel limiter as standard



Accessories, special types**:**
Throttling plug from DN 125 (appendix ...d)
Plug with soft seal, temp. max. 200 °C, (appendix ...w)
Hood valve design acc. to DIN EN 12828 (appendix ...k)

Material/nominal pressure:

EN-GJL-250	(GG-25)	PN 16	DN 15-300	List-No.: 246 **3**...
EN-GJS-400-18-LT	(GGG-40.3)	PN 16	DN 15-350	List-No.: 246 **4**...
EN-GJS-400-18-LT	(GGG-40.3)	PN 25	DN 15-150	List-No.: 246 **5**...

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...120	150	200	250	300	350	°C
EN-GJL-250	PN 16	16	14,4	12,8	11,2	9,6	---	bar
EN-GJS-400-18-LT	PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
EN-GJS-400-18-LT	PN 25	25	24,3	23,0	21,8	20,0	17,5	bar

Order text:
Manual stop valve, material . . ., PN . ., DN . .
in two way form with bellow sealing
List-No. 246 . . . ., accessories . . .

DN	List-No.	Kvs m³/h		Stroke kg		Length L	Height H	Handwheel Ød	Flange ØD	
		Stop-	Throttling-	PN16	PN25				PN16	PN25
15	246 .00.		4,8		3	130	211	125	95	95
20	246 .01.		8,3		4	150	214	125	105	105
25	246 .02.		11,9		5	160	220	125	115	115
32	246 .03.		19,9		8	180	238	125	140	140
40	246 .04.		27,1		9	200	243	125	150	150
50	246 .05.		43,3		11	230	266	160	165	165
65	246 .06.		75,1		17	290	290	160	185	185
80	246 .08.		116,7	21	29	310	324	200	200	200
100	246 .10.		172,3	31	40	350	348	200	220	235
125	246 .12.	270,0	171,5	51	65	400	460	250	250	270
150	246 .15.	393,0	204,0	69	89	480	479	250	285	300
200	246 .20.	657,0	457,0	139	---	600	570	400	340	---
250	246 .25.	1035,0	714,0	239	---	730	606	400	405	---
300	246 .30.	1466,0	1028,0	343	---	850	660	400	460	---
350	246 .35.	1466,0	1028,0	390	---	980	660	400	520	---

Manual operated control valve in three way form with PTFE-V-ring sealing, DN15-150 PN 16 / 25 / 40

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: manual operated

Accessories, special types**:**
Limit switches (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Manual operated control valve, with mixing plug
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
List-No.: PN16: 2631 **4** . . , PN25: 2631 **5** . . , PN40: 2631 **7** . . , PN40: 2631 **E**. .
Accessories . . .

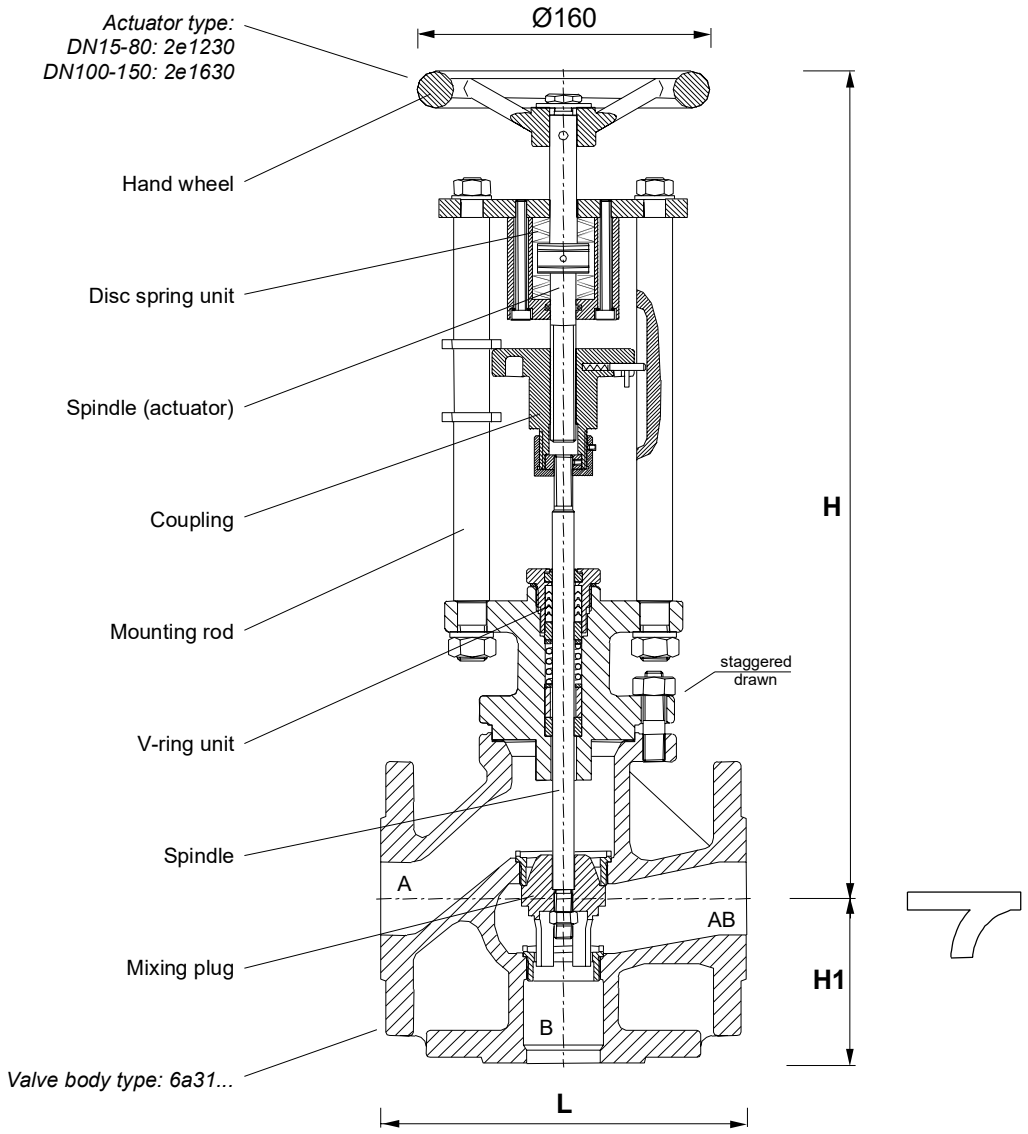
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	331 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	331 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	331 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	331 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**
	PN 16	PN 25	PN40	PN40	m³/h	mm
15	2631 400	2631 500	2631 700	2631 E00	4	20
20	2631 401	2631 501	2631 701	2631 E01	6,3	20
25	2631 402	2631 502	2631 702	2631 E02	10	20
32	2631 403	2631 503	2631 703	2631 E03	16	20
40	2631 404	2631 504	2631 704	2631 E04	25	20
50	2631 405	2631 505	2631 705	2631 E05	40	20
65	2631 406	2631 506	2631 706	2631 E06	63	30
80	2631 408	2631 508	2631 708	2631 E08	100	30
100	2631 410	2631 510	2631 710	2631 E10	150	30
125	2631 412	2631 512			230	35
150	2631 415	2631 515			330	38

Bigger DN and two way form on request



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	416	430	424	431	436	438	481	482	489	645	660
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	13	14	15	17	19	22	38	43	56	111	132

Manual operated control valve in three way form with bellow sealing, DN15-150 PN 16 / 25

Body: three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: manual operated

Accessories, special types**:**
Limit switches (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Manual operated control valve, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
List-No.: PN16: 2661 **4** . . , PN25: 2661 **5** . . , PN25: 2661 **6** . . , PN25: 2661 **E** . ._p2
Accessories . . .

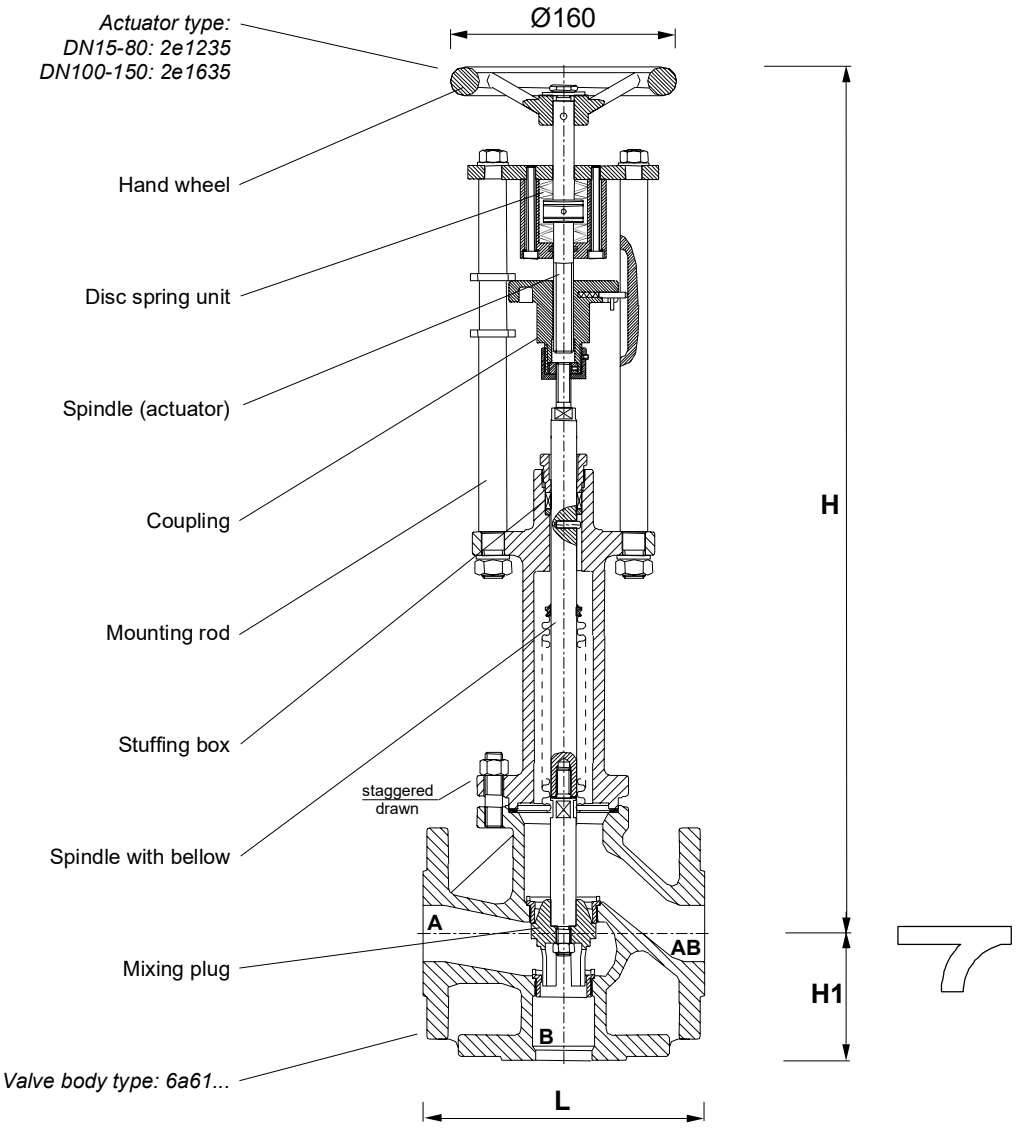
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	2661 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	2661 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	2661 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	2661 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**
	PN 16	PN 25	PN25	PN25	m³/h	mm
15	2661 400	2661 500	2661 600	2661 E00_p2	4	20
20	2661 401	2661 501	2661 601	2661 E01_p2	6,3	20
25	2661 402	2661 502	2661 602	2661 E02_p2	10	20
32	2661 403	2661 503	2661 603	2661 E03_p2	16	20
40	2661 404	2661 504	2661 604	2661 E04_p2	25	20
50	2661 405	2661 505	2661 605	2661 E05_p2	40	20
65	2661 406	2661 506	2661 606	2661 E06_p2	63	30
80	2661 408	2661 508	2661 608	2661 E08_p2	100	30
100	2661 410	2661 510	2661 610	2661 E10_p2	150	30
125	2661 412	2661 512			230	35
150	2661 415				330	38

Bigger DN and two way form on request



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	590	605	599	606	611	616	743	744	751	855	870
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	13	14	15	18	19	22	41	46	59	113	134

Overview Group 3
Pneumatic control valves

Pneumatic stop valve in two way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-100	1-5kN- actuator	311...

Pneumatic control valve in two way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-50	1-5kN- actuator	321..._1
DN 65-100	1-5kN- actuator	321…_2
DN 50-100	10kN- actuator	321...Se
DN 65-150	14/20kN- actuator	321...Sg/i
DN 200	14/24kN- actuator	321 4/520Sg/k

Pneumatic control valve in three way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-150	1-5kN- actuator, with mixing plug	331...
DN 50-150	14kN- actuator, with mixing plug	331…Sg
DN 200	14kN- actuator, with mixing plug	331 4/520Sg
DN 32-150	1-5kN- actuator, with diverting plug	332...
DN 50-150	14kN- actuator, with diverting plug	332...Sg
DN 200	12-18kN- actuator, with diverting plug	332 4/520Sf/g/h

Pneumatic control valve in two way form, PN 16 / 25 / 40(25)
Spindle sealing with bellow

DN 15-150	1-5kN- actuator	351...
DN 50-100	10kN- actuator	351...Se
DN 65-150	14kN- actuator	351...Sg
DN 200	14/25kN- actuator	351 420Sg/k

Pneumatic control valve in three way form, PN 16 / 25 / 40(25)
Spindle sealing with bellow

DN 15-150	1-5kN- actuator, with mixing plug	361...
DN 200	14kN- actuator, with mixing plug	361 420Sg
DN 32-150	1-5kN- actuator, with diverting plug	362...
DN 200	12-18kN- actuator, with diverting plug	362 420Sf/g/h

Pneumatic control valve in three or two way form, PN 16 ..... 381...
with thread connectors

Accessories:

Electro-pneumatic (E/P) converter	39036..
Pneumatic (P/P) positioner	3905...
Electro-pneumatic (E/P) positioner	3908...
Pneumatic accessories	393/4...
Limit switches	39e...
Manual operating device	39h...

Pneumatic actuators:

Pneumatic actuator type 3f1 Thrust 1-5 kN, diaphragm area 250 cm²	3f1...

Operating instructions: see group 0

Pneumatic stop valve in two way form with PTFE-V-ring sealing, DN15-100 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: OPEN - CLOSED
Leakage: < 0,001% Kvs



Actuator: diaphragm area 250 cm², ø250 mm
Closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic stop valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway
Closing pressure . . . bar
List-No.: PN16: 311 **4** . . , PN25: 311 **5** . . , PN40: 311 **7** . . , PN40: 311 **E** . .
Accessories: . . .

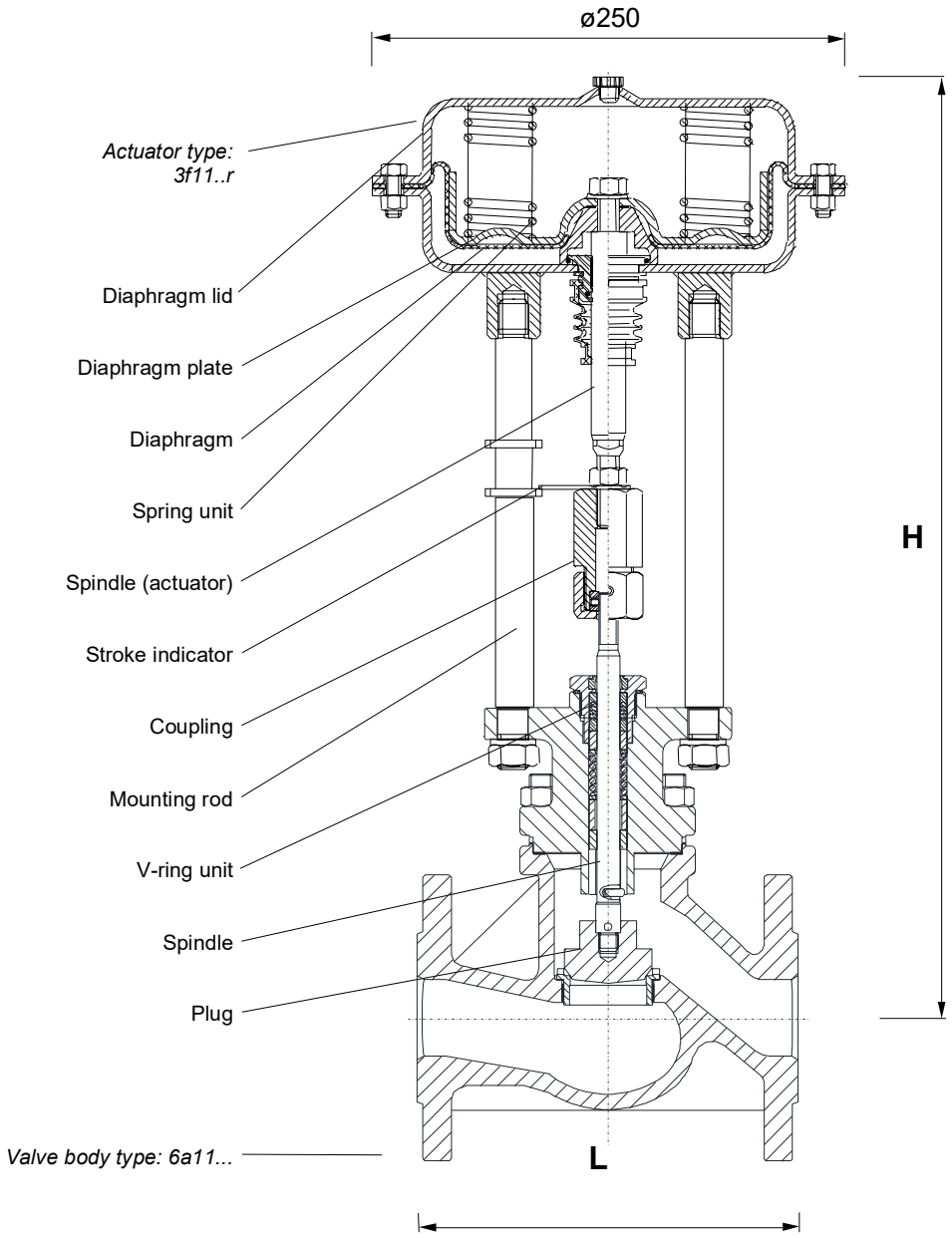
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	311 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	311 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	311 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	311 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) by operating pressure... 1,6 bar: standard	2,4 bar: type ...c	4,4 bar: type ...d
15	311 400	311 500	311 700	311E00	4,0	7	40,0		
20	311 401	311 501	311 701	311E01	6,3	9	40,0		
25	311 402.	311 502.	311 702.	311E02.	10	10	32,9	40,0	
32	311 403.	311 503.	311 703.	311E03.	16	12	22,8	39,3	40,0
40	311 404.	311 504.	311 704.	311E04.	25	14	10,8	23,4	40,0
50	311 405.	311 505.	311 705.	311E05.	40	14	6,6	14,8	33,0
65	311 406.	311 506.	311 706.	311E06.	63	20	2,3	7,0	16,5
80	311 408.	311 508.	311 708.	311E08.	100	20	1,3	4,4	10,7
100	311 410.	311 510.	311 710.	311E10.	150	30		1,7	4,7

Pneumatic stop valve in two way form with PTFE-V-ring sealing, DN15-100 PN 16 / 25 / 40



DN	15	20	25	32	40	50	65	80	100
Height H	460	474	468	474	480	482	525	526	533
Length L	130	150	160	180	200	230	290	310	350
Weight kg	17	18	19	20	21	23	38	41	51

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40



Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 50:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

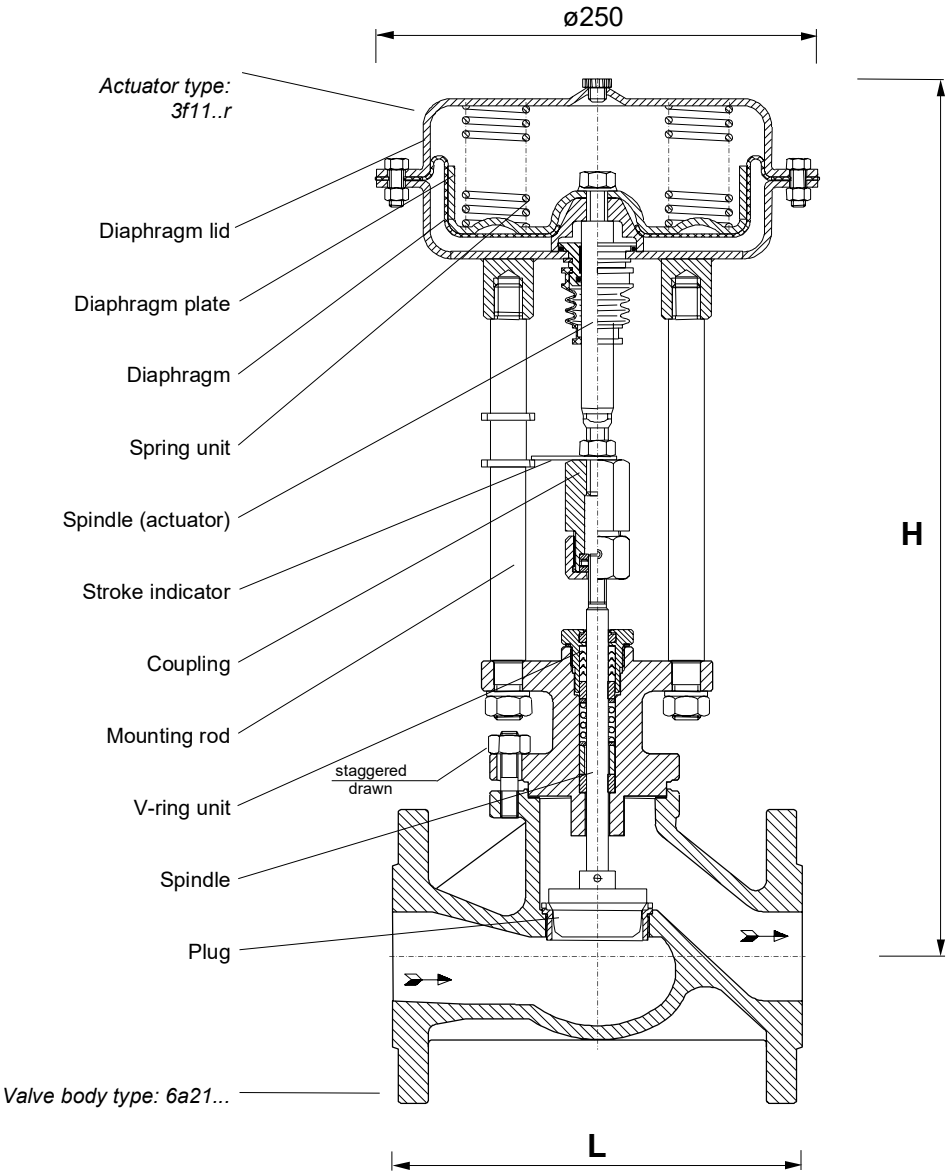
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . , PN25: 321 **5** . . , PN40: 321 **7** . . , PN40: 321 **E** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	321 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	321 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	321 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	321 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,2bar: standard.	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	321 400.	321 500.	321 700.	321E00.	4,0	20	17,9	40,0	
	321 450.	321 550.	321 750.	321E50.	2,5	20	17,9	40,0	
	321 470.	321 570.	321 770.	321E70.	1,6	20	17,9	40,0	
20	321 401.	321 501.	321 701.	321E01.	6,3	20	17,9	40,0	
	321 451.	321 551.	321 751.	321E51.	4,0	20	17,9	40,0	
	321 471.	321 571.	321 771.	321E71.	2,5	20	17,9	40,0	
25	321 402.	321 502.	321 702.	321E02.	10	20	11,1	37,3	40,0
	321 452.	321 552.	321 752.	321E52.	6,3	20	17,9	40,0	
	321 472.	321 572.	321 772.	321E72.	4,0	20	17,9	40,0	
32	321 403.	321 503.	321 703.	321E03.	16	20	6,3	22,8	40,0
	321 453.	321 553.	321 753.	321E53.	10	20	11,1	37,3	40,0
	321 473.	321 573.	321 773.	321E73.	6,3	20	17,9	40,0	40,0
40	321 404.	321 504.	321 704.	321E04.	25	20	3,6	14,4	32,4
	321 454.	321 554.	321 754.	321E54.	16	20	6,3	22,8	40,0
	321 474.	321 574.	321 774.	321E74.	10	20	11,1	37,3	40,0
50	321 405.	321 505.	321 705.	321E05.	40	20	1,9	8,9	20,7
	321 455.	321 555.	321 755.	321E55.	25	20	3,6	14,4	32,4
	321 475.	321 575.	321 775.	321E75.	16	20	6,3	22,8	40,0



DN	15	20	25	32	40	50
Height H	460	474	468	474	480	482
Length L	130	150	160	180	200	230
Weight kg	17	18	19	20	21	23

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN65-100 PN 16 / 25 / 40



Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

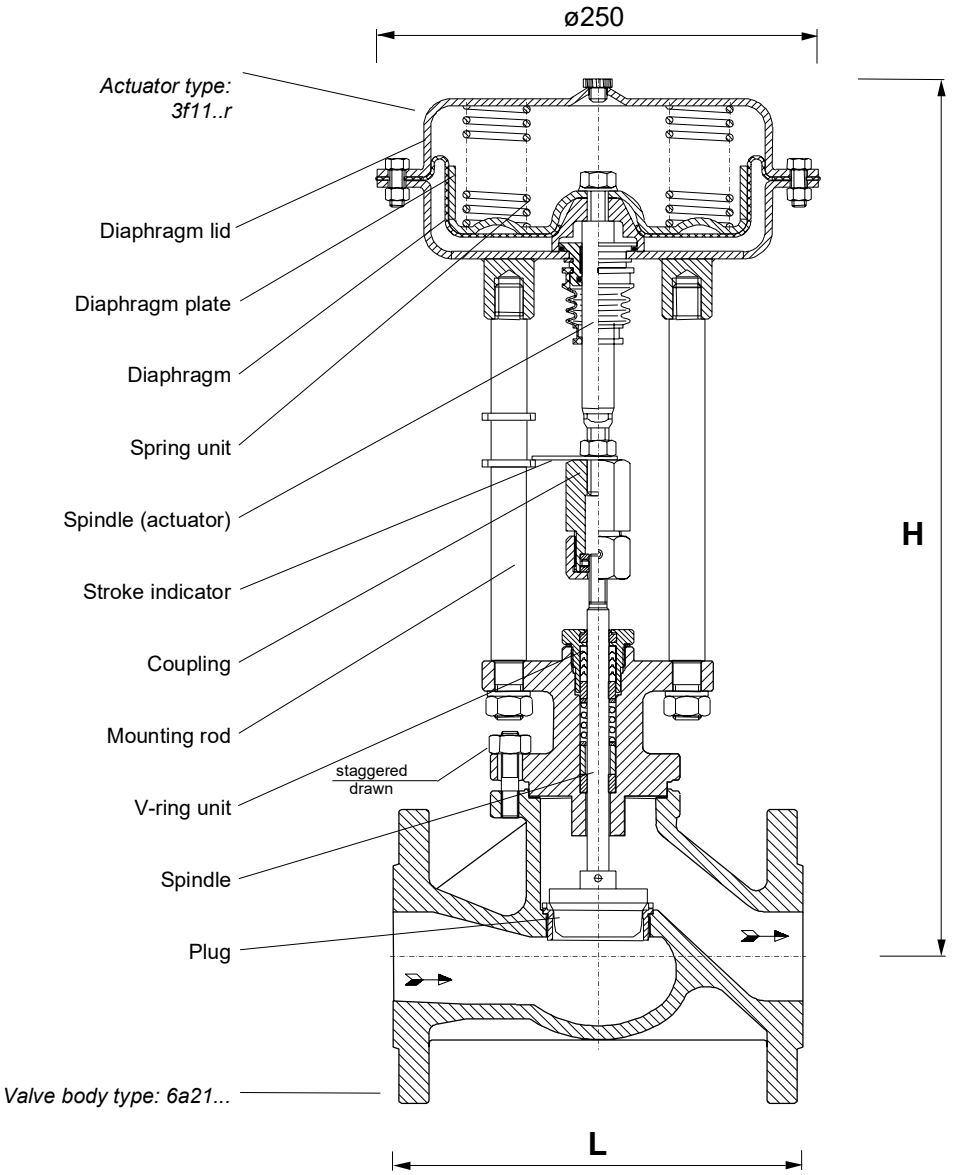
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . , PN25: 321 **5** . . , PN40: 321 **7** . . , PN40: 321 **E** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	321 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	321 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	321 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	321 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
65	321 406.	321 506.	321 706.	321E06.	63	30	0,6	4,8	11,9
	321 456.	321 556.	321 756.	321E56.	40	20	1,9	8,9	20,7
	321 476.	321 576.	321 776.	321E76.	25	20	3,6	14,4	32,2
80	321 408.	321 508.	321 708.	321E08.	100	30		3,0	7,7
	321 458.	321 558.	321 758.	321E58.	63	20	0,6	4,8	11,9
	321 478.	321 578.	321 778.	321E78.	40	20	1,9	8,9	20,7
100	321 410.	321 510.	321 710.	321E10.	150	30		1,7	4,7
	321 460.	321 560.	321 760.	321E60.	100	30		4,8	11,9
	321 480.	321 580.	321 780.	321E80.	63	22	0,6	4,8	11,9



DN	65	80	100
Height H	525	526	533
Length L	290	310	350
Weight kg	38	41	51

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN50-100 PN 16 / 25 / 40, with 10kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 400 cm², ø310 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: 4,4…5,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . Se, PN25: 321 **5** . . Se, PN40: 321 **7** . . Se, PN40: 321 **E** . . Se
Accessories: . . .

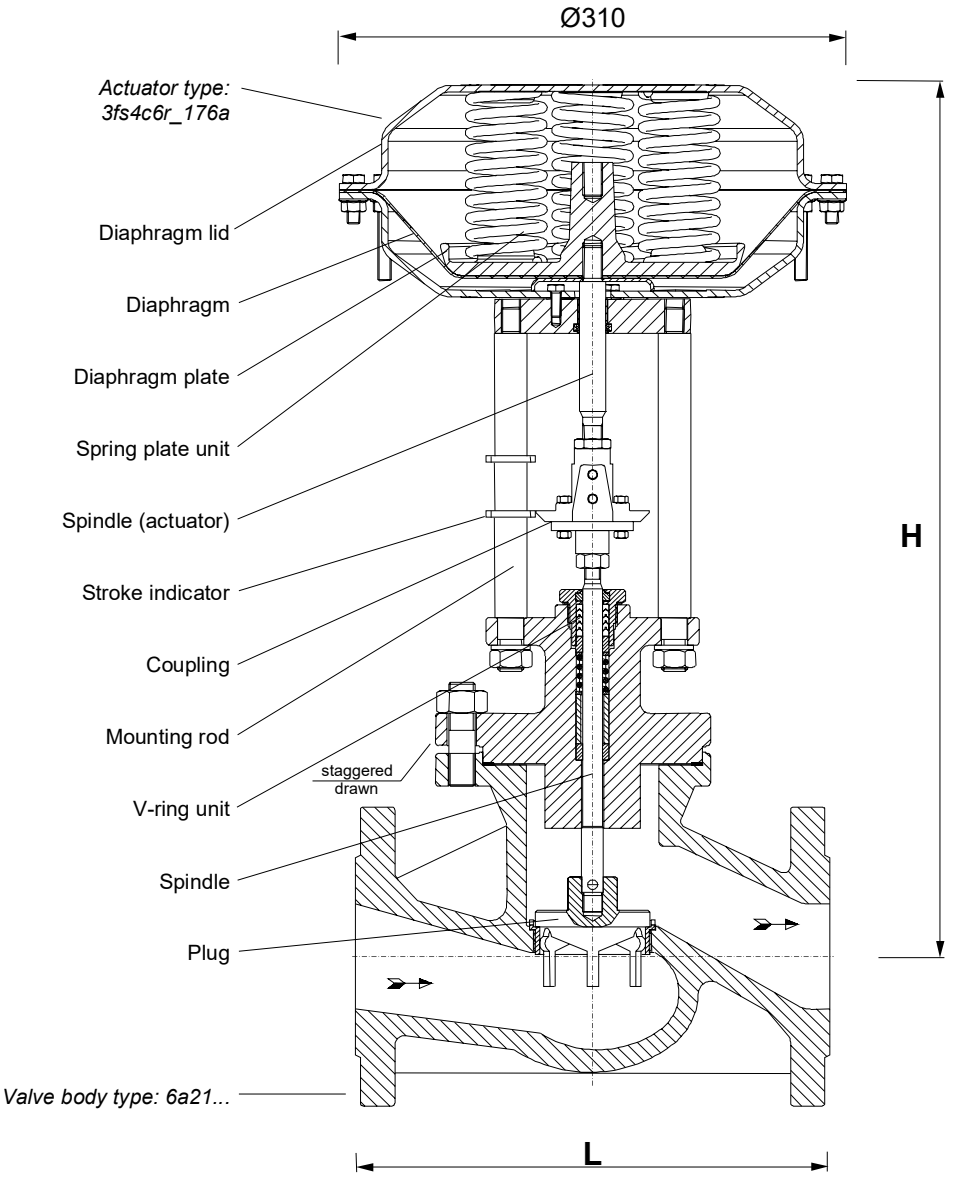
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	321 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	321 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	321 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	321 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) type ...Se
50	321 405Se	321 505Se	321 705Se	321 E05Se	40	20	40,0
	321 455Se	321 555Se	321 755Se	321 E55Se	25	20	40,0
	321 475Se	321 575Se	321 775Se	321 E75Se	16	20	40,0
65	321 406Se	321 506Se	321 706Se	321 E06Se	63	30	26,1
	321 456Se	321 556Se	321 756Se	321 E56Se	40	20	40,0
	321 476Se	321 576Se	321 776Se	321 E76Se	25	20	40,0
80	321 408Se	321 508Se	321 708Se	321 E08Se	100	30	17,2
	321 458Se	321 558Se	321 758Se	321 E58Se	63	20	26,1
	321 478Se	321 578Se	321 778Se	321 E78Se	40	20	40,0
100	321 410Se	321 510Se	321 710Se	321 E10Se	150	30	10,9
	321 460Se	321 560Se	321 760Se	321 E60Se	100	30	26,1
	321 480Se	321 580Se	321 780Se	321 E80Se	63	22	26,1

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN50-100 PN 16 / 25 / 40, with 10kN actuator



DN	50	65	80	100
Height H	528	571	572	579
Length L	230	290	310	350
Weight kg	29	47	51	61

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40, with 14/20kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 800 cm², ø420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 3,7…6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . S . , PN25: 321 **5** . . S . , PN40: 321 **7** . . S . , PN40: 321 **E** . . S .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

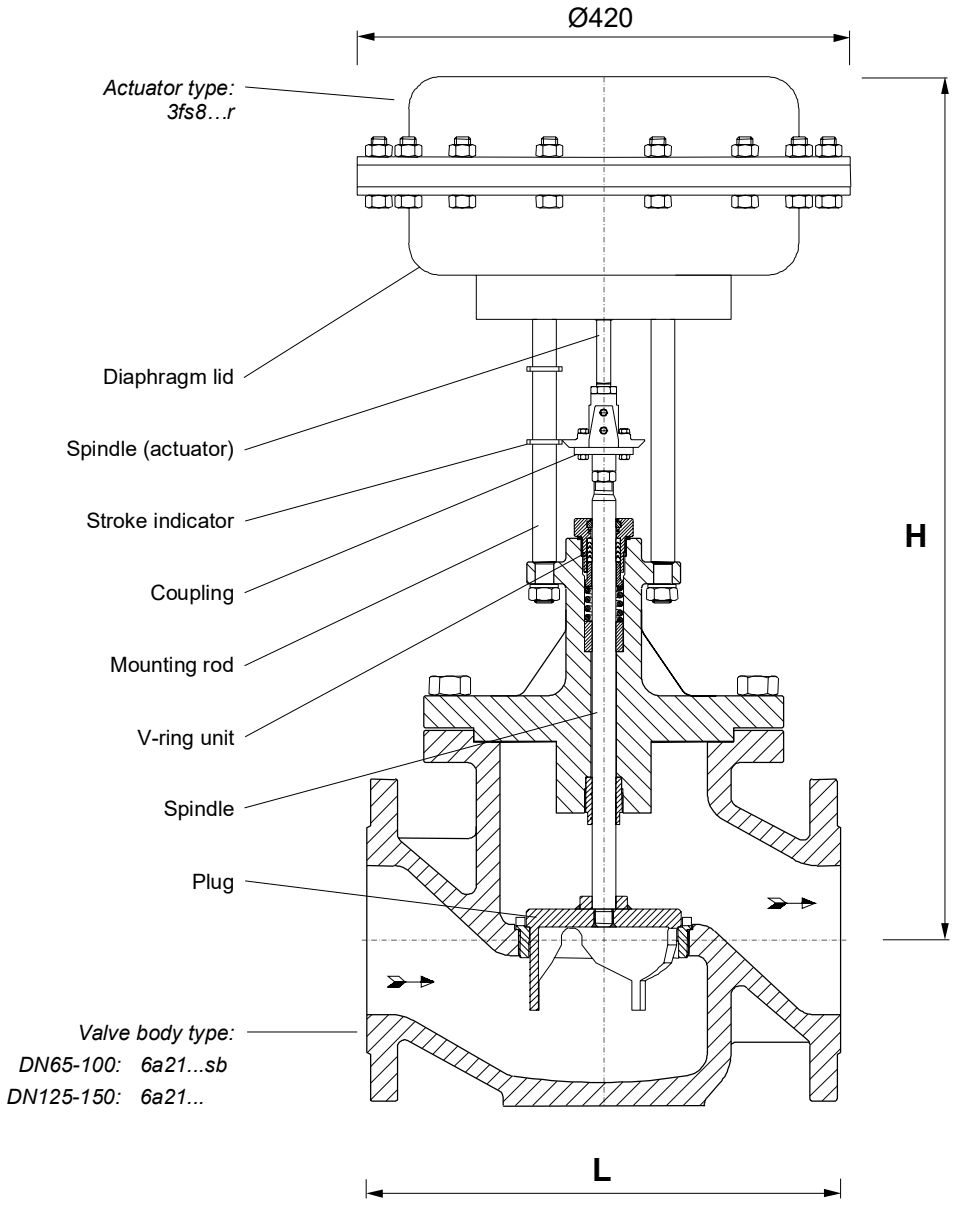
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	321 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	321 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	321 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	321 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Sg	type ...Si
65	321 406S.	321 506S.	321 706S.	321 E06S.	63	30	38,0	40,0
80	321 408S.	321 508S.	321 708S.	321 E08S.	100	30	24,7	39,0
100	321 410S.	321 510S.	321 710S.	321 E10S.	150	30	16,0	25,0
	321 460S.	321 560S.	321 760S.	321 E60S.	100	30	38,0	40,0
125	321 412S.	321 512S.			230	60	10,0	14,7
	321 412S._140a	321 512S._140a			140	35	16,0	25,0
	321 412S._100a	321 512S._100a			100	35	24,7	36,1
150	321 415S.	321 515S.			330	60	6,8	10,1
	321 415S._250a	321 515S._250a			250	50	10,0	14,7
	321 415S._150a	321 515S._150a			150	35	16,0	25,0

*** = higher closing pressures and DN>200 on request, DN200: see page 3214/520Sg/k*

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40, with 14/20kN actuator



DN	65	80	100	125	150
Height H	677	678	685	763	778
Length L	290	310	350	400	480
Weight kg	87	90	100	137	157

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16/25

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway
Air connection: G 1/4",
Operating pressure: 5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . – . . . bar, closing pressure . . bar
List-No. 321 . 20 S . , accessories: . . .

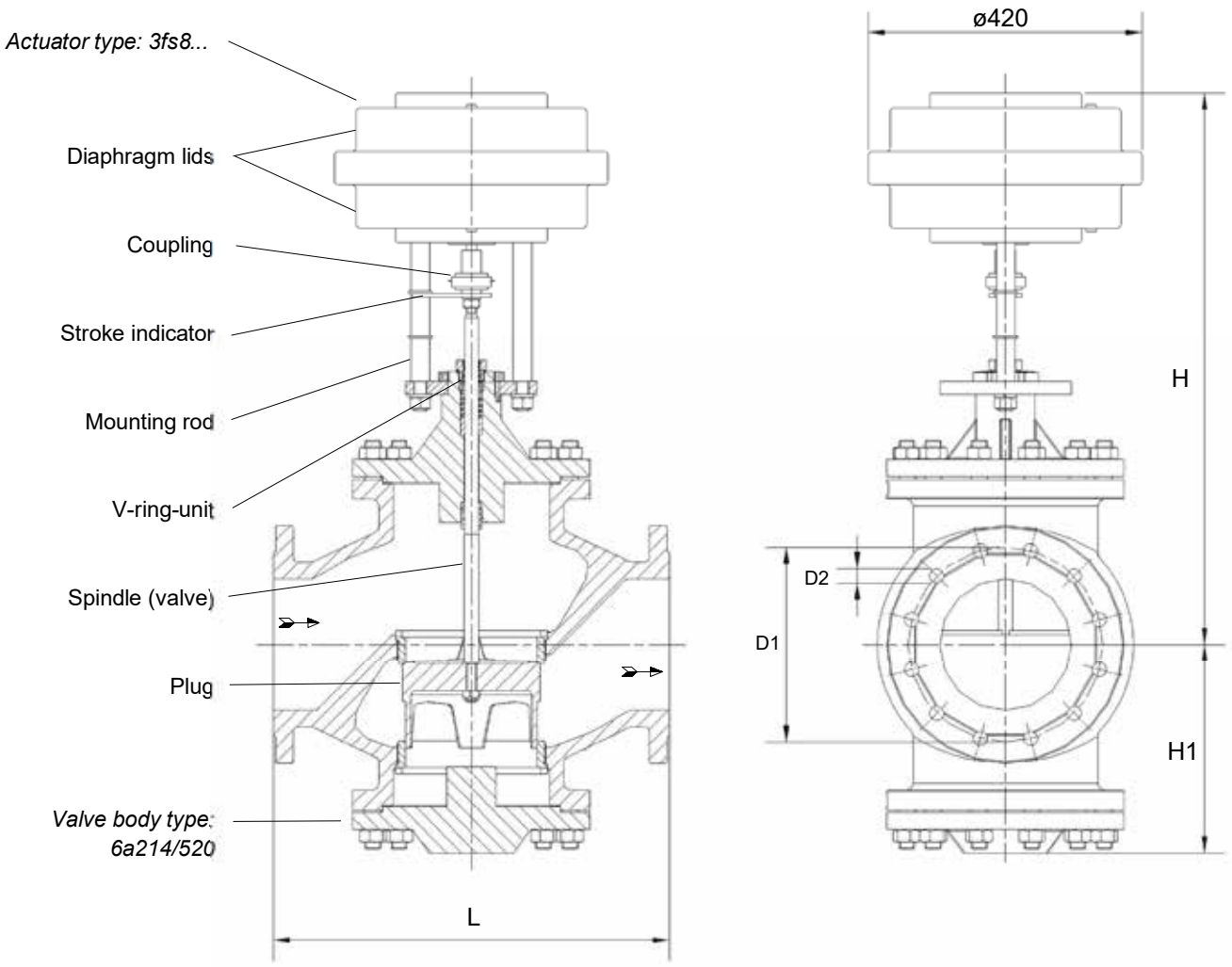
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...	
	PN 16	PN 25	m³/h	mm	1,9...4,9 bar	2,1…5,1bar
200	321420Sg	321520Sg	630	60	3,7	
200	321420Sk	321520Sk	630	60		6,8

*** higher closing pressures on request*



Dimensions

DN	200
Height H	835
Length H1	315
Length L	600
Weight kg	315

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN15-150 PN 16 / 25 / 40

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 331 **4** . . , PN25: 331 **5** . . , PN40: 331 **7** . . , PN40: 331 **E**. .
Accessories: . . .

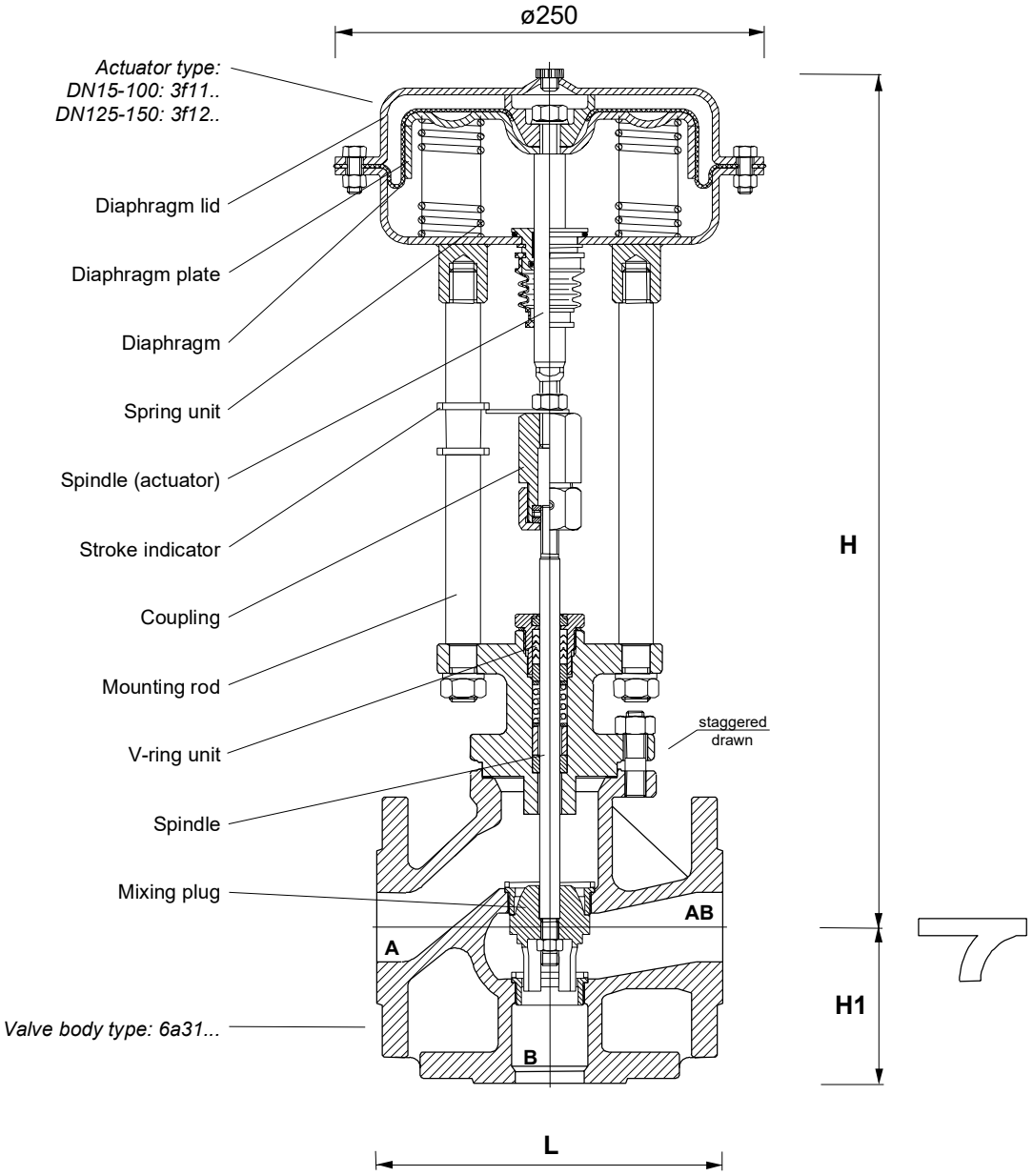
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	331 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	331 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	331 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	331 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN16	PN25	PN40	PN40	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	331 400.	331 500.	331 700.	331 E00.	4,0	20	17,9	40,0	
20	331 401.	331 501.	331 701.	331 E01.	6,3	20	17,9	40,0	
25	331 402.	331 502.	331 702.	331 E02.	10	20	11,1	37,3	40,0
32	331 403.	331 503.	331 703.	331 E03.	16	20	6,3	22,8	40,0
40	331 404.	331 504.	331 704.	331 E04.	25	20	3,6	14,4	32,4
50	331 405.	331 505.	331 705.	331 E05.	40	20	1,9	8,9	20,7
65	331 406.	331 506.	331 706.	331 E06.	63	30	0,6	4,8	11,9
80	331 408.	331 508.	331 708.	331 E08.	100	30		3,0	7,7
100	331 410.	331 510.	331 710.	331 E10.	150	30		1,7	4,7
125	331 412.	331 512.			230	35		0,7	2,5
150	331 415.	331 515.			330	38			1,6

*** = higher closing pressures and DN>200 on request, DN200: see page 3314/520Sg*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	458	472	466	473	480	483	525	526	533	685	700
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	17	18	19	22	23	26	42	47	61	115	137

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40 with 14kN actuator

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB
Air connection: G1/4"
Operating pressure: 3,8-5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 331 **4** . . Sg, PN25: 331 **5** . . Sg, PN40: 331 **7** . . Sg, PN40: 331 **E** . . Sg
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

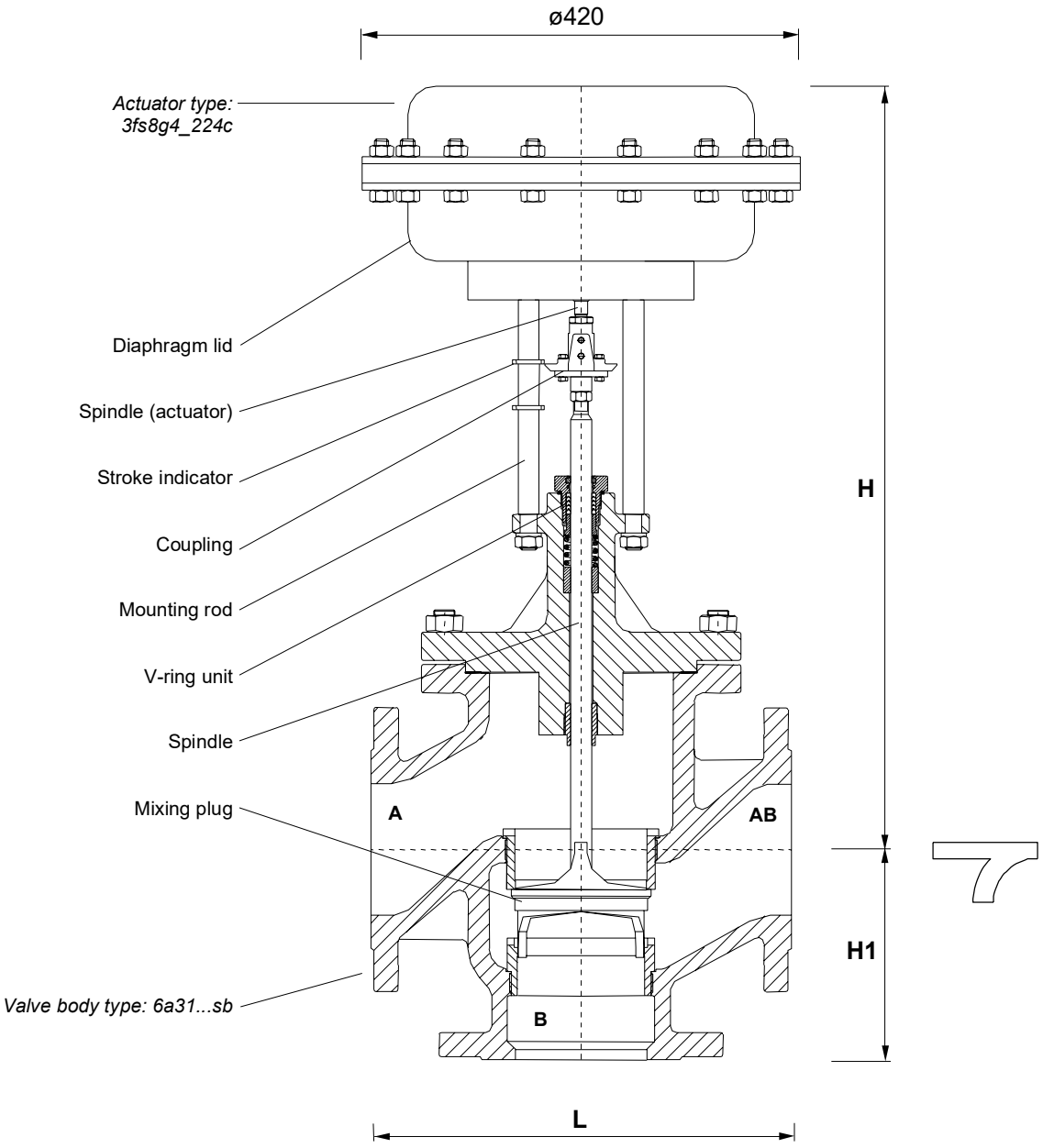
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	331 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	331 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	331 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	331 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar)
	PN 16	PN25	PN40	PN40	m³/h	mm	type ...Sg
50	331 405Sg	331 505Sg	331 705Sg	331 E05Sg	40	20	25,0
65	331 406Sg	331 506Sg	331 706Sg	331 E06Sg	63	30	25,0
80	331 408Sg	331 508Sg	331 708Sg	331 E08Sg	100	30	24,7
100	331 410Sg	331 510Sg	331 710Sg	331 E10Sg	150	30	15,8
125	331 412Sg	331 512Sg			230	35	10,0
150	331 415Sg	331 515Sg			330	38	6,8

*** = higher closing pressures and DN>200 on request, DN200: see page 3314/520Sg*

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40 with 14kN actuator



DN	50	65	80	100	125	150
Height H	610	653	654	661	763	778
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	62	79	81	94	150	170

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16/25

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB"
Air connection: G 1/4",
Operating pressure: 6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Spring closes straightway A-AB
Control signal 1,2 – 4,9 bar, closing pressure 2,0 bar
List-No. 331 . . . Sg, accessories: . . .

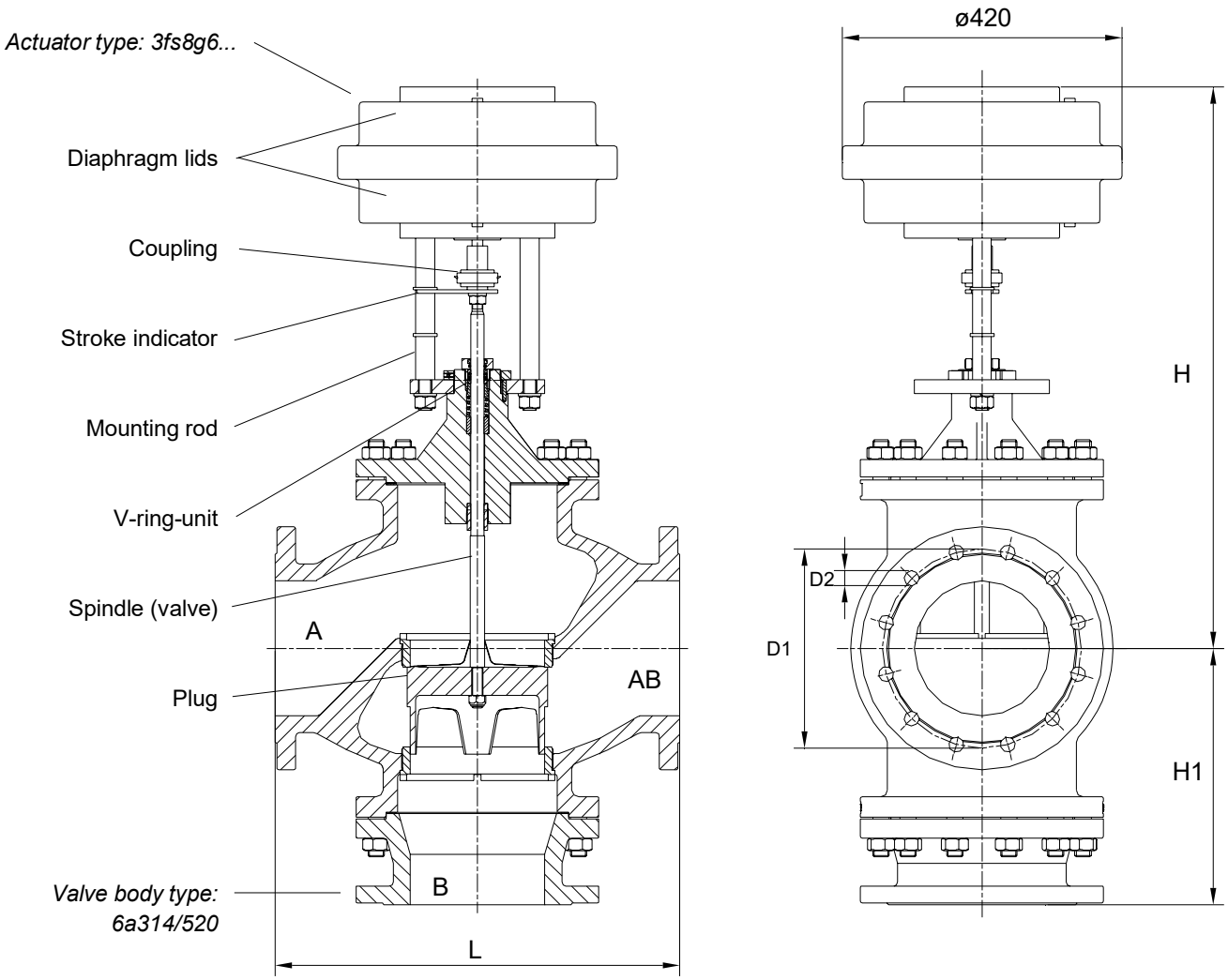
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...
	PN 16	PN 25	m³/h	mm	1,9...4,9 bar
200	331420Sg	331520Sg	630	60	2,0

** higher closing pressures on request*



7

Dimensions

DN	200
Height H	835
Stud length H1	380
Length L	600
Weight kg	315

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Pneumatic control valve for diverting function three way form with PTFE-V-ring sealing, DN32-150 PN 16 / 25 / 40

Body: three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway AB-A"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 332 **4** . . , PN25: 332 **5** . . , PN40: 332 **7** . . , PN40: 332 **E**. .
Accessories: . . .

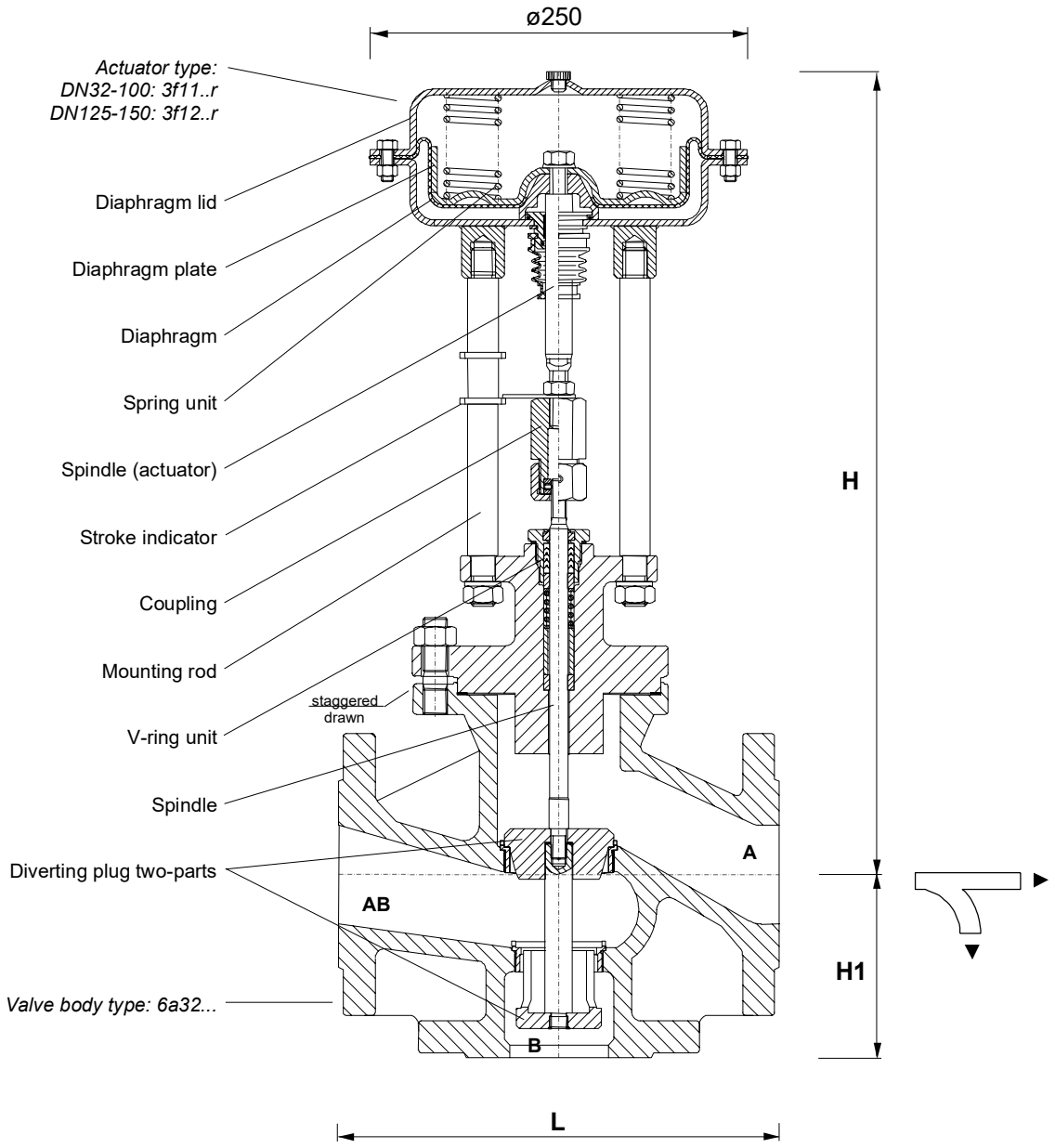
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	332 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	332 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	332 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	332 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN16	PN25	PN40	PN40	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
32	332 403.	332 503.	332 703.	332 E03.	12	20	6,3	22,8	40,0
40	332 404.	332 504.	332 704.	332 E04.	20	20	3,6	14,4	32,4
50	332 405.	332 505.	332 705.	332 E05.	27	20	1,9	8,9	20,7
65	332 406.	332 506.	332 706.	332 E06.	50	30	0,6	4,8	11,9
80	332 408.	332 508.	332 708.	332 E08.	83	30		3,0	7,7
100	332 410.	332 510.	332 710.	332 E10.	123	30		1,7	4,7
125	332 412.	332 512.			190	35		1,7	4,7
150	332 415.	332 515.			250	35		1,0	3,1

*** = higher closing pressures and DN>200 on request, DN200: see page 3324/520Sf/g/h*



DN	32	40	50	65	80	100	125	150
Height H	473	480	483	525	526	533	685	700
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	22	23	26	42	45	58	115	135

Pneumatic control valve for diverting function three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 14kN actuator

Body: three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway AB-A
Air connection: G1/4"
Operating pressure: 3,8-5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 332 **4** . . Sg, PN25: 332 **5** . . Sg, PN40: 332 **7** . . Sg, PN40: 332 **E** . . Sg
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

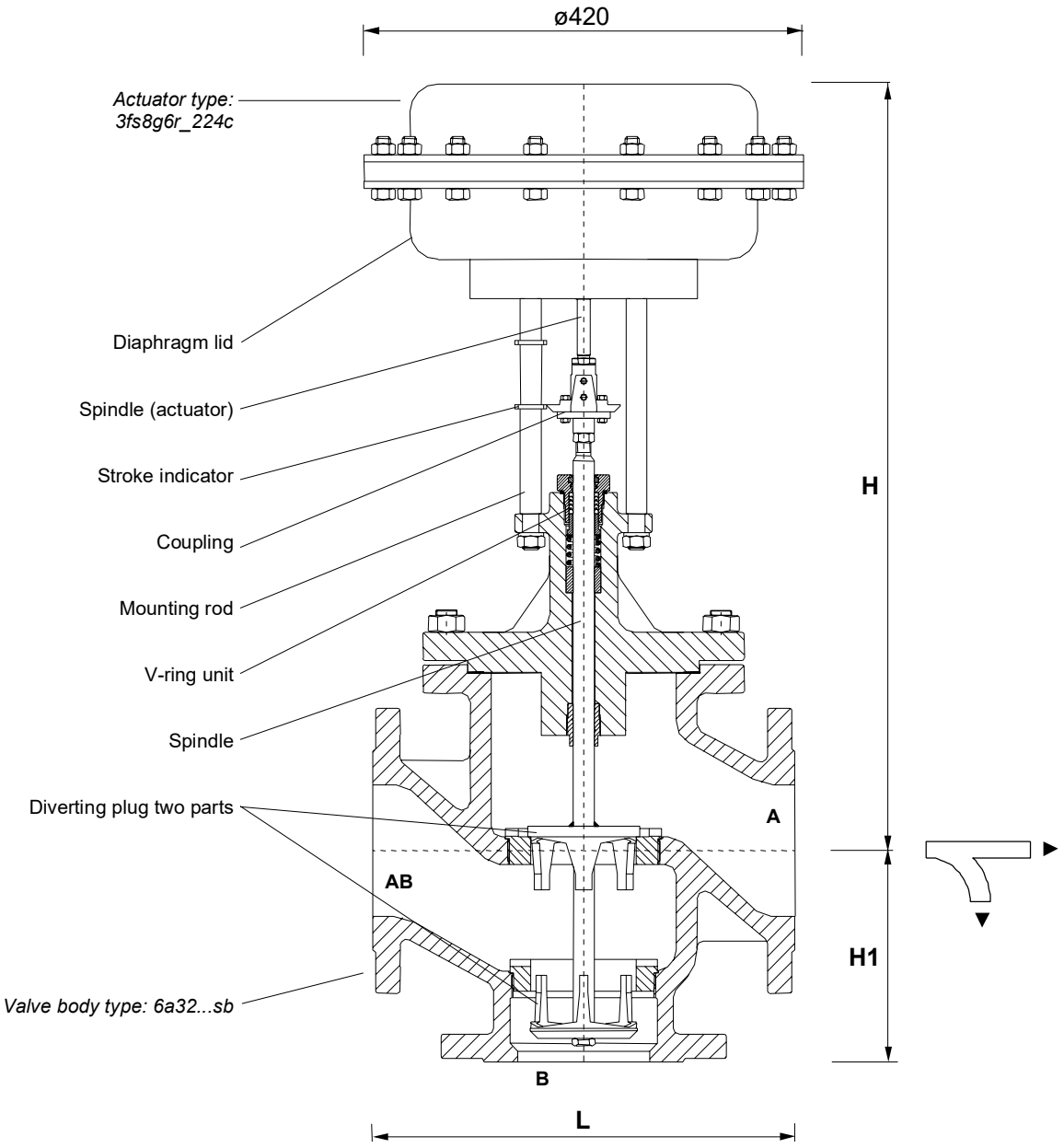
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	332 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	332 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	332 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	332 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN 16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Sg
50	332 405Sg	332 505Sg	332 705Sg	332 E05Sg	27	20	25,0
65	332 406Sg	332 506Sg	332 706Sg	332 E06Sg	50	30	25,0
80	332 408Sg	332 508Sg	332 708Sg	332 E08Sg	83	30	24,7
100	332 410Sg	332 510Sg	332 710Sg	332 E10Sg	123	30	15,8
125	332 412Sg	332 512Sg			190	35	15,8
150	332 415Sg	332 515Sg			250	35	10,8

*** = higher closing pressures and DN>200 on request, DN200: see page 3324/520Sf/g/h*

Pneumatic control valve for diverting function three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 14kN actuator



DN	50	65	80	100	125	150
Height H	610	653	654	661	763	778
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	62	79	81	94	150	170

Pneumatic control valve for diverting function 332 4/5 20Sf/g/h E
with PTFE-V-ring sealing, DN200
EN-GJS-400-18-LT (GGG-40.3), PN 16/25, with 12-18kN actuator

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version with diverting plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
type ...h: 1730 cm², ∅ = 600 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway AB-A
Air connection: G 1/4", type ...h: G 3/4“
Operating pressure: 6,0 bar, type ...h: 3 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 470
Spindle sealing with PTFE-V-ring unit
Spring closes straightway AB-A
Control signal . . . – . . . bar, closing pressure . . . bar
List-No. 332 . 20 S . , accessories: . . .

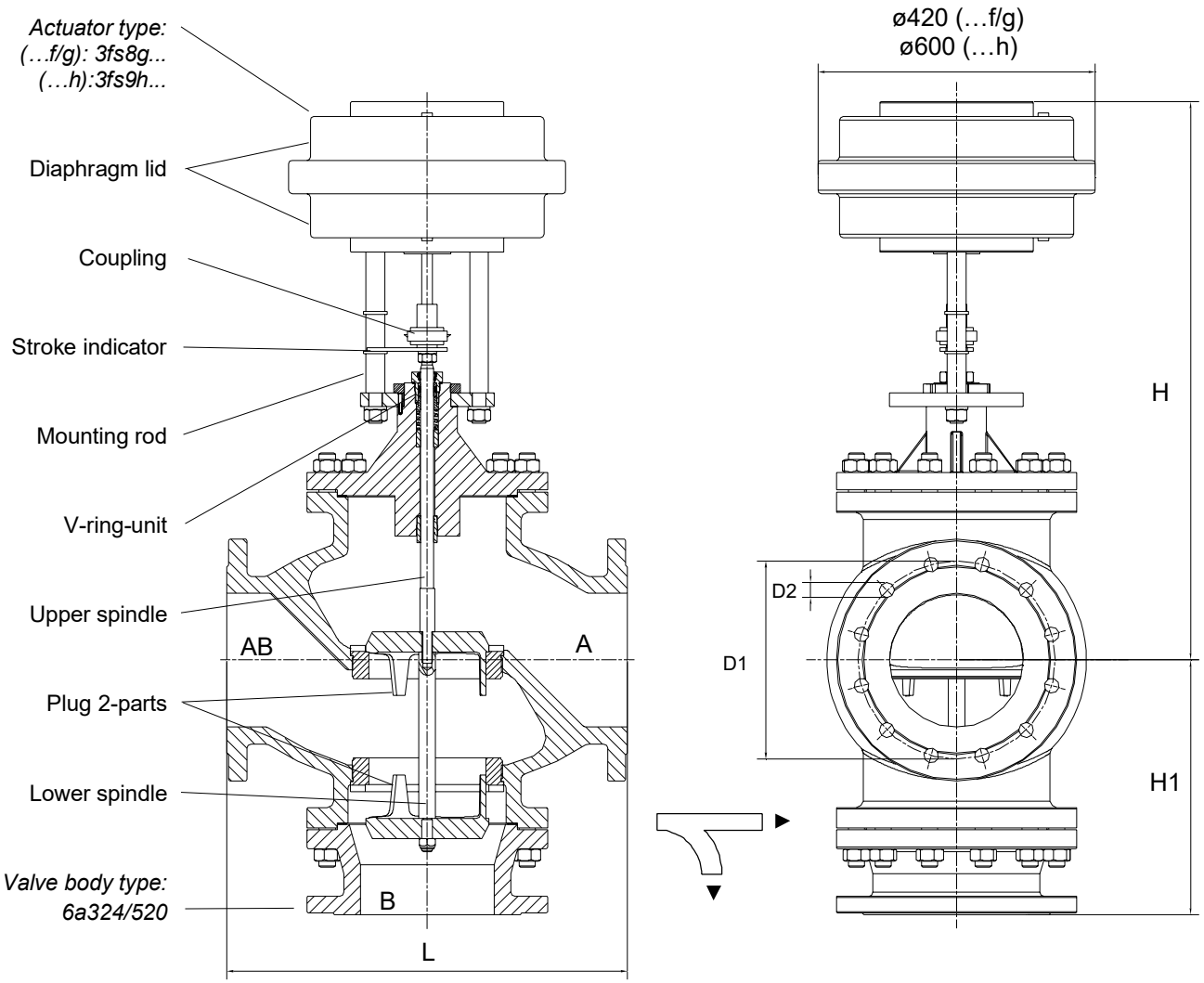
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN 16	PN 25	m³/h	mm	1,5...4,5 bar	2,1...4,1 bar	0,9...2,0 bar
200	332420S**f**	332520S**f**	470	50	4,0		
200	332420S**g**	332520S**g**	470	50		4,9	
200	332420S**h**	332520S**h**	470	50			6,5

*** higher closing pressures on request*



Dimensions

DN	200
Height H (…f/g)	835
Height H (…h)	1200
Stud length H1	380
Length L	600
Weight kg (…f/g)	315
Weight kg (…h)	400

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Pneumatic control valve in two way form with bellow sealing, DN15-150 PN 16 / 25



Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . , PN25: 351 **5** . . , PN25: 351 **6** . . , PN25: 351 **E** . ._p2
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

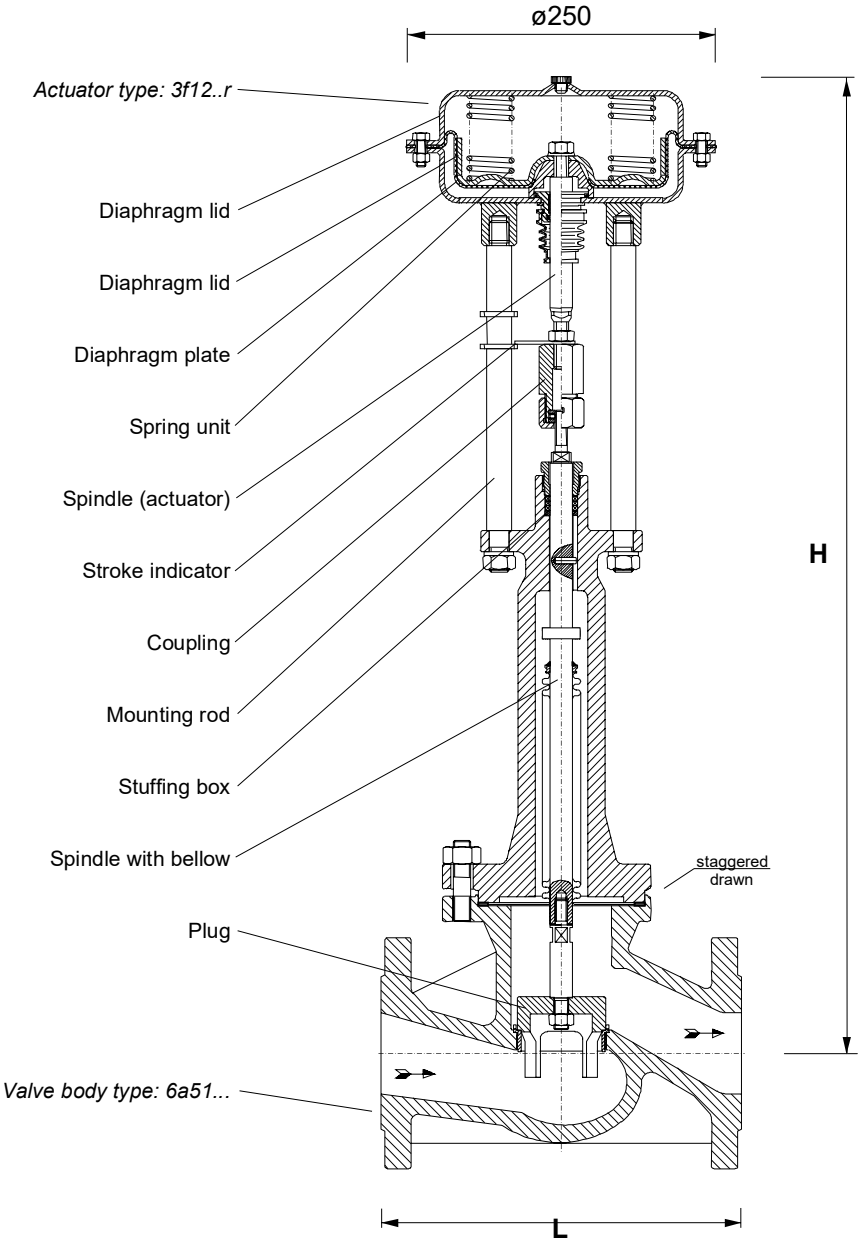
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	351 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	351 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	351 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	351 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN16	PN25	PN25	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	351 400.	351 500.	351 600.	351 E00._p2	4,0	20	17,9	25,0	
20	351 401.	351 501.	351 601.	351 E01._p2	6,3	20	17,9	25,0	
25	351 402.	351 502.	351 602.	351 E02._p2	10	20	11,1	25,0	
32	351 403.	351 503.	351 603.	351 E03._p2	16	20	6,3	22,8	25,0
40	351 404.	351 504.	351 604.	351 E04._p2	25	20	3,6	14,4	25,0
50	351 405.	351 505.	351 605.	351 E05._p2	40	20	1,9	8,9	20,7
65	351 406.	351 506.	351 606.	351 E06._p2	63	30	0,6	4,8	11,9
80	351 408.	351 508.	351 608.	351 E08._p2	100	30		3,0	7,7
100	351 410.	351 510.	351 610.	351 E10._p2	150	30		1,7	4,7
125	351 412d	351 512d			230	40			2,5
150	351 415d				330	40			1,6

*** = higher closing pressures see pages 351Se / 351Sg, DN200: see page 351420Sg/k, DN>200 on request*

Pneumatic control valve in two way form with bellow sealing, DN15-150 PN 16 / 25



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	633	647	641	648	653	656	785	786	793	896	912
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	19	20	21	22	24	26	45	49	59	106	126

Pneumatic control valve in two way form with bellow sealing, DN50-100 PN 16 / 25, with 10kN actuator

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 400 cm², ø310 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 4,4…5,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . Se, PN25: 351 **5** . . Se, PN25: 351 **6** . . Se, PN25: 351 **E** . .Se_p2
Accessories: . . .

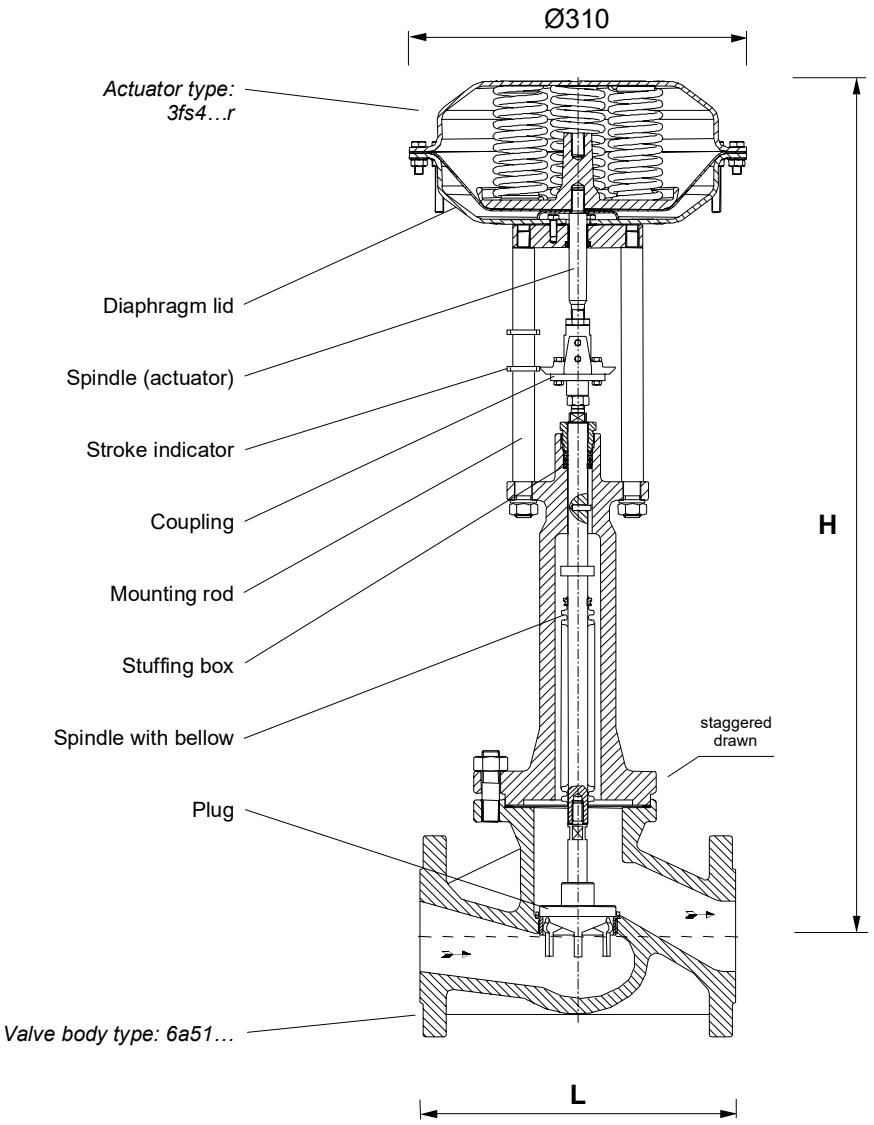
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	351 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	351 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	351 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	351 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN25	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure **** (bar) Type ...Se
50	351 405Se	351 505Se	351 605Se	351 E05Se_p2	40	20	25,0
	351 455Se	351 555Se	351 655Se	351 E55Se_p2	25	20	25,0
	351 475Se	351 575Se	351 675Se	351 E75Se_p2	16	20	25,0
65	351 406Se	351 506Se	351 606Se	351 E06Se_p2	63	30	25,0
	351 456Se	351 556Se	351 656Se	351 E56Se_p2	40	20	25,0
	351 476Se	351 576Se	351 676Se	351 E76Se_p2	25	20	25,0
80	351 408Se	351 508Se	351 608Se	351 E08Se_p2	100	30	17,2
	351 458Se	351 558Se	351 658Se	351 E58Se_p2	63	20	25,0
	351 478Se	351 578Se	351 678Se	351 E78Se_p2	40	20	25,0
100	351 410Se	351 510Se	351 610Se	351 E10Se_p2	150	30	10,9
	351 460Se	351 560Se	351 660Se	351 E60Se_p2	100	30	25,0
	351 480Se	351 580Se	351 680Se	351 E80Se_p2	63	22	25,0

*** = higher closing pressures and DN125-150 see page 351Sg, DN200: see page 351420Sg/k, DN>200 on request*



DN	50	65	80	100
Height H	690	819	820	830
Length L	230	290	310	350
Weight kg	28	46	50	60

Pneumatic control valve in two way form with bellow sealing, DN65-150 PN 16 / 25, with 14kN actuator

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 800 cm², ø420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 3,7…4,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . Sg, PN25: 351 **5** . . Sg, PN25: 351 **6** . . Sg, PN25: 351 **E** . . Sg_p2
Accessories: . . .

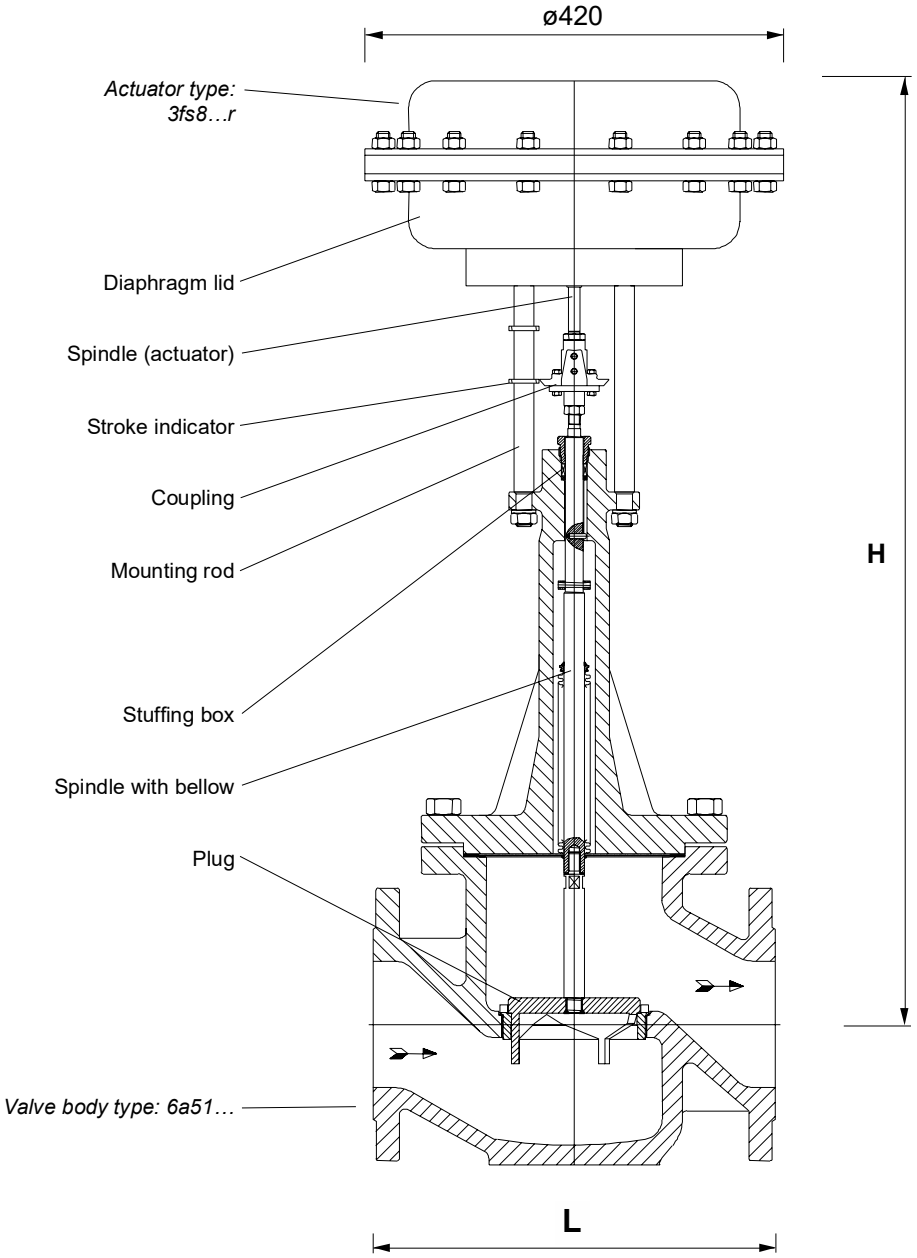
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	351 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	351 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	351 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	351 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN25	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) Type ...Sg
65	351 406Sg	351 506Sg	351 606Sg	351 E06Sg_p2	63	30	25,0
80	351 408Sg	351 508Sg	351 608Sg	351 E08Sg_p2	100	30	24,7
100	351 410Sg	351 510Sg	351 610Sg	351 E10Sg_p2	150	30	16,0
	351 460Sg	351 560Sg	351 660Sg	351 E60Sg_p2	100	30	25,0
125	351 412Sg	351 512Sg			230	40	10,0
	351 412Sg_140a	351 512Sg_140a			140	30	16,0
	351 412Sg_100a	351 512Sg_100a			100	30	24,7
150	351 415Sg				330	40	6,8
	351 415Sg_250a				250	40	10,0
	351 415Sg_150a				150	30	16,0

*** = DN200: see page 351420Sg/k, DN>200 on request*



DN	65	80	100	125	150
Height H	865	866	875	975	990
Length L	290	310	350	400	480
Weight kg	81	85	95	141	161

Pneumatic control valve in two way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway
Air connection: G 1/4",
Operating pressure: 5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

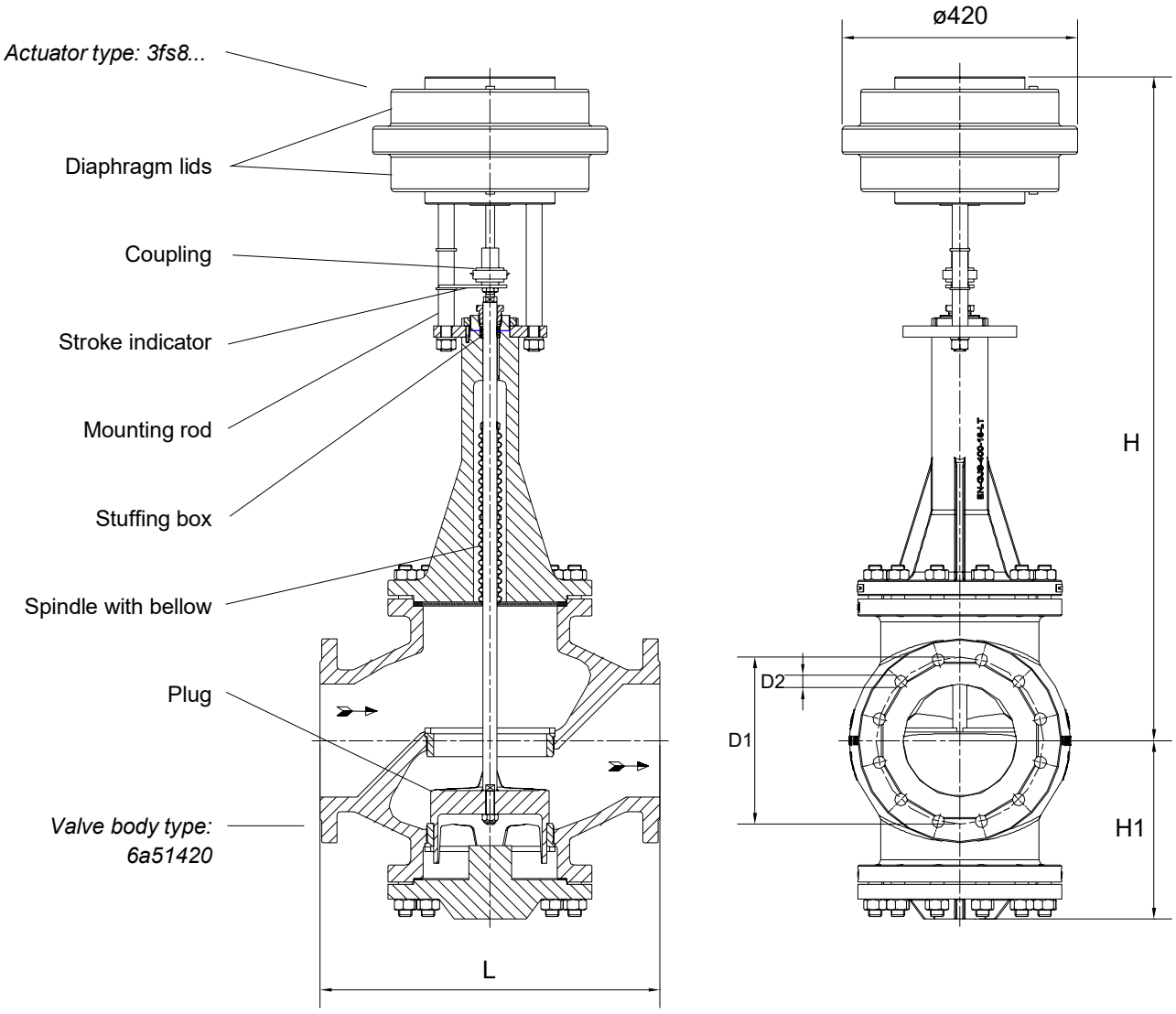
Order text:
Pneumatic control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 630
Spindle sealing with bellow
Spring closes straightway
Control signal . . . – . . . bar, closing pressure . . bar
List-No. 351 420 S . , accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,9...4,9 bar	2,1…5,1 bar
200	351 420Sg	630	60	3,7	
200	351 420Sk	630	60		6,8

** higher closing pressure on request*



Dimensions

DN	200
Height H (mm)	1180
Length H1 (mm)	315
Length L (mm)	600
Weight (kg)	345

Flange connections acc. to DIN EN 1092-2

PN	D1 (mm)	D2 (mm)	Quantity of screws	Thread
16	295	22	12	M20

Pneumatic control valve in three way form with bellow sealing, DN15-150 PN 16 / 25

Body: three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 361 **4** . . , PN25: 361 **5** . ., PN25: 361 **6** . ., PN25: 361 **E** . ._p2
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

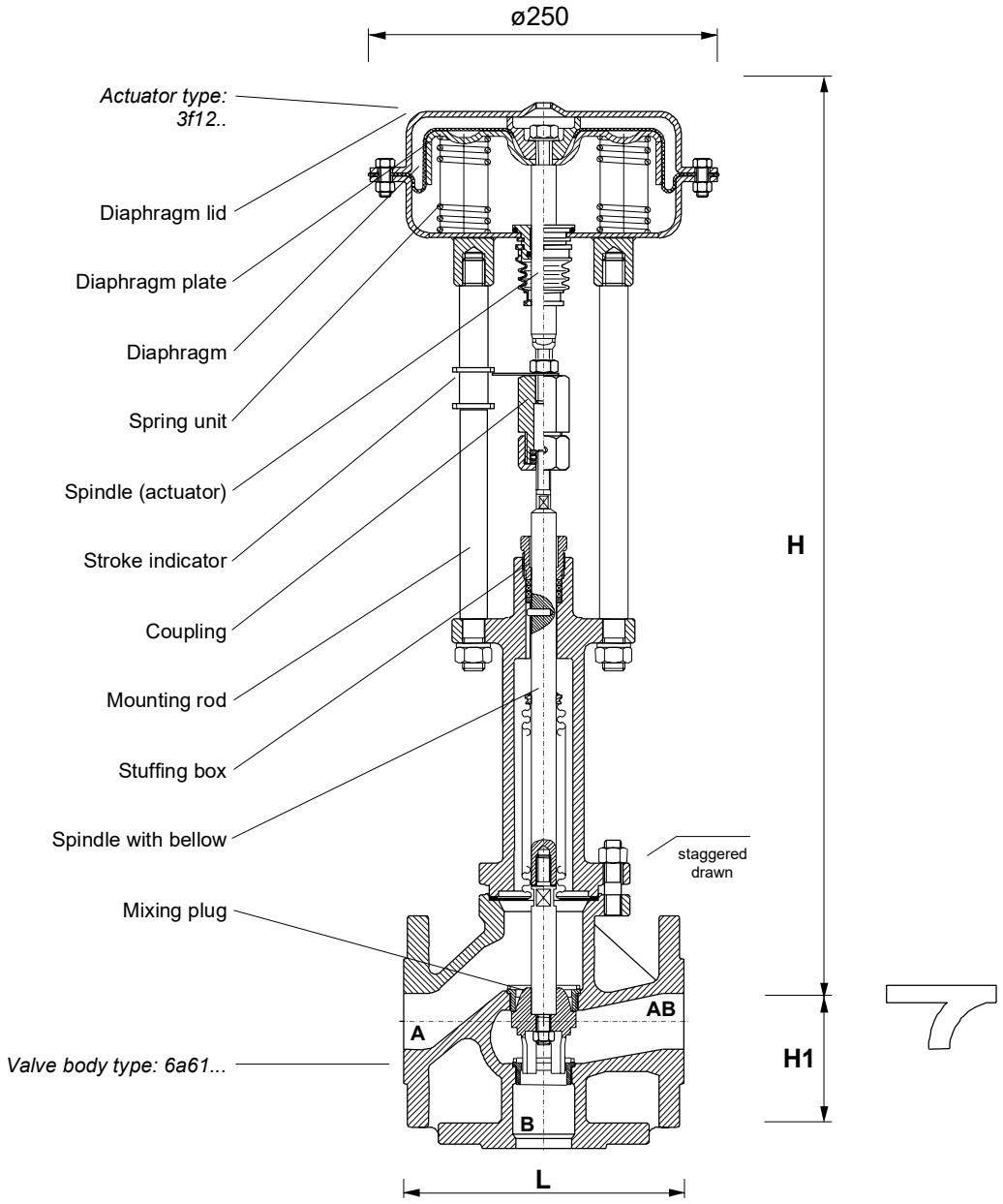
by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	361 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	361 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	361 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	361 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN16	PN25	PN25	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	361 400.	361 500.	361 700.	361 E00._p2	4,0	20	17,9	25,0	
20	361 401.	361 501.	361 701.	361 E01._p2	6,3	20	17,9	25,0	
25	361 402.	361 502.	361 702.	361 E02._p2	10	20	11,1	25,0	
32	361 403.	361 503.	361 703.	361 E03._p2	16	20	6,3	22,8	25,0
40	361 404.	361 504.	361 704.	361 E04._p2	25	20	3,6	14,4	25,0
50	361 405.	361 505.	361 705.	361 E05._p2	40	20	1,9	8,9	20,7
65	361 406.	361 506.	361 706.	361 E06._p2	63	30	0,6	4,8	11,9
80	361 408.	361 508.	361 708.	361 E08._p2	100	30		3,0	7,7
100	361 410.	361 510.	361 710.	361 E10._p2	150	30		1,7	4,7
125	361 412.	361 512.			230	35		0,7	2,5
150	361 415.				330	38			1,6

*** = higher closing pressures and DN>200 on request, DN200: see page 361420Sg*

Pneumatic control valve in three way form with bellow sealing, DN15-150 PN 16 / 25



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	633	647	641	648	653	656	785	786	793	896	912
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	18	19	20	23	24	28	46	50	64	118	140

Pneumatic control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB"
Air connection: G 1/4",
Operating pressure: 6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 630
Spindle sealing with bellow
Spring closes straightway A-AB
Control signal 1,2 – 4,9 bar, closing pressure 2,0 bar
List-No. 361 420 Sg, accessories: . . .

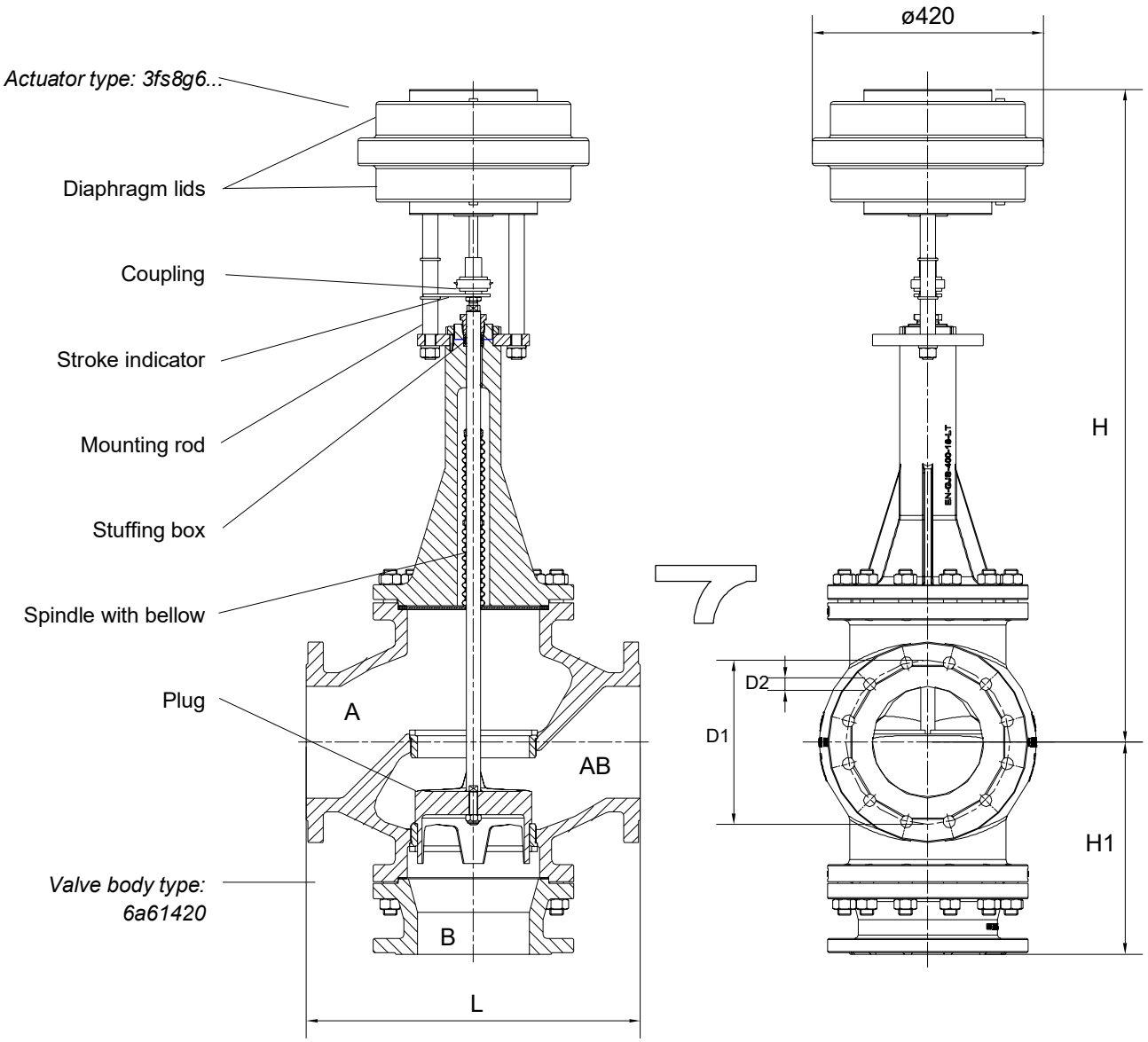
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,9...4,9 bar
200	361 420Sg	630	60	2,0

** higher closing pressures on request*

Pneumatic control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16



Dimensions

DN	200
Height H (mm)	1180
Stud length H1 (mm)	380
Length L (mm)	600
Weight (kg)	360

Flange connections acc. to DIN EN 1092-2

PN	D1 (mm)	D2 (mm)	Quantity of screws	Thread
16	295	22	12	M20

Pneumatic control valve for diverting function three way form with bellow sealing, DN32-150 PN 16 / 25

Body: three way form
Version with diverting plug, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway AB-A"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 362 **4** . . , PN25: 362 **5** . . , PN25: 362 **6** . . , PN25: 362 **E** . ._p2
Accessories: . . .

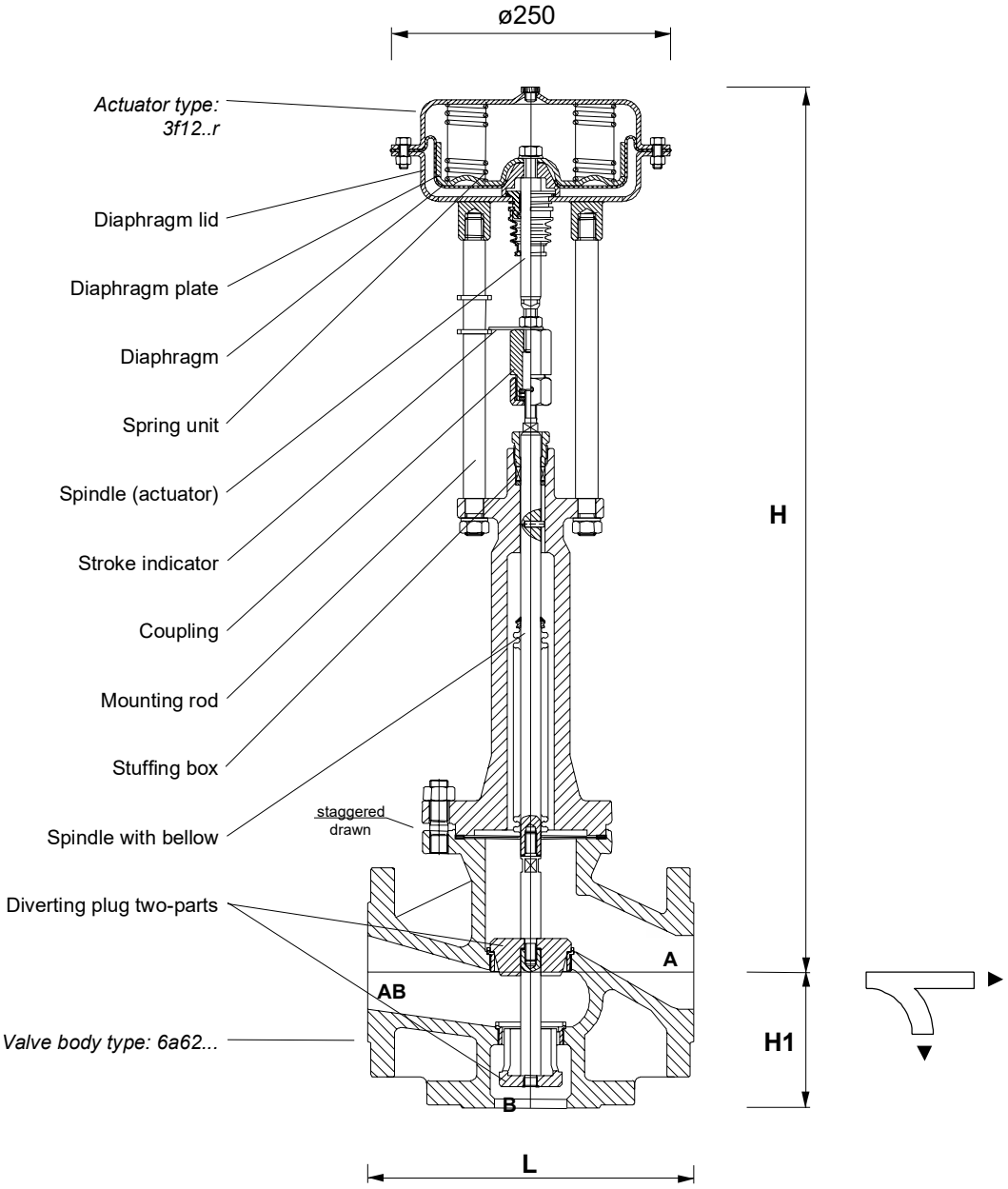
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	362 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	362 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	362 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	362 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN16	PN25	PN25	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
32	362 403.	362 503.	362 603.	362 E03._p2	12	20	6,3	22,8	25,0
40	362 404.	362 504.	362 604.	362 E04._p2	20	20	3,6	14,4	25,0
50	362 405.	362 505.	362 605.	362 E05._p2	27	20	1,9	8,9	20,7
65	362 406.	362 506.	362 606.	362 E06._p2	50	30	0,6	4,8	11,9
80	362 408.	362 508.	362 608.	362 E08._p2	83	30		3,0	7,7
100	362 410.	362 510.	362 610.	362 E10._p2	123	30		1,7	4,7
125	362 412.	362 512.			190	35		1,7	4,7
150	362 415.				250	35		1,0	3,1

*** = higher closing pressures and DN>200 on request, DN200: see page 362420Sf/g/h*



DN	32	40	50	65	80	100	125	150
Height H	648	653	656	785	786	793	896	912
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	24	25	28	45	49	62	118	138

Pneumatic control valve for diverting function with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16, with 12-18kN actuator

362 420Sf/g/h E

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with diverting plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: diaphragm area: 800 cm², ∅ = 420 mm
type ...h: 1730 cm², ∅ = 600 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway AB-A"
Air connection: G 1/4", type ...h: G 3/4"
Operating pressure: 6,0 bar, type ...h: 3 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 470
Spindle sealing with bellow
Spring closes straightway AB-A
Control signal . . . – . . . bar, closing pressure . . . bar
List-No. 362 420 S . , accessories: . . .

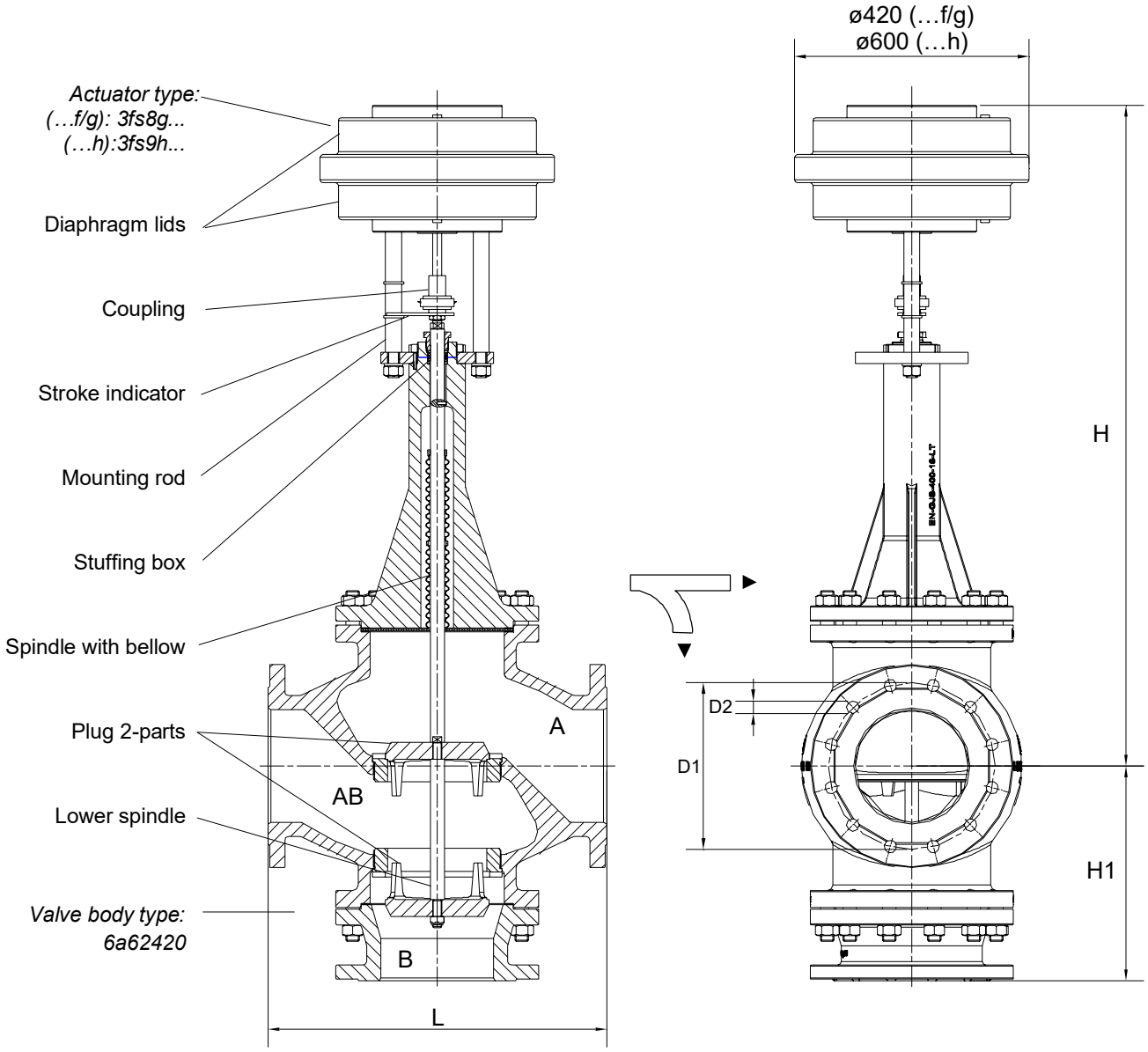
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,5...4,5 bar	2,1...4,1 bar	0,9...2,0 bar
200	362420S**f**	470	50	4,0		
200	362420S**g**	470	50		4,9	
200	362420S**h**	470	50			6,5

** higher closing pressures on request*

Pneumatic control valve for diverting function with bellow sealing, DN200
EN-GJS-400-18-LT (GGG-40.3), PN 16, with 12-18kN actuator



Dimensions

DN	200
Height H (...f/g)	1180
Height H (…h)	1545
Stud length H1	380
Length L	600
Weight kg (…f/g)	360
Weight kg (…h)	445

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Pneumatic control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”

Body: Bronze CC491K (Rg5)
for water 0...130°C
Internal thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron
optionally of bronze

Pressure range:	PN16
Spindle sealing:	EPDM-O-ring
Plug:	brass CW614N
Spindle:	stainless steel 1.4122
Flow characteristic:	A-AB equal percentage
	B-AB linear
Positioning ratio:	DN15: 50:1
	DN20-50 100:1

Leakage: EN1349 – seat leakage VI G 1 (tight sealing)



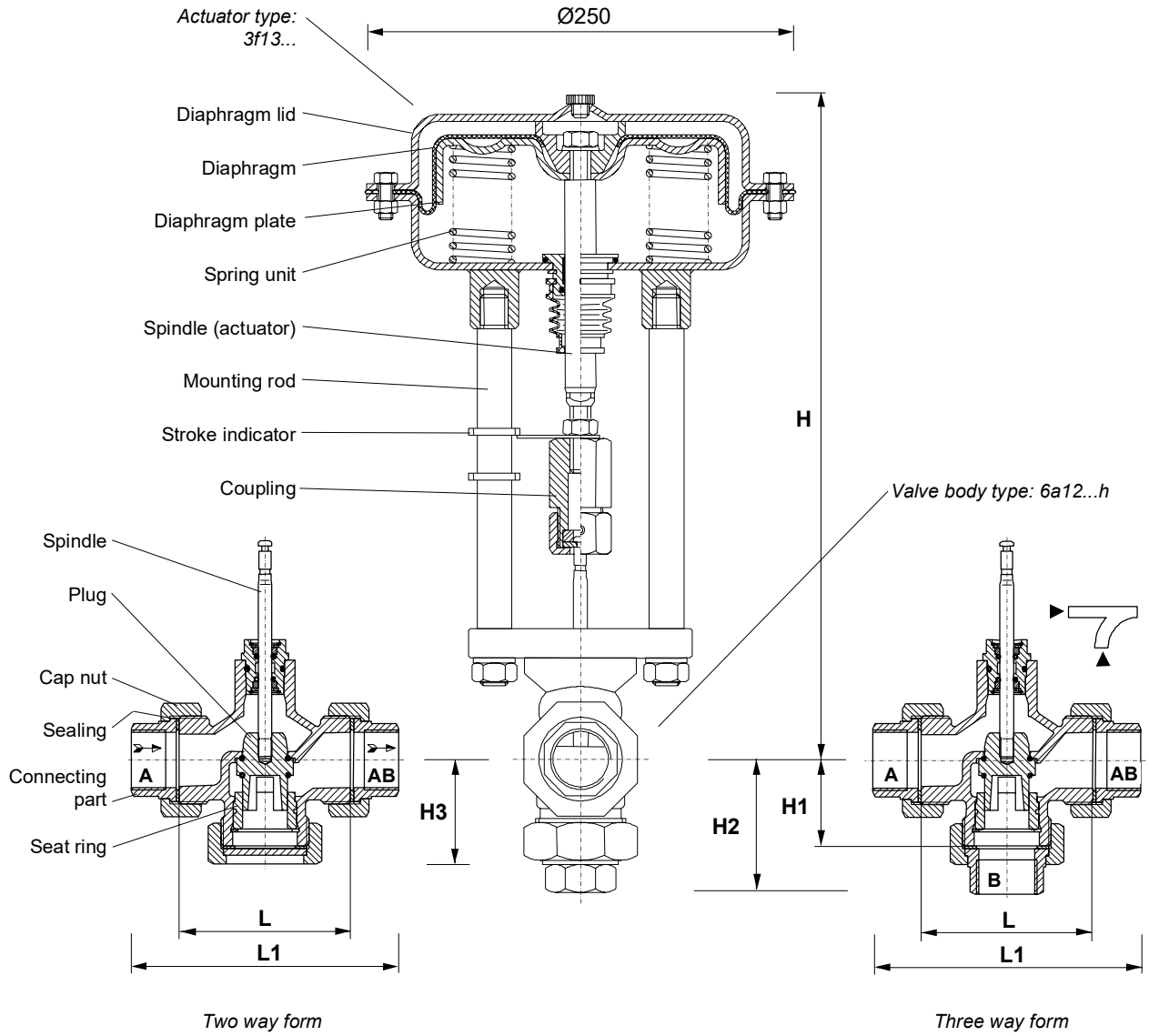
Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB“
Air connection: G1/4“
Operating pressure: standard type: 1,4 bar
other types: ...c: 2,8 bar, ...d: 5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)

Order text:
Pneumatic control valve in two way form / three way form
Bronze CC491K (Rg5) PN16, DN . ., Kvs . . .
Spindle sealing with O-ring
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: two way form: 381 **2** . . . , three way form: 381 **3** . . .
Accessories: . . .

DN	**List-No.** 2-way	3-way	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,0bar: standard	1,0...1,8bar: type ...c	1,8...3,2bar: type ...d
1/2"	3812 100	3813 100	4	12	16,0		
3/4"	3812 101	3813 101	6,3	12	16,0		
1"	3812 102.	3813 102.	10	14	11,0	16,0	
1 1/4"	3812 103.	3813 103.	16	14	6,3	16,0	
1 1/2"	3812 104.	3813 104.	25	14	3,6	16,0	
2"	3812 105.	3813 105.	40	14	2,0	8,9	16,0

Pneumatic control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”



Two way form *Three way form*

DN	1/2“	3/4“	1“	1 1/4"	1 1/2"	2“
Height H	370	373	376	385	388	388
Length L	62	75	80	120	130	150
Length ~L1	114	127	138	184	198	222
Stud length H1	40	41	45	55	60	65
Stud length ~H2	66	67	74	89	94	101
Stud length ~H3	48	53	57	68	73	78
Weight kg	11,0	11,5	11,8	12,5	13,1	14,7

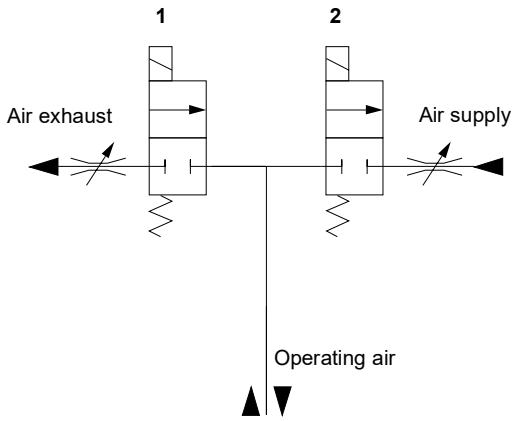
Technical data:

Input signal:	3-point-step signal
Supply:	230V / 50Hz, alternatively: 24V / 50Hz, 24V DC
Electrical connection:	Connector acc. to DIN EN 175301-803-C
Connecting cable:	ø4,5-6 mm / max. 0,75 mm²
Compressed air supply:	Class 3 acc. to ISO 8573-1
Air pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air pressure
Air connection:	G 1/4"
Protecting class:	IP65 acc. to DIN EN 60529

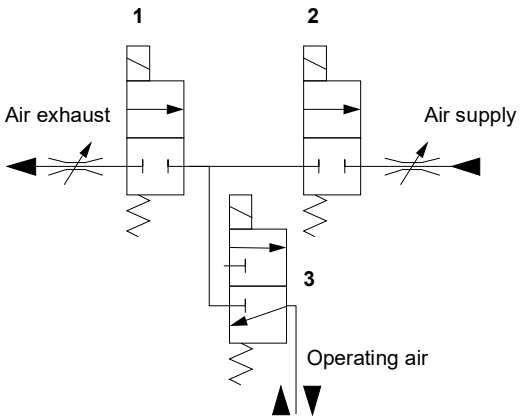


Function:

The electro-pneumatic converter is a connecting element between controller and pneumatic control valve.
It creates a control signal from "+"- or "-" impulse of 3-point-step controller and from available compressed air.
Voltage application on exhaust solenoid valve 1 effects de-aeration of the pneumatic actuator, voltage application on supply solenoid valve 2 effects aeration of the pneumatic actuator. For proper functioning of converter with quick-exhaust function, it is necessary to apply voltage also on solenoid valve 3. Voltage interruption on this valve activates the quick-exhaust function: de-aerating of the pneumatic actuator.
The pneumatic output signal depends on the supply air pressure and must not be higher than the maximum permissible pressure of the actuator. The flow rate of the supply and exhaust air can be modified with throttling valves, therefore it is possible to adjust the positioning time of the pneumatic actuator if necessary.



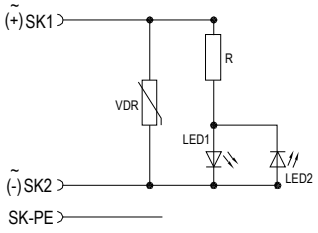
Type 390 360.*
without quick-exhaust function



Type 390 365.*
with quick-exhaust function

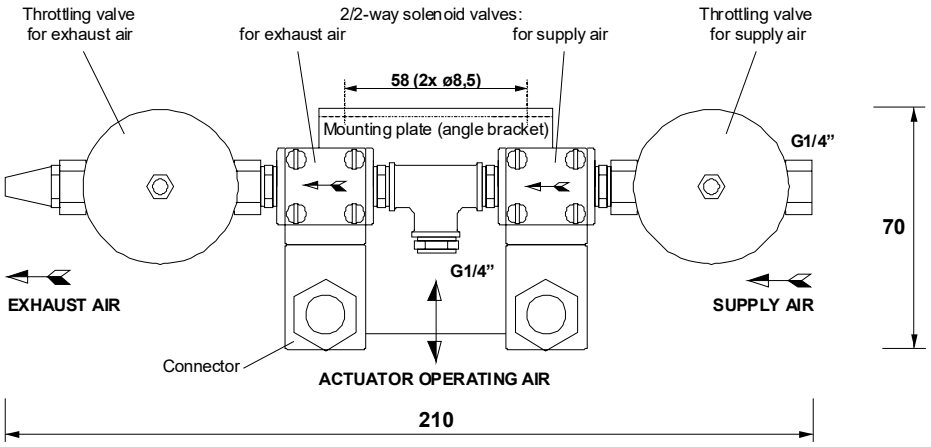
** = All solenoid valves are shown currentless*

Electrical wiring - connector:

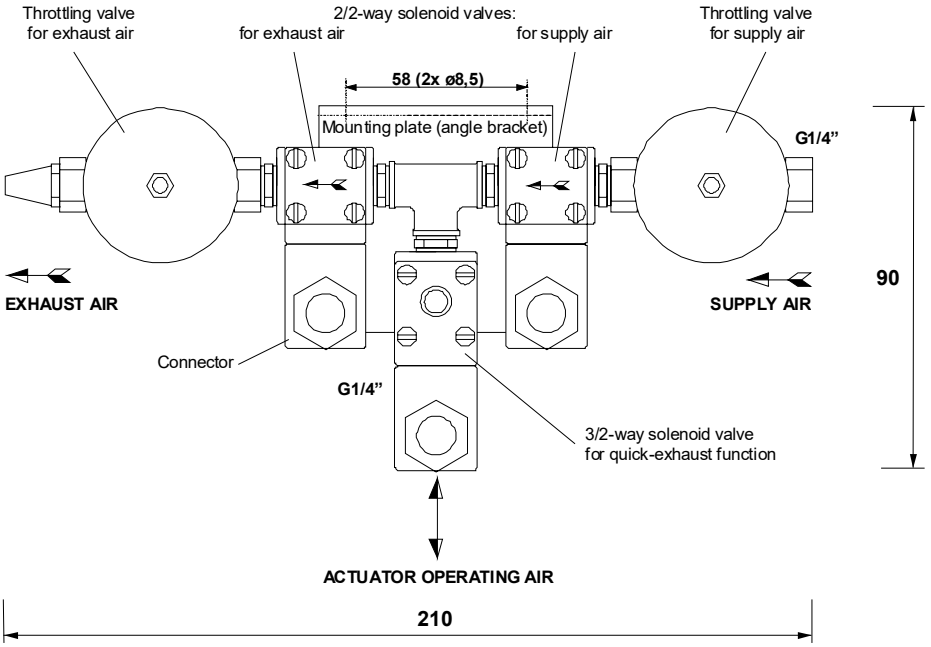


Types overview:**		**List– No.**
230V / 50 Hz	without quick-exhaust function	**390 360**
24 V / 50 Hz	without quick-exhaust function	**390 3602**
24V DC	without quick-exhaust function	**390 3608**
230V / 50 Hz	with quick-exhaust function	**390 365**
24 V / 50 Hz	with quick-exhaust function	**390 3652**
24V DC	with quick-exhaust function	**390 3658**

*** Ex-type of solenoid valves on request*



Type 390360. without quick-exhaust function



Type 390365. with quick-exhaust function



Foxboro SRP981

Function:

The positioner is mounted on pneumatic control valves and is used to assign the valve position to the control signal.
The positioner compares the pneumatic control signal of a control system to the stroke of the control valve and issues a signal pressure for the pneumatic actuator.
The stroke is measured by the pick-up lever connected to a measuring spring installed in the positioner and the downstream pneumatic control system. When a system deviation occurs, the actuator is either vented or filled with air.
The minimum and the maximum of the input signal correspond to the end positions of the valve.
If necessary, the signal pressure change can be slowed down by a volume restriction.

Technical data:

Input signal:	0,2...1,0 bar (3...15 psi), 0,2...0,6 bar and 0,6...1,0 bar
Air supply:	Acc. to ISO 8573-1: - Maximum particle size and density: class 2 - Oil contents: class 3 - Pressure dew point: class 3 or at least 10 K below ambient temperature
Air supply pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air supply pressure
Characteristic:	Linear
Air connection:	G 1/4" acc. to ISO 228
Operating direction:	Reversible *Factory setting: direct (increasing input => increasing output)*
Max. ambient temperature:	-40 ... 80 °C
Protection class:	IP54 (IP 65 on request)
Weight:	ca. 1,1 kg

Type:	**List– No.**
Foxboro SRP981:	**390 546**



Schneider Electric SRD998



Samson 3725

Function:

The positioner is mounted on pneumatic control valves and is used to assign the valve position to the control signal.
The positioner compares the electric control signal of a control system to the stroke of the control valve and issues a signal pressure for the pneumatic actuator.
The stroke is measured by the pick-up lever connected to a sensor installed in the positioner and the downstream electronics.
When a system deviation occurs, the actuator is either vented or filled with air.
The minimum and the maximum of the input signal correspond to the end positions of the valve.
If necessary, the signal pressure change can be slowed down by a volume restriction.

Technical data:

Input signal:	4...20 mA, 4...12 mA and 12...20 mA, two-wire system with reverse polarity protection
Communication:	HART 7 (only SRD998)
Air supply:	Acc. to ISO 8573-1: - Maximum particle size and density: class 2 for SRD998, class 4 for 3725 - Oil contents: class 3 - Pressure dew point: class 3 or at least 10 K below ambient temperature
Air supply pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air supply pressure
Characteristic:	Linear
Air connection:	G 1/4" acc. to ISO 228
Operating direction:	Reversible *Factory setting: direct (increasing input => increasing output)*

Type:	**390847Hx (Schneider Electric SRD998)**	**390841a. (Samson 3725)**
Max. ambient temperature:	-40 ... 80 °C	-20 ... 80 °C
Protection class:	IP 66	IP 66
Explosion protection:	II 2 G Ex ia IIC T4/T6 Gb / II 1 D Ex ia IIIC T100°C Da (Standard)	II 2 G Ex ia IIC T4 (Option)
Weight:	ca. 2,1 kg	ca. 1,0 kg

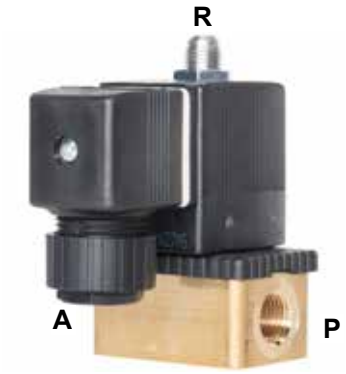
Types*:	**List– No.**
Schneider Electric SRD998 standard Ex-version:	**390 847Hx**
Samson 3725 standard version:	**390 841a**
Samson 3725 Ex-version:	**390 841ax**

* **On request:**
- *Accessories (for instance output signal 4...20 mA, inductive limit switches, pressure gauge)*
- *Special design (for instance other protection class, stainless steel housing, version for oxygen)*
- *Positioner from other producer (for instance ABB, Flowserve, Siemens)*
- *Positioner for other communications (for instance PROFIBUS)*

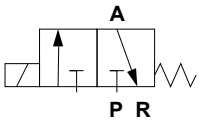
Accessories for operating air 3/2-ways solenoid valve, throttling valve, maintenance unit

3/2-ways solenoid valve for operating air

Material:	Brass, spool from polyamide
Nominal diameter:	2mm
Operating pressure:	0…10 bar
Voltage:	230V 50/60Hz, alternatively: 115V/50...60Hz (appendix …1) 24V/50...60Hz (appendix …2) 24VDC (appendix …8)
Ambient temp.:	-10° ... +55°C
Connections:	P = Air supply A = Actuator R = Deaeration
Operating mode:	De-energized P-A closed, A-R open (A deaerated)
El. connection:	Cable plug
Protection class:	IP65 with cable plug
Weight:	Ca. 0,5 kg
Listen-Nr.:	**393300..**



393300..

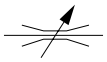


Special types:

Ex-protection:	II 2G Ex eb mb IIC T4 Gb, II 2D Ex mb tb IIIC T130 ºC Db with terminal box or with cast-on cable
List-No.:	**3933xc..**

Throttling valve

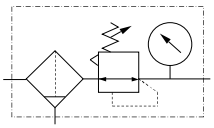
Material:	Brass
Connection:	Both sides R 1/4“ female thread
Weight:	Ca. 0,1 kg
List-No.:	**394800..**



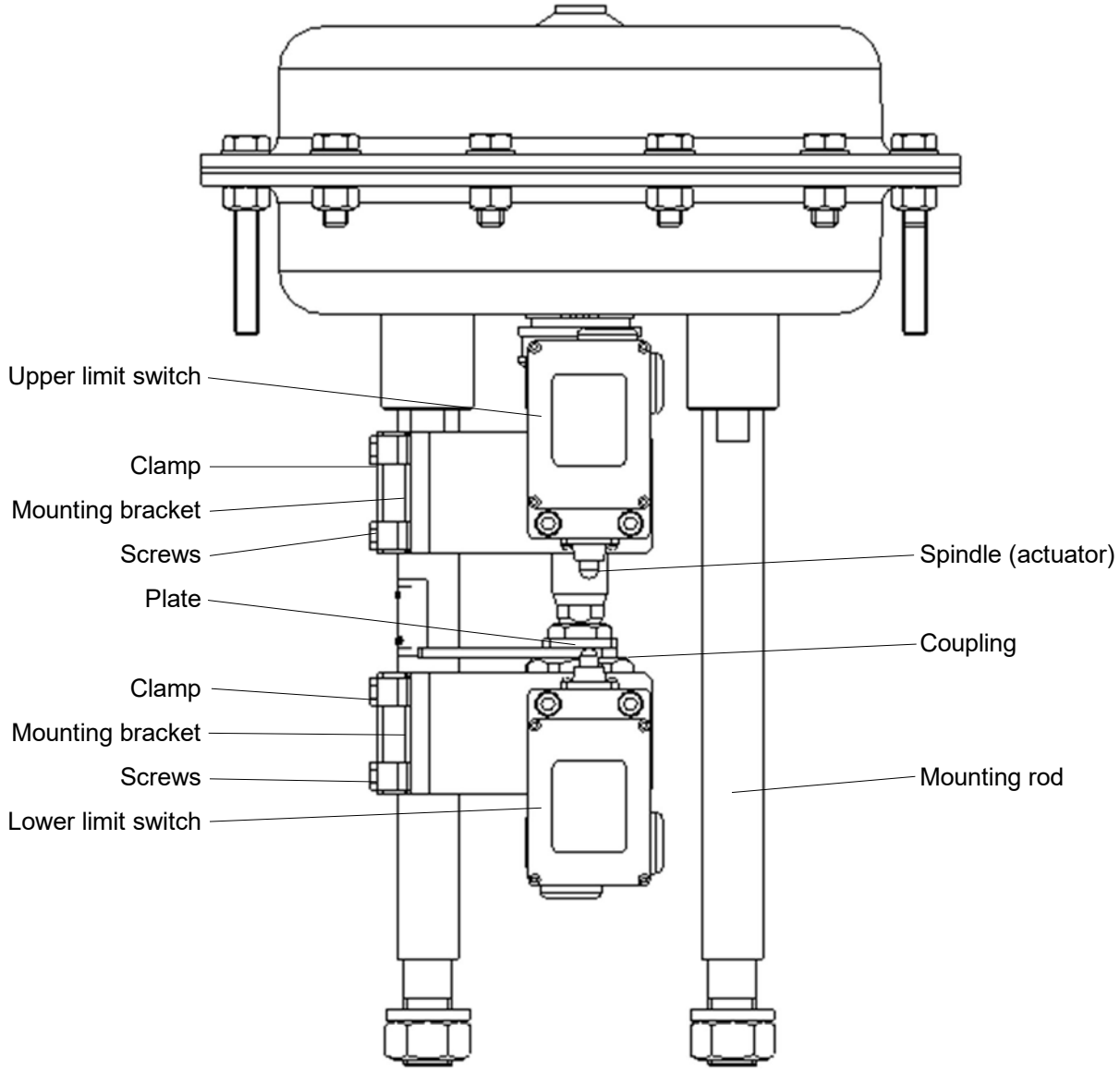
Maintenance unit

Input pressure:	Max. 10 bar
Output pressure:	Adjustable to 10…80% of the input pressure
Connection:	Both sides R 1/4" female thread
Weight:	Ca. 0,5 kg

List-No.:	**394150**	With manometer for output pressure 0…2,5 bar
	394151	With manometer for output pressure 0…6,0 bar
	394152	With manometer for output pressure 0…10,0 bar
	394159	Accessory: mounting angle



Pneumatic actuators type 3f1 can be equipped with an additional limit switch with positive break normally closed contact, for valve position up and / or down.



Limit switch (see also next page):

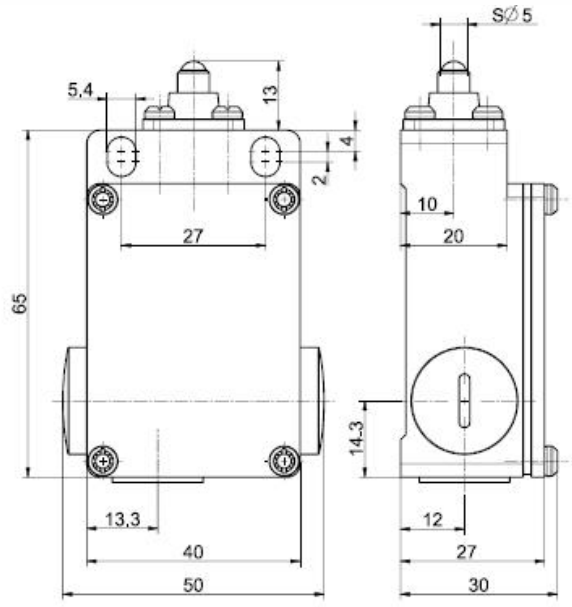
Switching system:	Slow action, positive break normally closed contact
Switching element:	1 opener / 1 closing contact
Electrical loading:	6A / 400V AC (AC-15)
Protection class:	IP 65

Type summary:	**List-No.**
1 additional upper limit switch for valve position up	**39eo**
1 additional lower limit switch for valve position down	**39eu**
2 additional limit switches for valve positions up and down	**39ev**

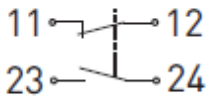
Technical Data:

Applied standards	EN ISO 13849-1, EN 60947-5-1, EN ISO 14119
Enclosure	aluminium die-cast, powder-coated
Switch type	type 1
Coding level	no coding
Degree of protection	IP65 (IEC/EN 60529)
B_{10d} (10 % load)	2 million
T_M	max. 20 years
Contact material	silver
Switching system	slow action, positive break NC contacts
Switching elements	1 NC/1 NO contact, type Za
Connection	screw connection terminals
Cable cross-section	max. 2.5 mm² (incl. conductor ferrules)
Cable entry	3 x M16 x 1.5
Rated impulse withstand voltage U_{imp}	4 kV
Rated insulation voltage U_i	400 V
Conventional thermal current I_{the}	6 A
Utilisation category	AC-15
Rated operating current/voltage I_e/U_e	6 A/400 VAC
Short-circuit protection	6 A gG/gN fuse
Mechanical life	> 1 million operations
Operation cycles	max. 3600/h
Ambient temperature	–20 °C … +80 °C
Repeat accuracy of switching points	± 0,1mm
Weight	144g

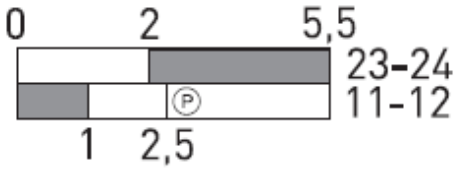
Dimensions

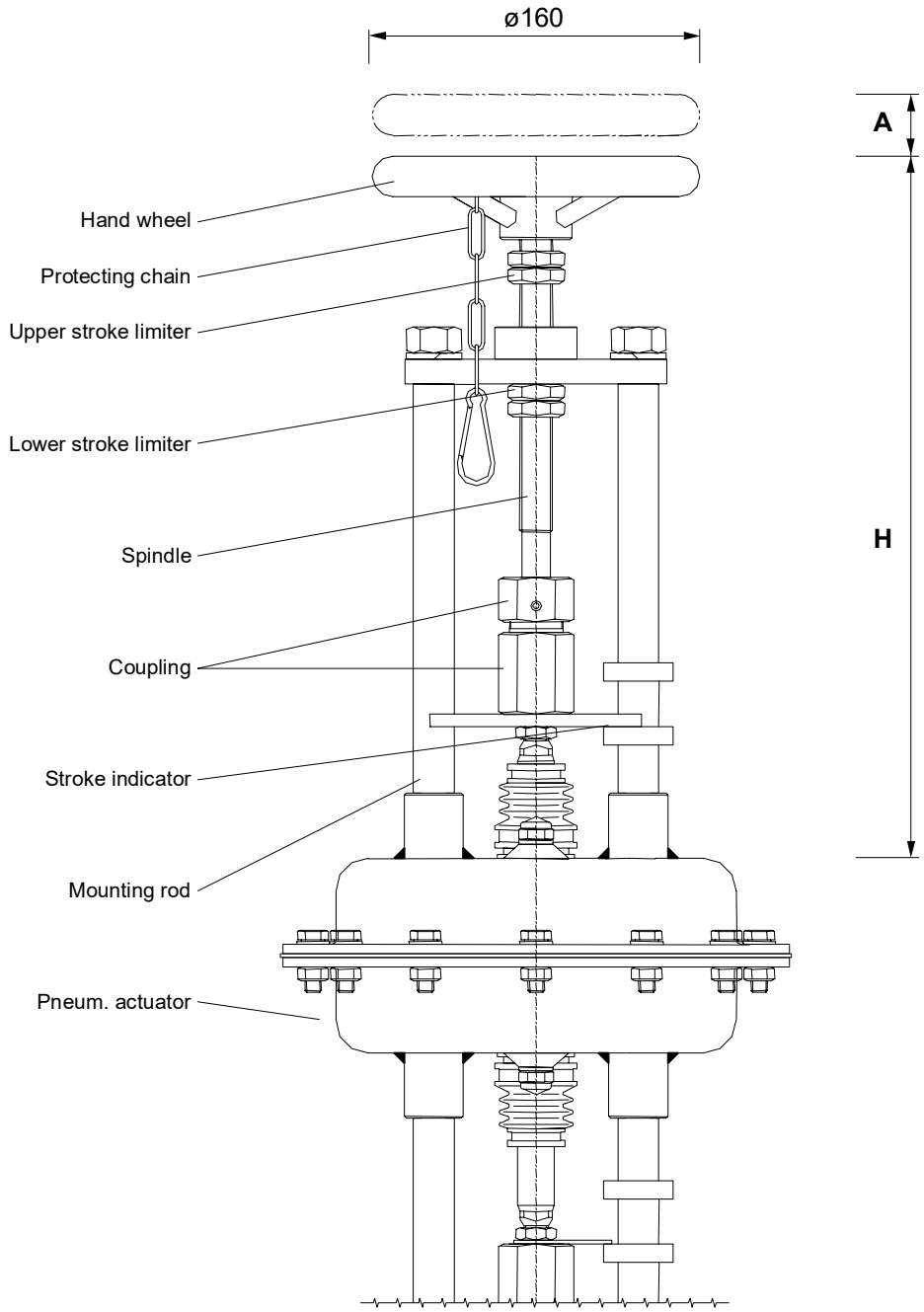


Contact diagram



Switching diagram





Summary of types:

Manual operating device for actuator with operating mode **Spring moves spindle downwards** (upper spring)

List.-No.	Hub mm	H mm	A mm
39h20o	20	300	41
39h30o	30	300	61
39h35o	35	300	71
39h40o	40	300	81

Manual operating device for actuator with operating mode **Spring moves spindle upwards** (lower spring)

List.-No.	Hub mm	H mm	A mm
39h20u	20	340	21
39h30u	30	340	31
39h35u	35	340	36
39h40u	40	340	41

The manual operating device can be delivered only assembled to the actuator, later assembly on an actuator without the manual operating device is not possible.

Technical data

Diaphragm area:	250 cm²
Diameter:	250 mm
Control pressure:	max. 6 bar
Thread connection:	G1/4“
Stroke:	15, 20, 30, 35, 40 mm
Spindle sealing:	O-Ring, maintenance free
Operating mode:	Spring moves spindle upwards / downwards (reversible)
Rods distance:	100 mm
Connection to valve spindle:	coupling ring ø20 x 10 mm with thread M10 or M12
Mounting position:	vertical to horizontal
Max. ambient temperature:	-20°…80°C
Weight:	9 kg



Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)

Order text:
Pneumatic actuator
Spring moves spindle upwards / downwards
Control signal . . . - . . . bar for stroke . . . mm
Mounting rod length . . . mm
List-No. 3f1 . . .

Stroke	**Spring range (bar)**				
mm	0,4…1,2	1,0…2,0	2,0…4,0	0,9…2,2	1,8…4,4
15	X	X	X	-	-
20	X	X	X	-	-
30	X	X	X	-	-
35	-	X	X	-	-
40	-	-	-	X	X

Summary of types:

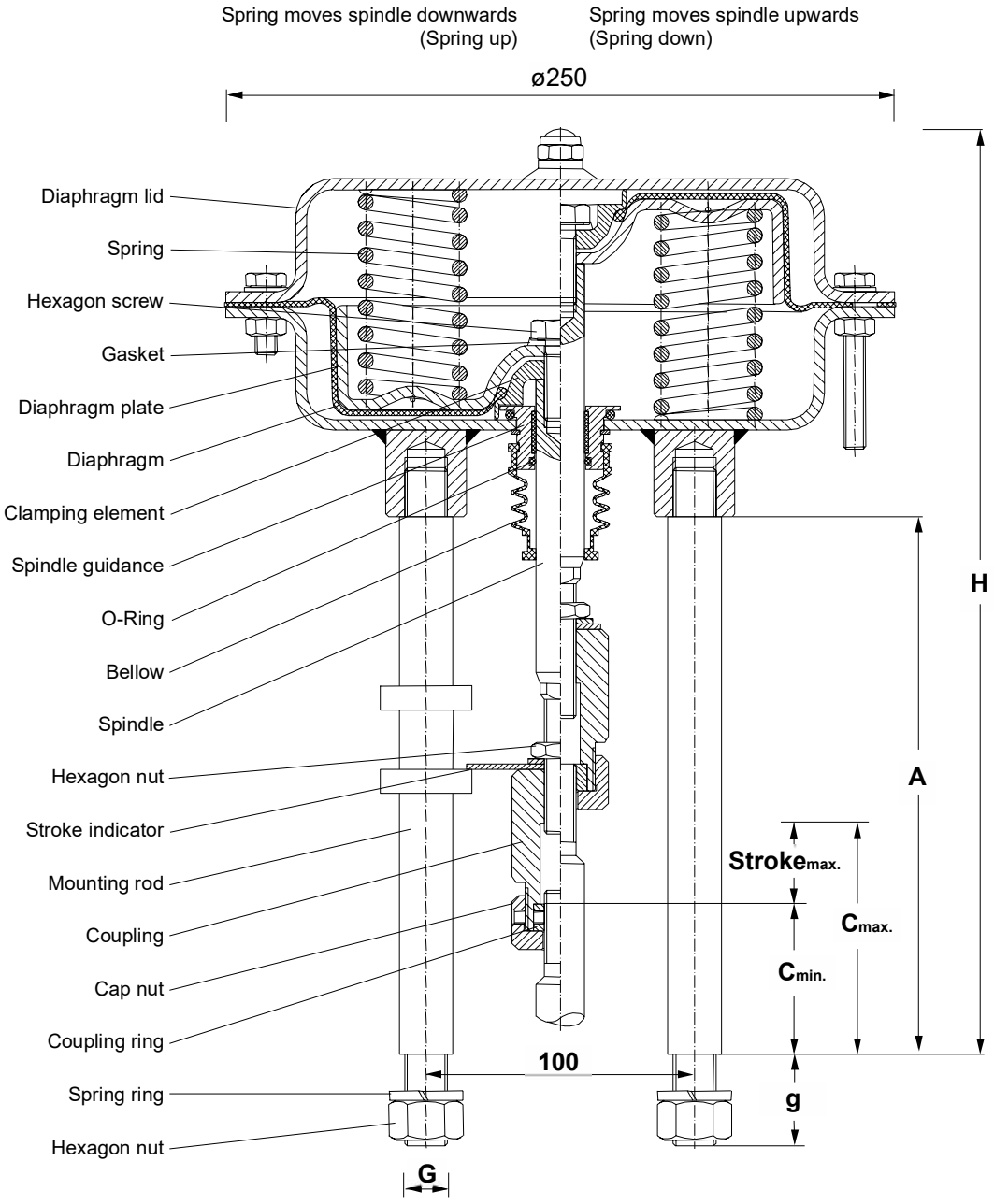
3f1 **x** **x** **x** **x**

Mounting rod length
0 = 200 mm
1 = 180 mm
2 = 230 mm

Spring range
b = 0,4…1,2 bar
c = 1,0…2,0 bar
d = 2,0…4,0 bar

Stroke
1 = 15 mm
2 = 20 mm
3 = 30 mm
4 = 35-40 mm

Reverse operating mode
r = Spring moves spindle downwards



A* mm	Cmin. mm	Cmax. mm	H mm	G mm	g mm
180	29	65	325	M12	24
200	49	85	345	M16	32
230	86	122	375	M16	32

** = Other mounting rod lengths on request*

Overview Group 4
Motor control valves

Motor stop valve in two way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-100	2-5,5kN- actuator	411...

Motor control valve in two way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-50	2-5,5kN- actuator	421..._1
DN 65-150	2-5,5kN- actuator	421..._2
DN 50-150	8-15kN- actuator	421...He/f/h
DN 80-150	20/25kN- actuator	421...Hi/k
DN 200	12-25kN- actuator	421 4/520Hf/h/i/k

Motor control valve in three way form, PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

DN 15-150	2-5,5kN- actuator, with mixing plug	431...
DN 50-150	8-15kN- actuator, with mixing plug	431...He/f/h
DN 200	12/15kN- actuator, with mixing plug	431 4/520Hf/h
DN 32-150	2-5,5kN- actuator, with diverting plug	432...
DN 50-150	8-15kN- actuator, with diverting plug	432...He/f/h
DN 200	12-25kN- actuator, with diverting plug	432 4/520Hf/h/i/k

Motor control valve in two way form, PN 16 / 25 / 40(25)
Spindle sealing with bellow

DN 15-150	2-5,5kN- actuator	451...
DN 50-150	8-15kN- actuator	451...He/f/h
DN 200	12-25kN- actuator	451 420Hf/h/i/k

Motor control valve in three way form, PN 16 / 25 / 40(25)
Spindle sealing with bellow

DN 15-150	2-5,5kN- actuator, with mixing plug	461...
DN 200	12/15kN- actuator, with mixing plug	461 420Hf/h
DN 32-150	2-5,5kN- actuator, with diverting plug	462...
DN 200	12-25kN- actuator, with diverting plug	462 420Hf/h/i/k

Motor control valve in three or two way form, PN 16 ..... 481...
with thread connectors

Accessories:

Additional load dependent limit switches	49ev
Potentiometer	49f...
Process controller integrated into actuator	49r...
Digital positioner integrated into actuator	49sr7...
Additional travel dependent limit switch	49w.

Electrical actuators:

Electrical actuator type 4e1 ..... 4e1...
Thrust 1,5-5,5 kN

Electrical, explosion proof actuator type 4ex ..... 4ex...
PTB-certified in accordance to ATEX directive 2014/34/EU for zone 1, 2, 21, 22, Thrust 0,5-10 kN
alternatively suitable for most KFM control valve types

Operating instructions: see group 0

Motor stop valve in two way form with PTFE-V-ring sealing, DN15-100 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: OPEN - CLOSED
Leakage: < 0,001% Kvs



Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Actuator heater (on request)
Other positioning speed (on request)
Flange drillings acc. to ANSI / JIS (on request)

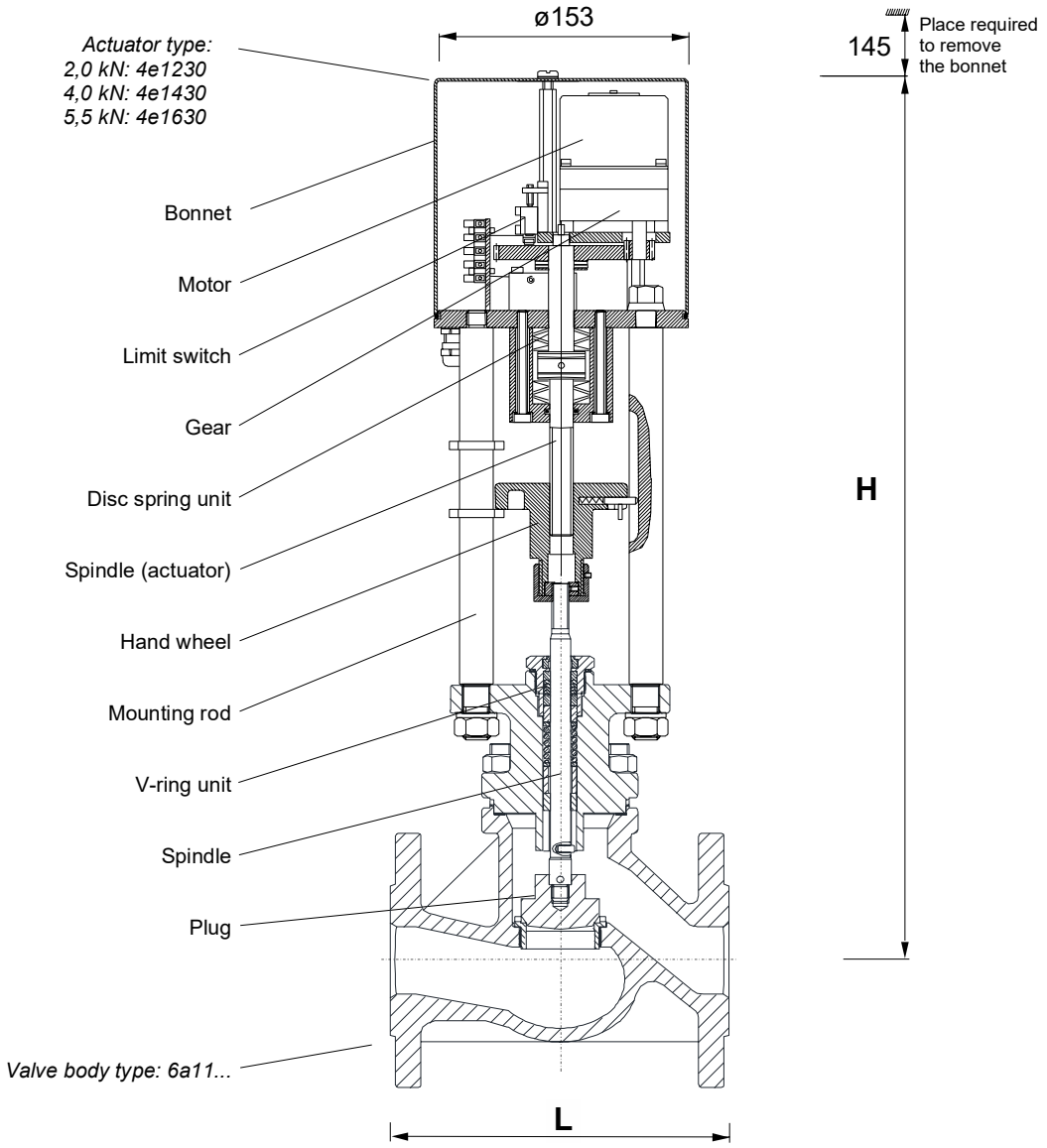
Order text:
Motor stop valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 411 **4** . . , PN25: 411 **5** . . , PN40: 411 **7** . ., PN40: 411 **E** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	421 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	421 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	421 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	421 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

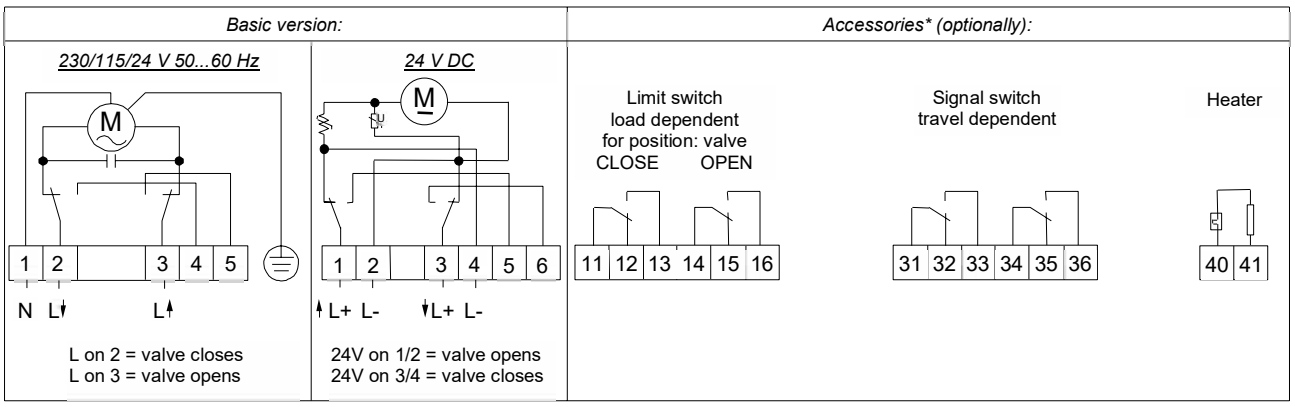
** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Sroke**	**Pos. time**	**Closing pressure** (bar)		
	PN16	PN25	PN40	PN40	m³/h	mm	sec	2000N	4000N	5500N
15	411 400	411 500	411 700	411E00	4	7	23	40,0		
20	411 401	411 501	411 701	411E01	6,3	9	30	40,0		
25	411 402.	411 502.	411 702.	411E02.	10	10	33	28,5	40,0	
32	411 403.	411 503.	411 703.	411E03.	16	12	40	17,3	39,3	40,0
40	411 404.	411 504.	411 704.	411E04.	25	14	46	10,8	25,2	36,0
50	411 405.	411 505.	411 705.	411E05.	40	14	46	6,6	16,0	23,0
65	411 406.	411 506.	411 706.	411E06.	63	20	66	3,4	9,1	13,4
80	411 408.	411 508.	411 708.	411E08.	100	20	66	2,0	5,8	8,6
100	411 410.	411 510.	411 710.	411E10.	150	30	99	1,1	3,5	5,4



DN	15	20	25	32	40	50	65	80	100
Height H	491	505	499	506	511	513	556	557	564
Length L	130	150	160	180	200	230	290	310	350
Weight kg	14	15	16	18	19	21	35	38	48

Electrical wiring:



Motor control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 50:1
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . , PN25: 421 **5** . . , PN40: 421 **7** . ., PN40: 421 **E** . .
Accessories: . . .

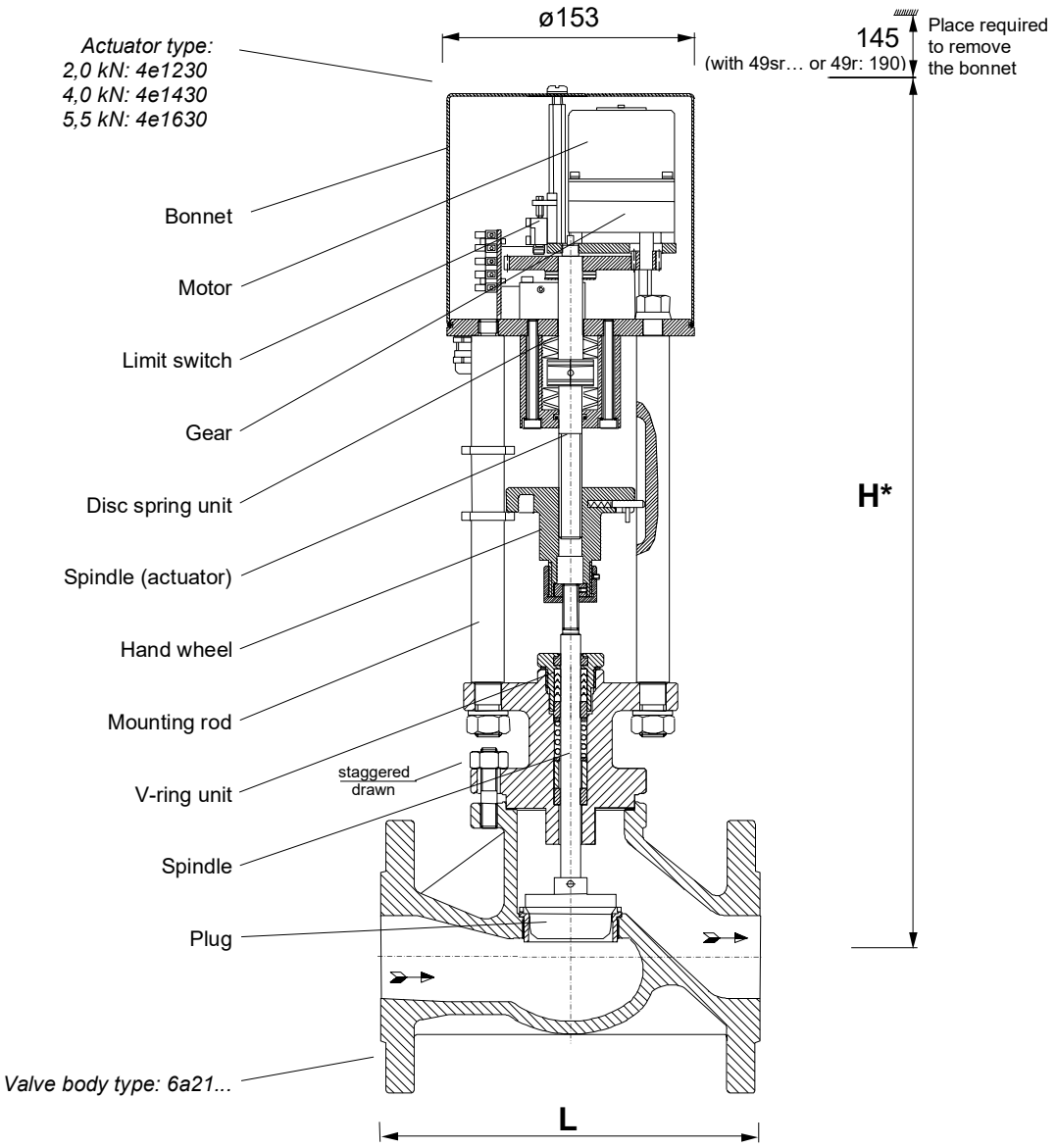
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	421 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	421 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	421 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	421 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure** (bar)		
	PN16	PN25	PN40	PN40	m³/h	mm	sec	2000N	4000N	5500N
15	421 400	421 500	421 700	421E00	4	20	66	40,0		
	421 450	421 550	421 750	421E50	2,5	20	66	40,0		
	421 470	421 570	421 770	421E70	1,6	20	66	40,0		
20	421 401	421 501	421 701	421E01	6,3	20	66	40,0		
	421 451	421 551	421 751	421E51	4,0	20	66	40,0		
	421 471	421 571	421 771	421E71	2,5	20	66	40,0		
25	421 402.	421 502.	421 702.	421E02.	10	20	66	28,5	40,0	
	421 452	421 552	421 752	421E52	6,3	20	66	40,0		
	421 472	421 572	421 772	421E72	4,0	20	66	40,0		
32	421 403.	421 503.	421 703.	421E03.	16	20	66	17,3	39,3	40,0
	421 453.	421 553.	421 753.	421E53.	10	20	66	28,5	40,0	
	421 473	421 573	421 773	421E73	6,3	20	66	40,0		
40	421 404.	421 504.	421 704.	421E04.	25	20	66	10,8	25,2	36,0
	421 454.	421 554.	421 754.	421E54.	16	20	66	17,3	39,3	40,0
	421 474	421 574.	421 774.	421E74.	10	20	66	28,5	40,0	
50	421 405.	421 505.	421 705.	421E05.	40	20	66	6,6	16,0	23,0
	421 455.	421 555.	421 755.	421E55.	25	20	66	10,8	25,2	36,0
	421 475.	421 575.	421 775.	421E75.	16	20	66	17,3	39,3	40,0

Motor control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40



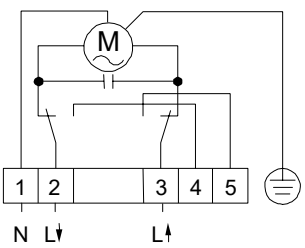
DN	15	20	25	32	40	50
Height H*	491	505	499	506	511	513
Length L	130	150	160	180	200	230
Weight kg	14	15	16	18	19	21

** = add. 45mm for actuators with positioner 49sr… or controller 49r*

Electrical wiring:

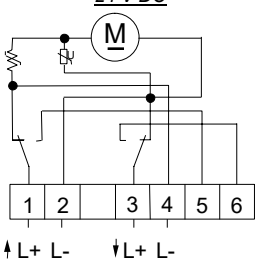
Basic version:

230/115/24 V 50...60 Hz



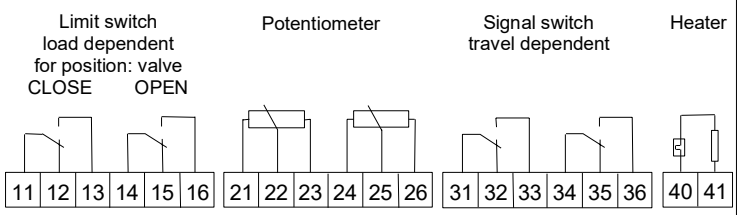
L on 2 = valve closes
L on 3 = valve opens

24 V DC



24V on 1/2 = valve opens
24V on 3/4 = valve closes

*Accessories** (optionally):*



*** = for actuators with positioner 49sr… or controller 49r see electrical wiring on page 49sr… or 49r*

Motor control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40



Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner for max. 40mm stroke (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . , PN25: 421 **5** . . , PN40: 421 **7** . . , PN40: 421 **E** . .
Accessories: . . .

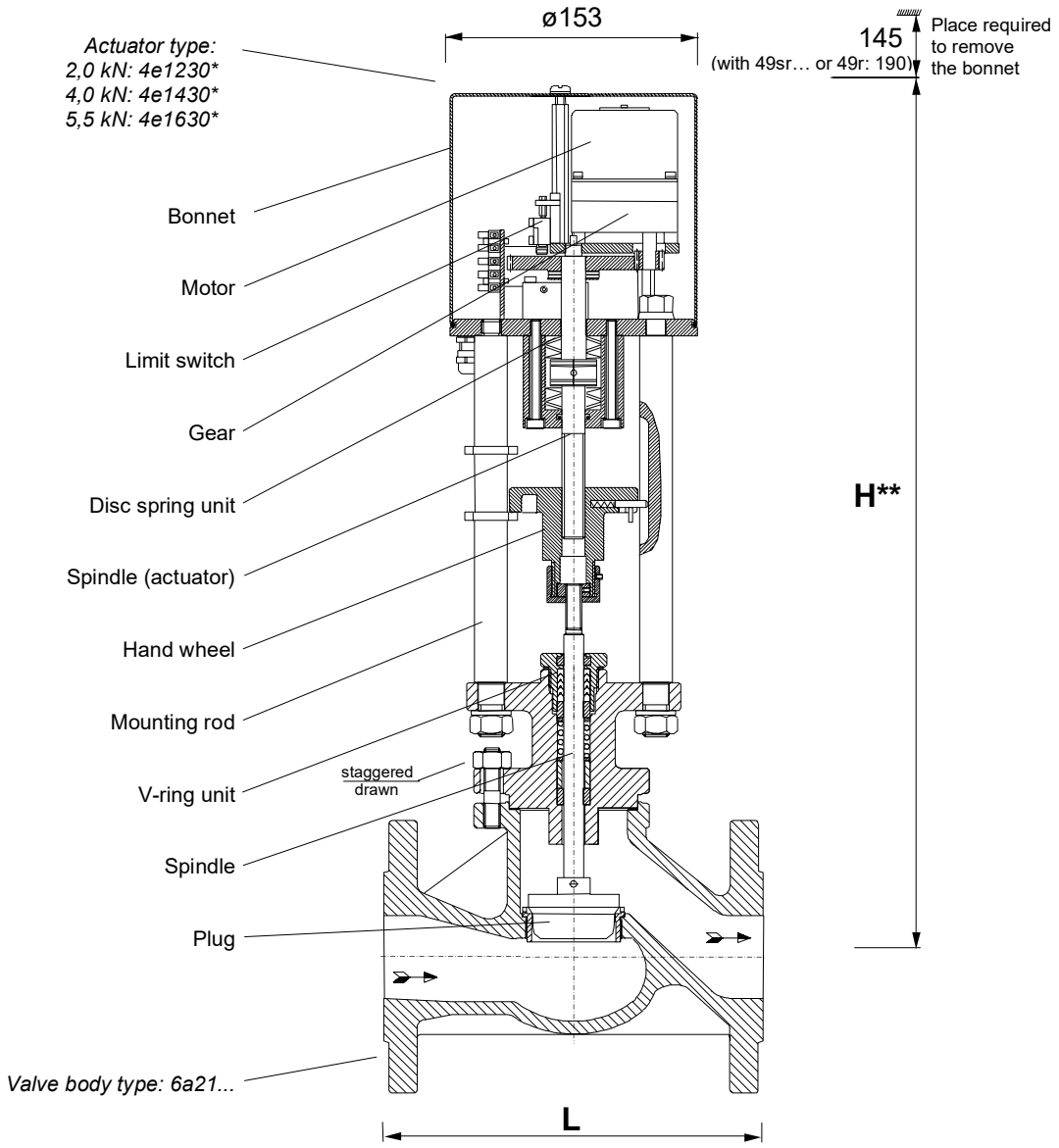
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	421 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	421 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	421 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	421 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**stroke** mm	**Pos. time** sec	**Closing pressure** (bar) 2000N	4000N	5500N
65	421 406.	421 506.	421 706.	421 E06.	63	30	99	3,4	9,1	13,5
	421 456.	421 556.	421 756.	421 E56.	40	20	66	6,6	16,0	23,1
	421 476.	421 576.	421 776.	421 E76.	25	20	66	10,8	25,2	36,0
80	421 408.	421 508.	421 708.	421 E08.	100	30	99	2,0	5,8	8,6
	421 458.	421 558.	421 758.	421 E58.	63	20	66	3,4	9,1	13,4
	421 478.	421 578.	421 778.	421 E78.	40	20	66	6,6	16,0	23,1
100	421 410.	421 510.	421 710.	421 E10.	150	30	99	1,1	3,5	5,4
	421 460.	421 560.	421 760.	421 E60.	100	30	99	3,4	9,1	13,4
	421 480.	421 580.	421 780.	421 E80.	63	22	73	3,4	9,1	13,4
125	421 412.	421 512.		.	230	60	198	0,5	2,1	3,2
	421 412._140a	421 512._140a			140	35	116	1,1	3,5	5,4
	421 412._100a	421 512._100a			100	35	116	2,0	5,8	8,6
150	421 415.	421 515.			330	60	198	-	1,3	2,1
	421 415._250a	421 515._250a			250	50	165	0,5	2,1	3,3
	421 415._150a	421 515._150a			150	35	116	1,1	3,5	5,4

Motor control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40



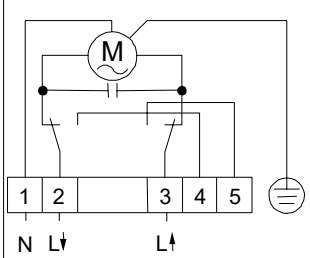
DN	65	80	100	125	150
Height H**	556	557	564	760	775
Length L	290	310	350	400	480
Weight kg	35	38	48	101	121

** = only for stroke up to 40mm; actuators for stroke 50-60mm: 4e1266 (2kN) , 4e1466 (4kN) and 4e1666 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr… or controller 49r*

Electrical wiring:

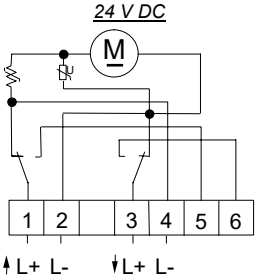
Basic version:

230/115/24 V 50...60 Hz



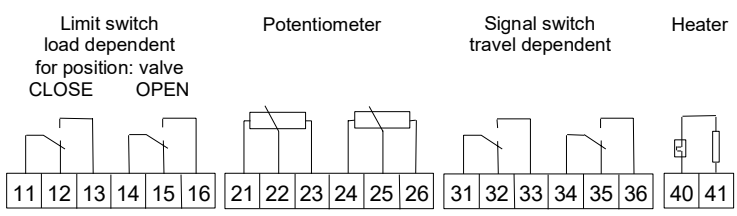
L on 2 = valve closes
L on 3 = valve opens

24 V DC



24V on 1/2 = valve opens
24V on 3/4 = valve closes

*Accessories*** (optionally):*



**** = for actuators with positioner 49sr… or controller 49r*
see electrical wiring on page 49sr… or 49r

Motor control valve in two way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 8-15kN actuator



Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Other voltages: 115V 50/60Hz, 24V 50/60Hz,
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . H ., PN25: 421 **5** . . H ., PN40: 421 **7** . . H ., PN40: 421 **E** . . H .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

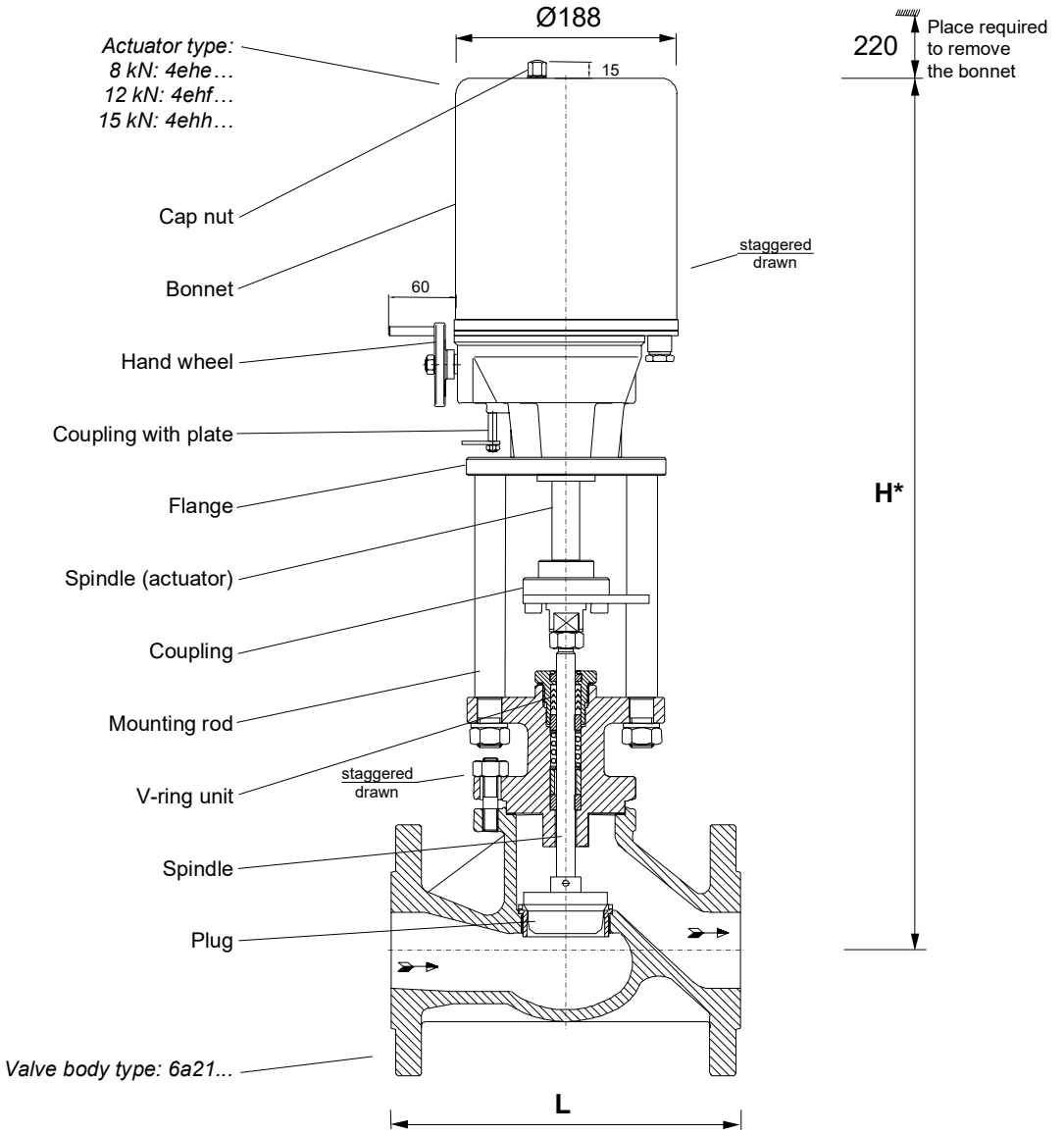
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	421 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	421 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	421 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	421 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	List-No.				Kvs	Stroke	Pos. time	Closing pressure** (bar)		
	PN16	PN25	PN40	PN40	m³/h	mm	sec	8kN	12kN	15kN
50	421 405H.	421 505H.	421 705H.	421 E05H.	40	20	48	34,8	40,0	
	421 455He	421 555He	421 755He	421 E55He	25	20	48	40,0		
	421 475He	421 575He	421 775He	421 E75He.	16	20	48	40,0		
65	421 406H.	421 506H.	421 706H.	421 E06H.	63	30	72	20,4	31,8	40,0
	421 456H.	421 556H.	421 756H.	421 E56H.	40	20	48	34,8	40,0	
	421 476He	421 576He.	421 776He	421 E76He	25	20	48	40,0		
80	421 408H.	421 508H.	421 708H.	421 E08H.	100	30	72	13,4	21,0	26,6
	421 458H.	421 558H.	421 758H.	421 E58H.	63	20	48	20,4	31,8	40,0
	421 478H.	421 578H.	421 778H.	421 E78H.	40	20	48	34,8	40,0	
100	421 410H.	421 510H.	421 710H.	421 E10H.	150	30	72	8,4	13,3	17,0
	421 460H.	421 560H.	421 760H.	421 E60H.	100	30	72	20,4	31,8	40,0
	421 480H.	421 580H.	421 780H.	421 E80H.	63	22	53	20,4	31,8	40,0
125	421 412H.	421 512H.		.	230	60	72	5,2	8,4	10,8
	421 412H._140a	421 512H._140a			140	35	42	8,4	13,3	17,0
	421 412H._100a	421 512H._100a			100	35	42	13,4	21,0	26,6
150	421 415H.	421 515H.			330	60	72	3,5	5,7	7,4
	421 415H._250a	421 515H._250a			250	50	60	5,2	8,4	10,8
	421 415H._150a	421 515H._150a			150	35	42	8,4	13,3	17,0

*** = higher closing pressures see page 421Hi/k, DN200 see page 4214/520Hf/h/i/k, DN>200 on request*

Motor control valve in two way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 8-15kN actuator



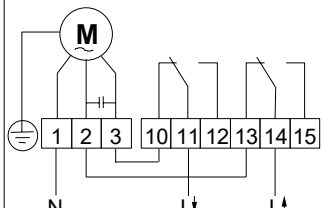
DN	50	65	80	100	125	150
Height H*	625	668	669	676	834	849
Length L	230	290	310	350	400	480
Weight kg	25	39	42	52	104	124

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**

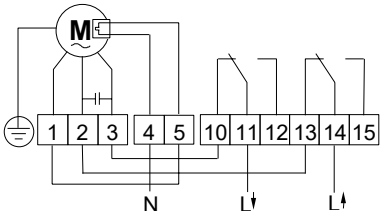
Basic version:

Actuator 8kN / 12kN (...e / ...f)



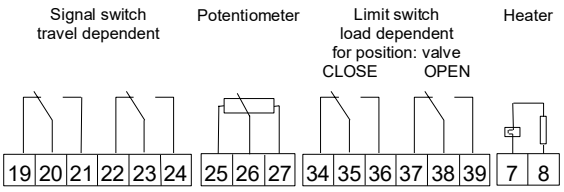
L on 11 = valve closes
L on 14 = valve opens

Actuator 15kN (...h)



L on 11 = valve closes
L on 14 = valve opens

*Accessories** (optionally):*



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with PTFE-V-ring sealing, DN80-150 PN 16 / 25 / 40, with 20-25kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 20 kN / 218 VA (appendix ...i)
25 kN / 218 VA (appendix ...k)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...i6/k6)
Other voltages: 115V 50/60Hz, 24V 50/60Hz,
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . H ., PN25: 421 **5** . . H ., PN40: 421 **7** . . H ., PN40: 421 **E** . . H .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

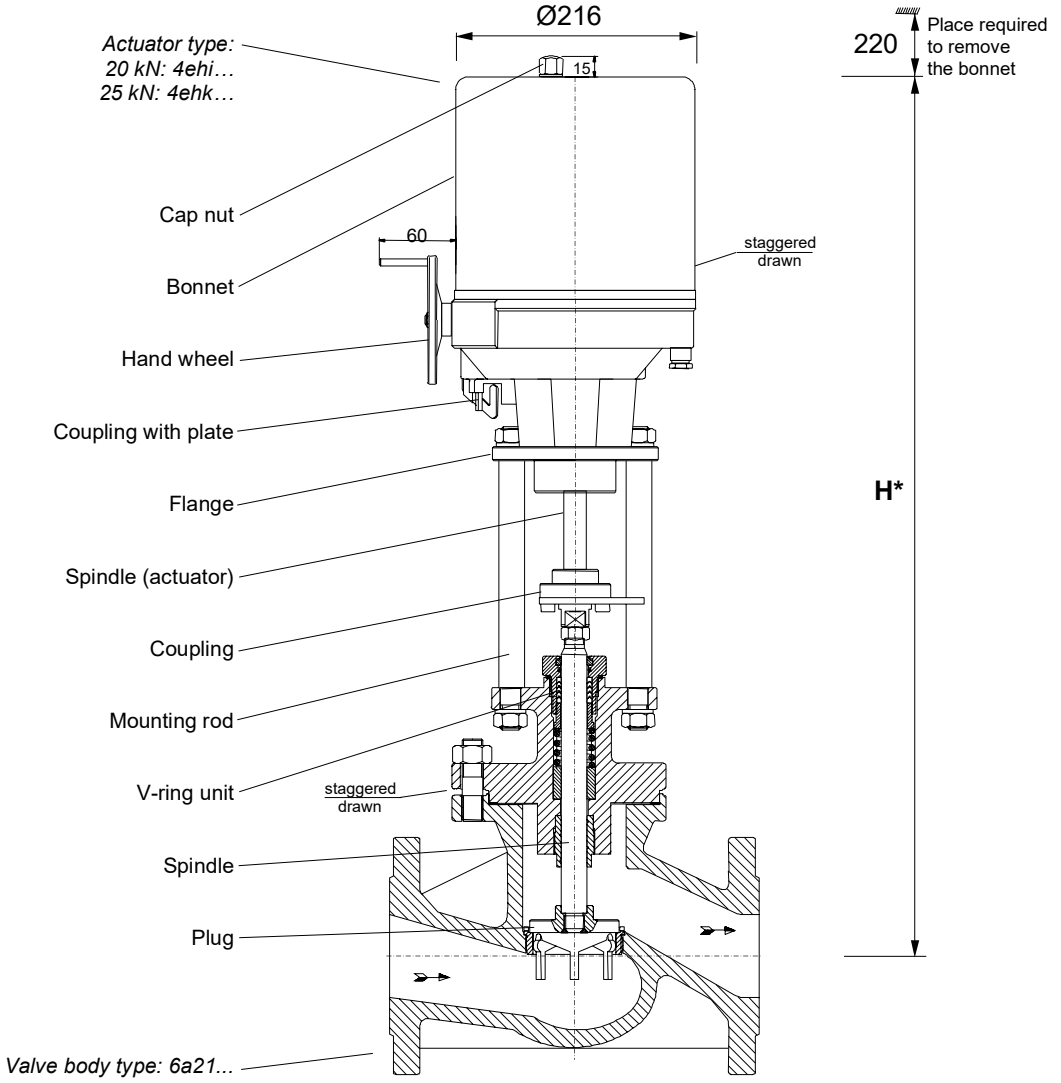
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	421 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	421 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	421 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	421 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	PN40	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure**** (bar) 20kN	25kN
80	421 408H.	421 508H.	421 708H.	421 E08H.	100	30	36	36,1	40,0
100	421 410H.	421 510H.	421 710H.	421 E10H.	150	30	36	23,1	29,2
125	421 412H.	421 512H.			230	60	72	14,7	18,7
	421 412H._140a	421 512H._140a			140	35	42	23,1	29,2
	421 412H._100a	421 512H._100a			100	35	42	36,1	40,0
150	421 415H.	421 515H.			330	60	72	10,1	12,9
	421 415H._250a	421 515H._250a			250	50	50	14,7	18,7
	421 415H._150a	421 515H._150a			150	35	42	23,1	29,2

*** = DN200 see page 4214/520Hf/h/i/k, DN>200 on request*

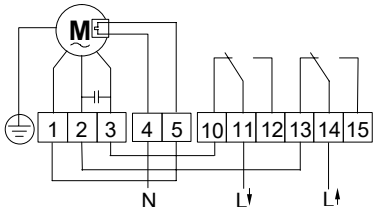
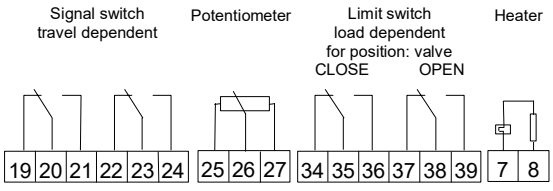
Motor control valve in two way form with PTFE-V-ring sealing, DN80-150 PN 16 / 25 / 40, with 20-25kN actuator



DN	80	100	125	150
Height H*	762	769	934	949
Length L	310	350	400	480
Weight kg	47	57	109	119

** = additional 40mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**

Basic version:	*Accessories** (optionally):*
	

L on 11 = valve closes
L on 14 = valve opens

*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 421 . 20 H . , accessories . . .

Pressure-Temperature ratings acc. to DIN EN 1092-2:

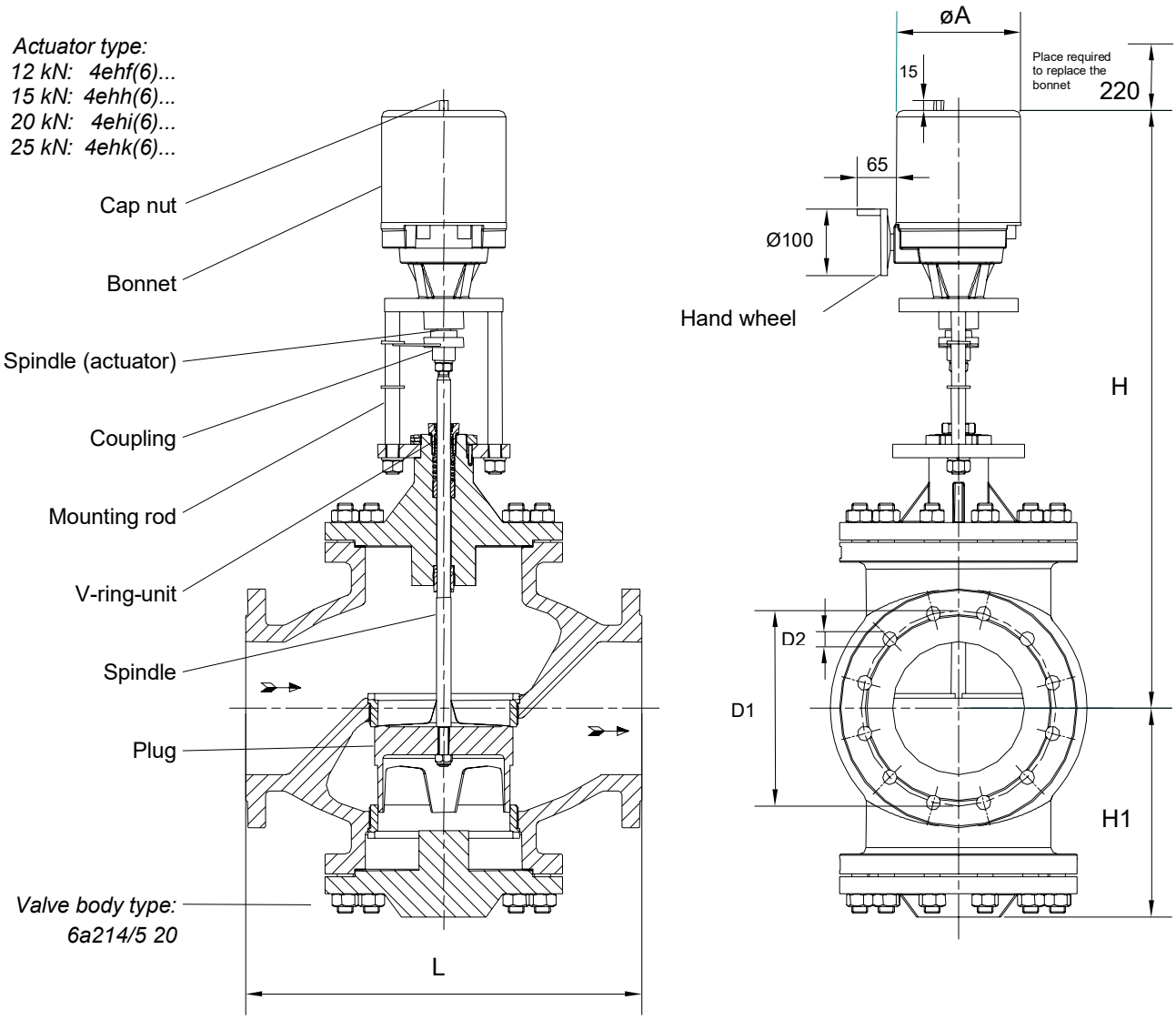
by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure** (bar) 12 kN	15kN	20kN	25kN
200	421 420Hf	421 520Hf	630	60	72	3,1			
200	421 420Hh	421 520Hh	630	60	90		4,0		
200	421 420Hi	421 520Hi	630	60	72			5,6	
200	421 420Hk	421 520Hk	630	60	72				7,1

*** higher closing pressures on request*

Motor control valve in two way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25



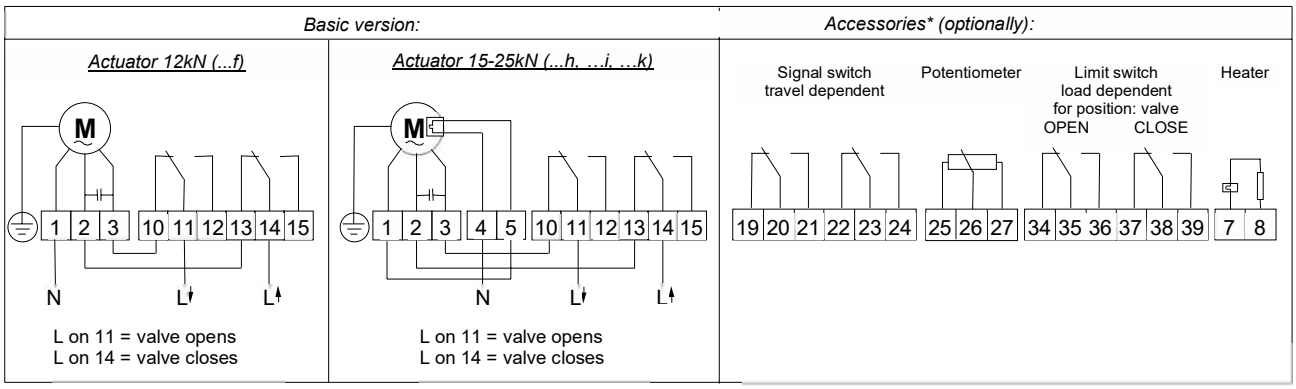
Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	905	980
Length H1	315	315
Length L	600	600
Weight kg	280	285
Diameter A	188	216

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in three way form with PTFE-V-ring sealing, DN15-150 PN 16 / 25 / 40

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
5500 N / 28 VA (appendix ...d)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 431 **4** . . , PN25: 431 **5** . . , PN40: 431 **7** . . , PN40: 431 **E** . .
Accessories: . . .

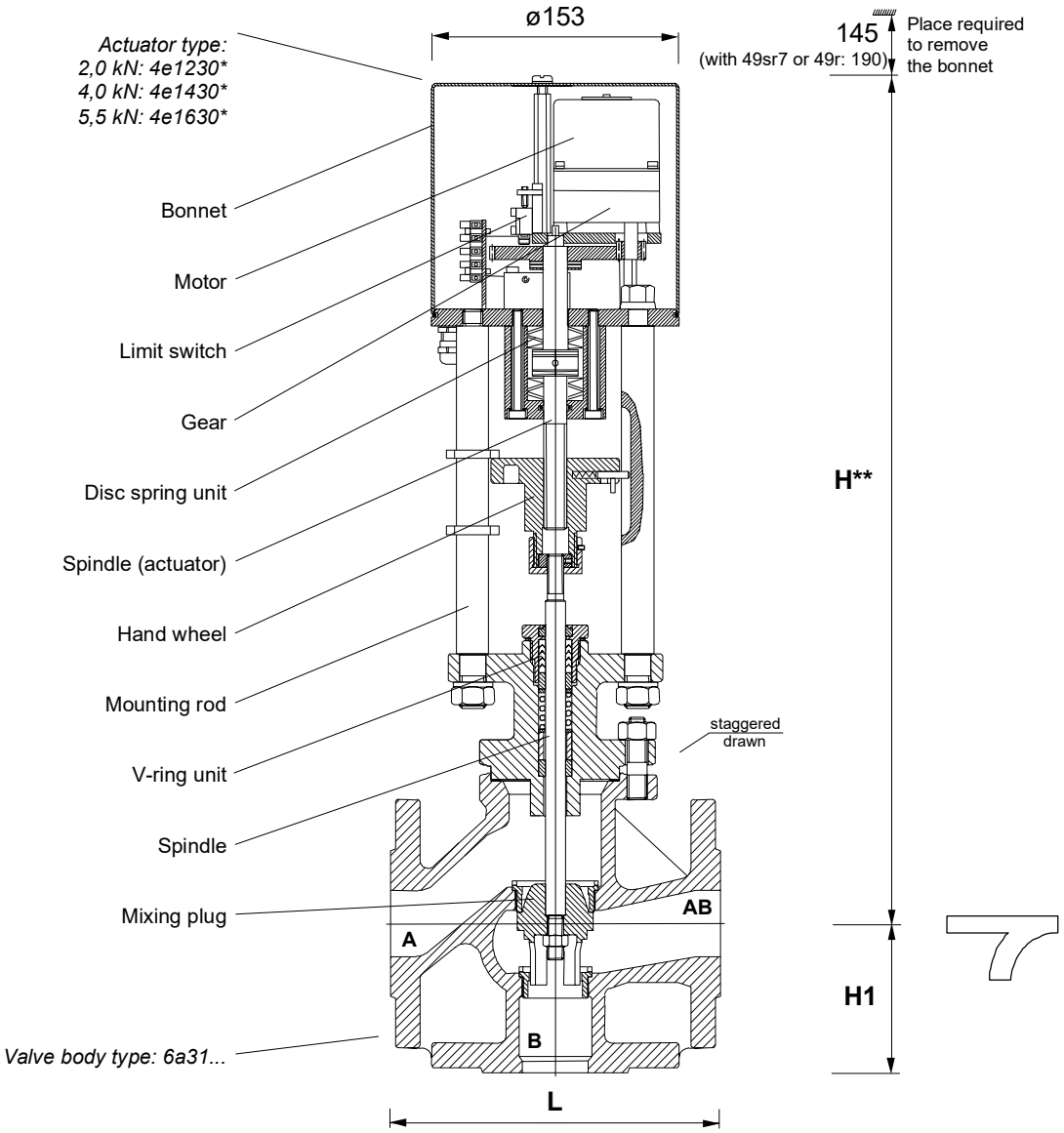
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	431 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	431 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	431 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	431 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	PN40	PN40	m³/h	mm	sec	2000N	4000N	5500N
15	431 400	431 500	431 700	431 E00	4	20	66	40,0		
20	431 401	431 501	431 701	431 E01	6,3	20	66	40,0		
25	431 402	431 502	431 702.	431 E02.	10	20	66	28,5	40,0	
32	431 403.	431 503.	431 703.	431 E03.	16	20	66	17,3	39,3	40,0
40	431 404.	431 504.	431 704.	431 E04.	25	20	66	10,8	25,2	36,0
50	431 405.	431 505.	431 705.	431 E05.	40	20	66	6,6	16,0	23,0
65	431 406.	431 506.	431 706.	431 E06.	63	30	99	3,4	9,1	13,3
80	431 408.	431 508.	431 708.	431 E08.	100	30	99	2,0	5,8	8,6
100	431 410.	431 510.	431 710.	431 E10.	150	30	99	1,1	3,5	5,4
125	431 412.	431 512.			230	35	116		2,1	3,3
150	431 415.	431 515.			330	38	126		1,3	2,1

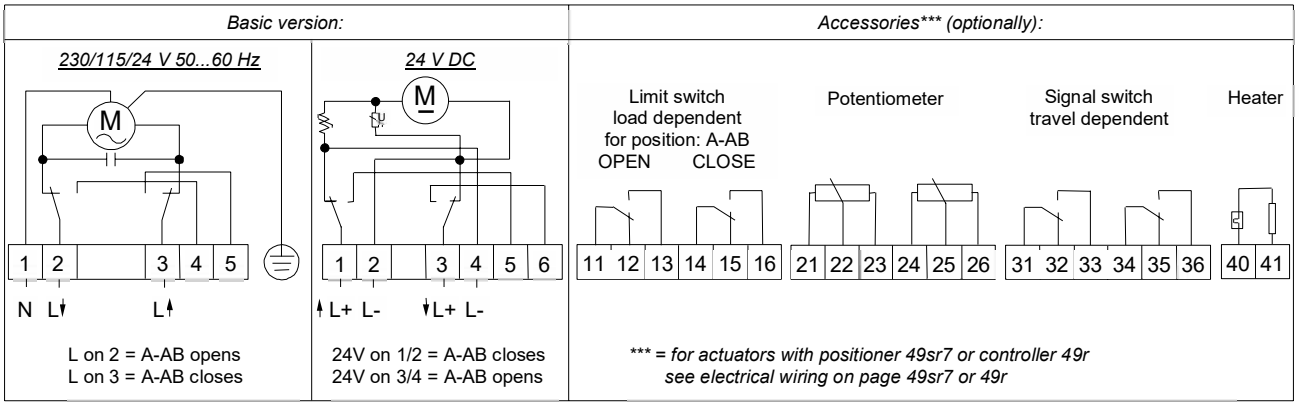
*** = higher closing pressures see page 4314/5He/f/h, DN200 see page 4314/520Hf/h, bigger DN on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H**	491	505	499	506	511	513	556	557	564	720	735
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	15	16	17	20	21	24	40	45	58	113	134

** = only for DN 15-100; actuators for DN 125-150: 4e1435 (4kN) and 4e1635 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr7 or controller 49r*

Electrical wiring:



Motor control valve in three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 8-15kN actuator

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 431 **4** . . H ., PN25: 431 **5** . . H ., PN40: 431 **7** . . H ., PN40: 431 **E** . . H .
Accessories: . . .

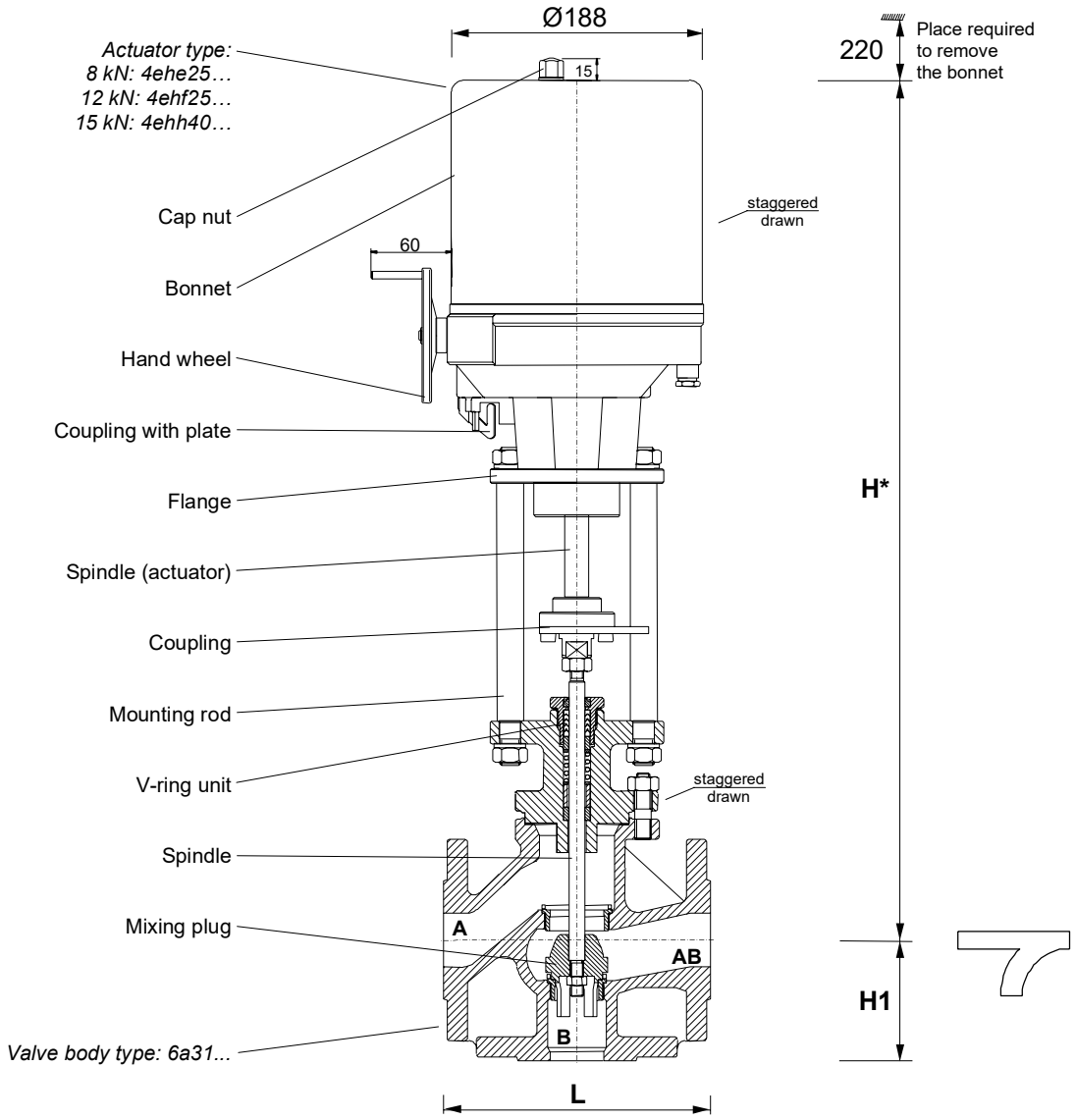
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	431 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	431 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	431 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	431 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN16	PN25	PN40	PN40	m³/h	mm	sec	8kN	12kN	15kN
50	431 405H.	431 505H.	431 705H.	431 E05H.	40	20	48	34,8	40,0	
65	431 406H.	431 506H.	431 706H.	431 E06H.	63	30	72	20,4	31,8	40,0
80	431 408H.	431 508H.	431 708H.	431 E08H.	100	30	72	13,4	21,0	26,6
100	431 410H.	431 510H.	431 710H.	431 E10H.	150	30	72	8,4	13,3	17,0
125	431 412H.	431 512H.			230	35	84	5,2	8,4	10,8
150	431 415H.	431 515H.			330	38	92	3,5	5,7	7,4

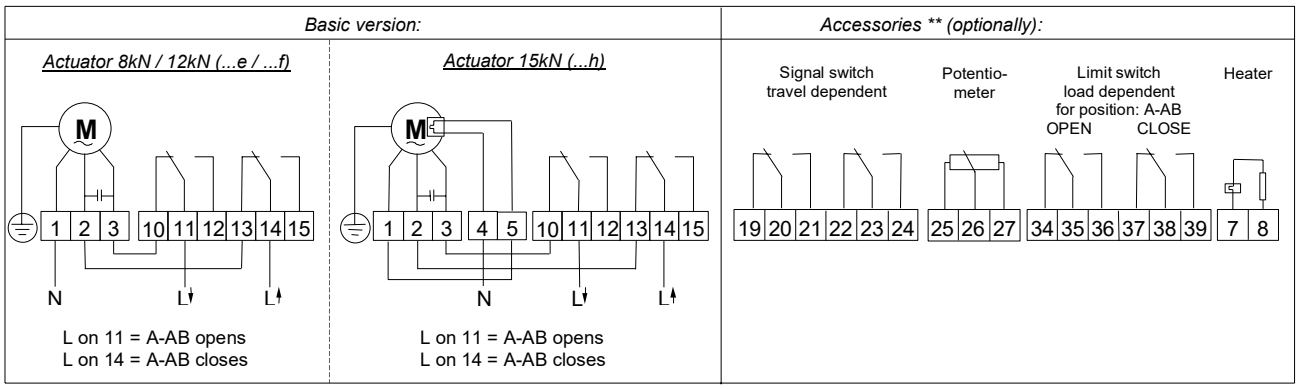
*** = DN200 see page 4314/520Hf/h, higher closing pressures and DN>200 on request*



DN	50	65	80	100	125	150
Height H*	708	751	752	760	861	876
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	28	45	49	62	117	138

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in three way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 431 . . . H . , accessories . . .

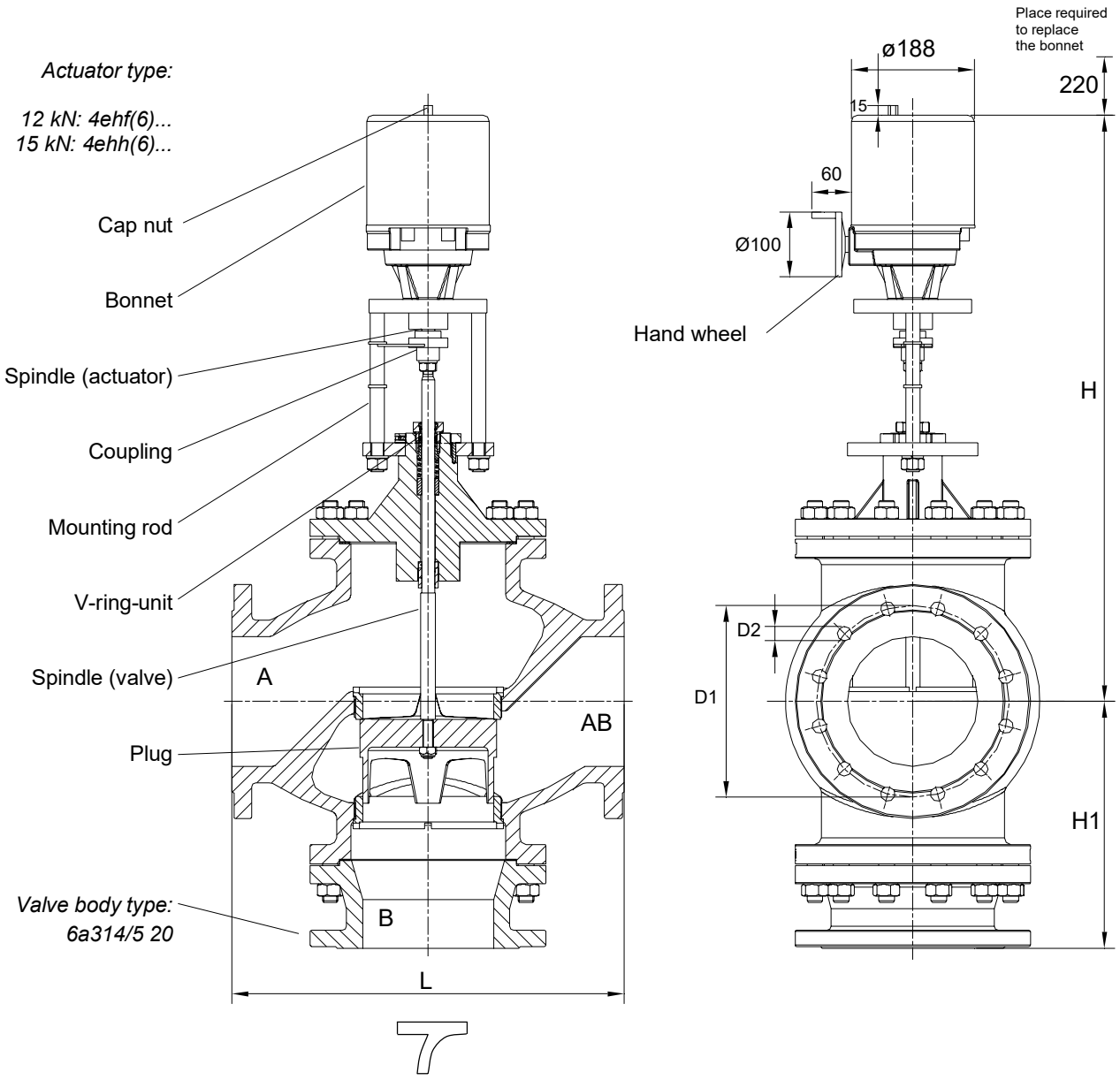
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.** PN 16	PN 25	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure*** (bar) 12 kN	15kN
200	431 420Hf	431 520Hf	630	60	72	3,1	
200	431 420Hh	431 520Hh	630	60	90		4,0

** higher closing pressures on request*



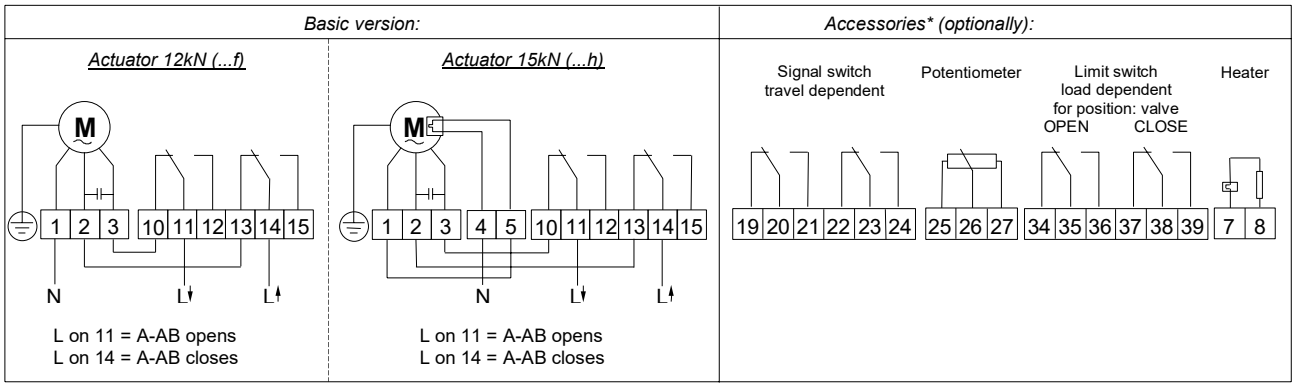
Dimensions

DN	200
Height H	905
Stud length H1	380
Length L	600
Weight kg	280

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve for diverting function three way form with PTFE-V-ring sealing, DN32-150 PN 16 / 25 / 40

Body: three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 432 **4** . . , PN25: 432 **5** . . , PN40: 432 **7** . . , PN40: 432 **E** . .
Accessories: . . .

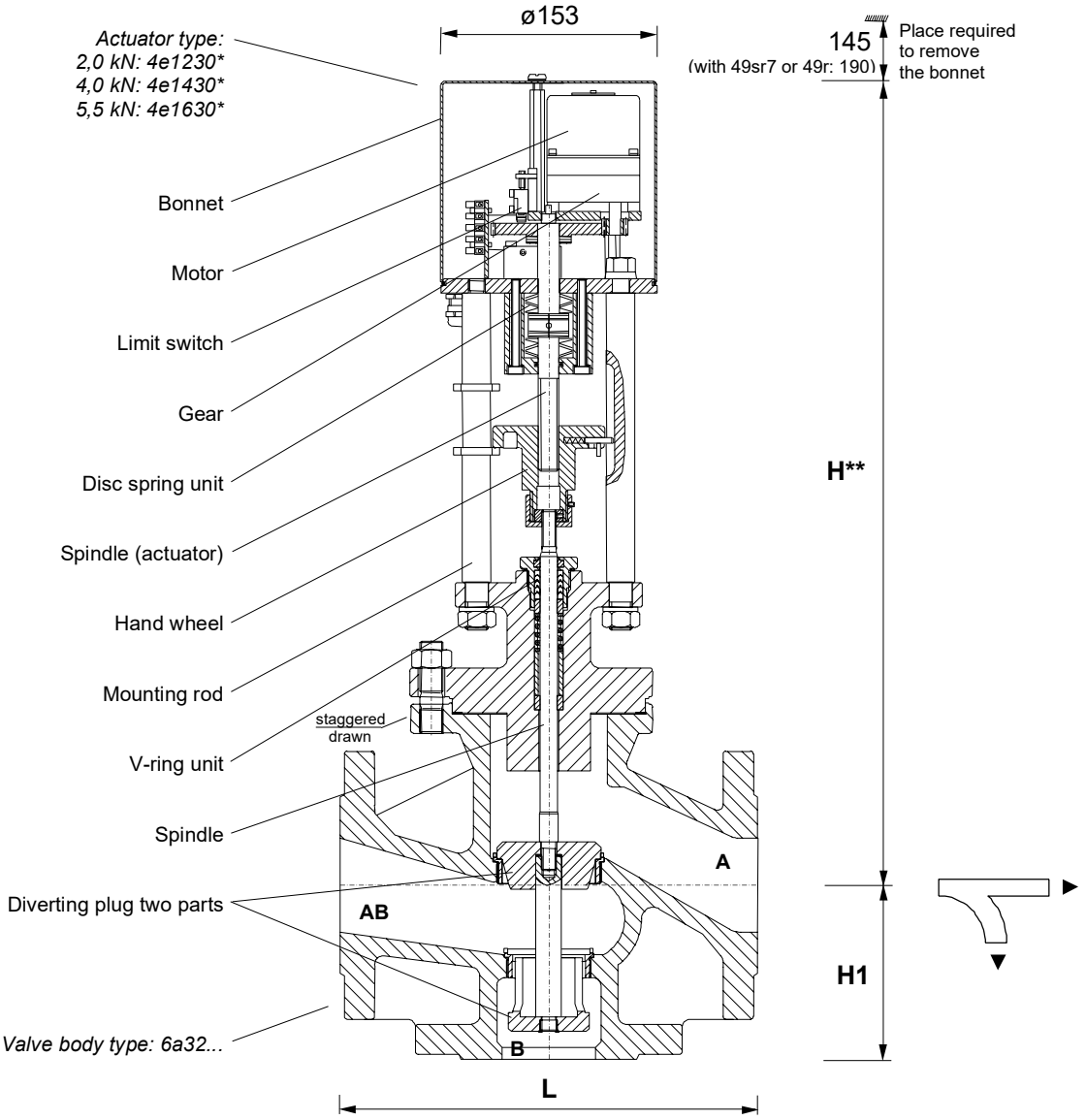
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	432 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	432 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	432 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	432 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	PN40	PN40	m³/h	mm	sec	2000N	4000N	5500N
32	432 403	432 503.	432 703.	432 E03.	12	20	66	17,3	39,3	40,0
40	432 404.	432 504.	432 704.	432 E04.	20	20	66	10,8	25,2	36,0
50	432 405.	432 505.	432 705.	432 E05.	27	20	66	6,6	16,0	23,0
65	432 406.	432 506.	432 706.	432 E06.	50	30	99	3,4	9,1	13,3
80	432 408.	432 508.	432 708.	432 E08.	83	30	99	2,0	5,8	8,6
100	432 410.	432 510.	432 710.	432 E10.	123	30	99	1,1	3,5	5,4
125	432 412.	432 512.			190	35	116		3,5	5,4
150	432 415.	432 515.			250	35	116		2,3	3,6

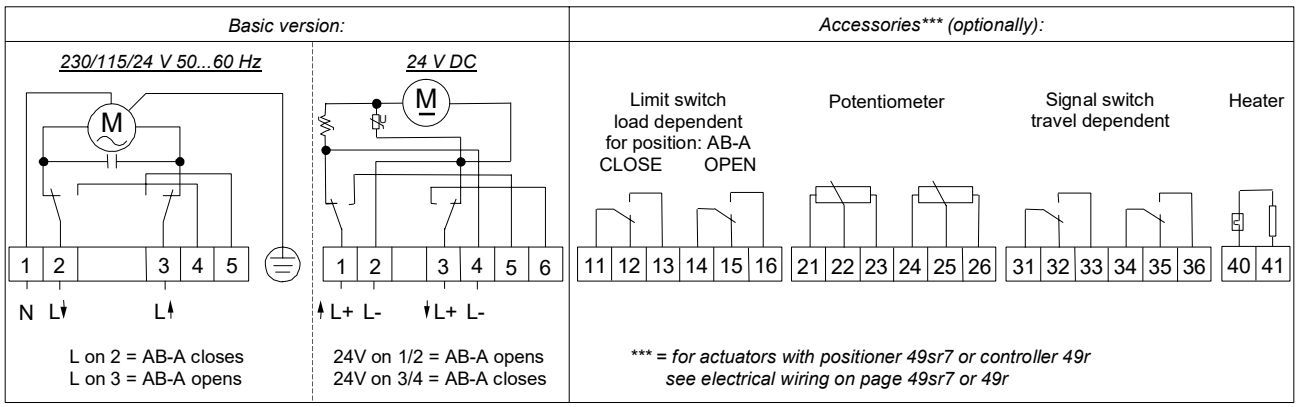
*** = higher closing pressures see page 432He/f/h, DN200 see page 4324/520Hf/h/i/k, bigger DN on request*



DN	32	40	50	65	80	100	125	150
Height H**	506	511	513	556	557	564	720	735
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	20	21	24	39	43	56	112	133

** = only for DN 32-100; actuators for DN 125-150: 4e1435 (4kN) and 4e1635 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr7 or controller 49r*

Electrical wiring:



Motor control valve for diverting function three way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 8-15kN actuator

Body: three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 432 **4** . . H ., PN25: 432 **5** . . H ., PN40: 432 **7** . . H ., PN40: 432 **E** . . H .
Accessories: . . .

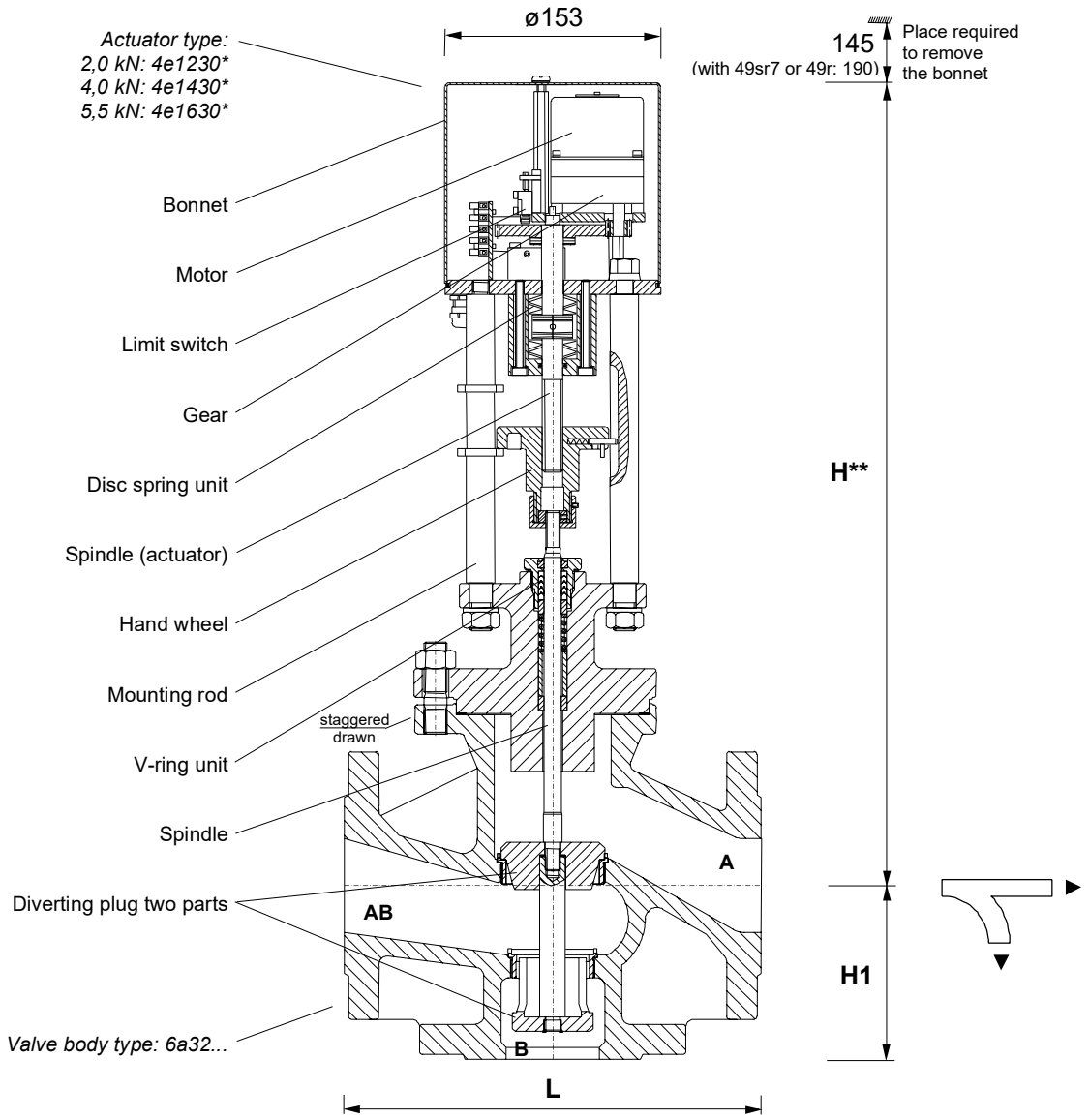
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	432 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	432 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	432 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	432 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN16	PN25	PN40	PN40	m³/h	mm	sec	8kN	12kN	15kN
50	432 405H.	432 505H.	432 705H.	432 E05H.	27	20	48	34,8	40,0	
65	432 406H.	432 506H.	432 706H.	432 E06H.	50	30	72	20,4	31,8	40,0
80	432 408H.	432 508H.	432 708H.	432 E08H.	83	30	72	13,4	21,0	26,6
100	432 410H.	432 510H.	432 710H.	432 E10H.	123	30	72	8,4	13,3	17,0
125	432 412H.	432 512H.		.	190	35	84	8,4	13,3	17,0
150	432 415H.	432 515H.			250	35	84	5,7	9,1	11,7

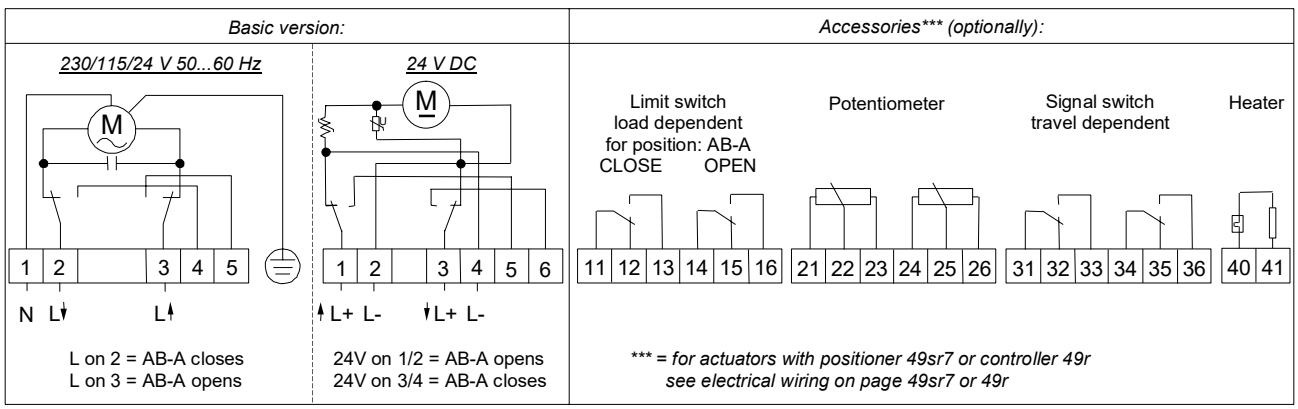
*** = DN200 see page 4324/520Hf/h/i/k, higher closing pressures and DN>200 on request*



DN	32	40	50	65	80	100	125	150
Height H**	506	511	513	556	557	564	720	735
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	20	21	24	39	43	56	112	133

** = only for DN 32-100; actuators for DN 125-150: 4e1435 (4kN) and 4e1635 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr7 or controller 49r*

Electrical wiring:



Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version with diverting plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 470
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 432 . . . H . , accessories . . .

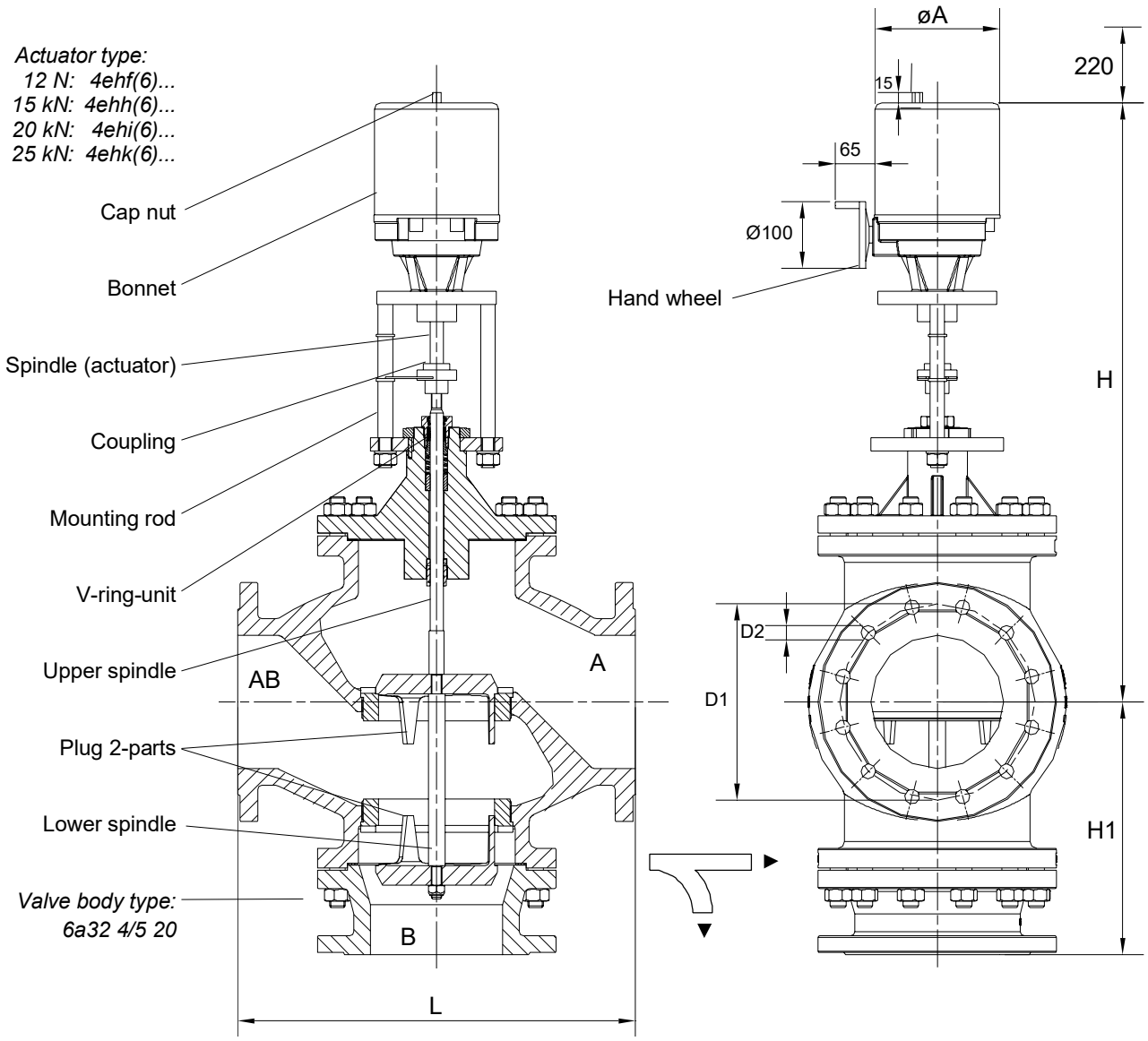
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure** (bar) 12 kN	15kN	20kN	25kN
200	432 420Hf	432 520Hf	470	50	60	4,1			
200	432 420Hh	432 520Hh	470	50	75		5,3		
200	432 420Hi	432 520Hi	470	50	60			7,4	
200	432 420Hk	432 520Hk	470	50	60				9,4

*** higher closing pressures on request*



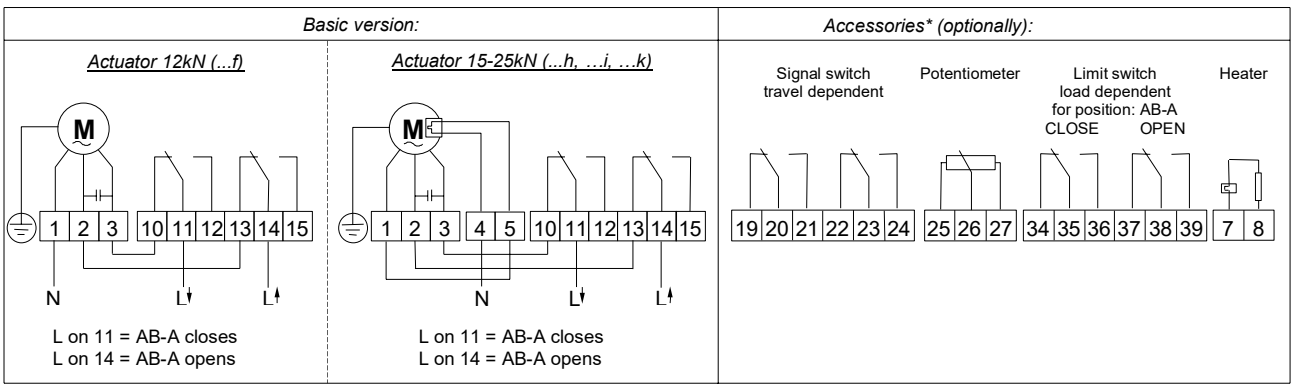
Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	905	980
Length H1	380	380
Length L	600	600
Weight kg	280	285
Diameter A	188	216

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with bellow sealing, DN15-150 PN 16 / 25



Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
5500 N / 28 VA (appendix ...d)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 451 **4** . . , PN25: 451 **5** . . , PN25: 451 **6** . . , PN25: 451 **E** . ._p2
Accessories: . . .

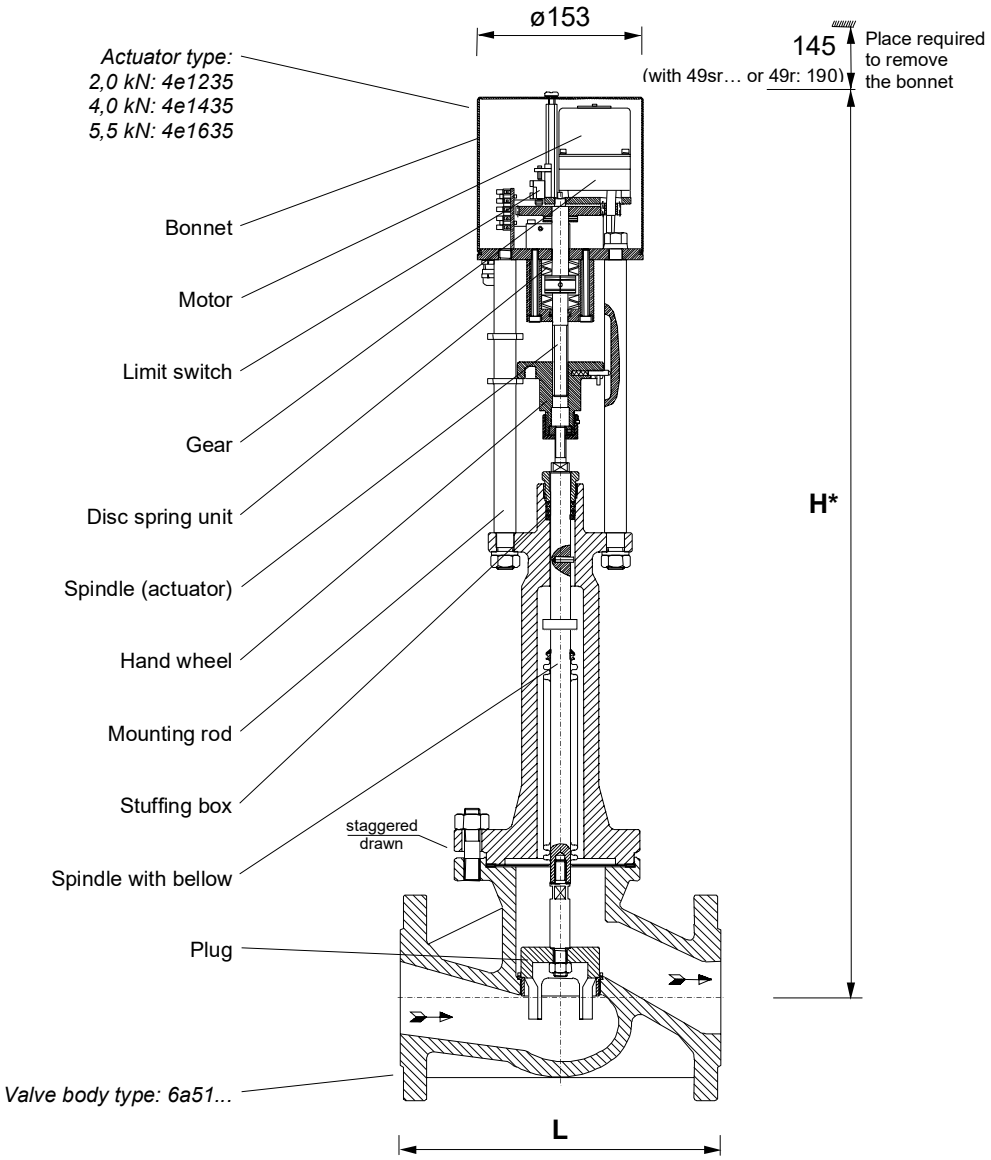
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	451 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	451 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	451 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	451 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	PN25	PN25	m³/h	mm	sec	2000N	4000N	5500N
15	451 400	451 500	451 600	451 E00_p2	4	20	66	25,0		
20	451 401	451 501	451 601	451 E01_p2	6,3	20	66	25,0		
25	451 402	451 502	451 602	451 E02_p2	10	20	66	25,0		
32	451 403.	451 503.	451 603.	451 E03._p2	16	20	66	17,3	25,0	
40	451 404.	451 504.	451 604.	451 E04._p2	25	20	66	10,8	25,0	
50	451 405.	451 505.	451 605.	451 E05._p2	40	20	66	6,6	16,0	23,0
65	451 406.	451 506.	451 606.	451 E06._p2	63	30	99	3,4	9,1	13,3
80	451 408.	451 508.	451 608.	451 E08._p2	100	30	99	2,0	5,8	8,6
100	451 410.	451 510.	451 610.	451 E10._p2	150	30	99	1,1	3,5	5,4
125	451 412.	451 512.			230	40	132		2,1	3,3
150	451 415.				330	40	132		1,3	2,1

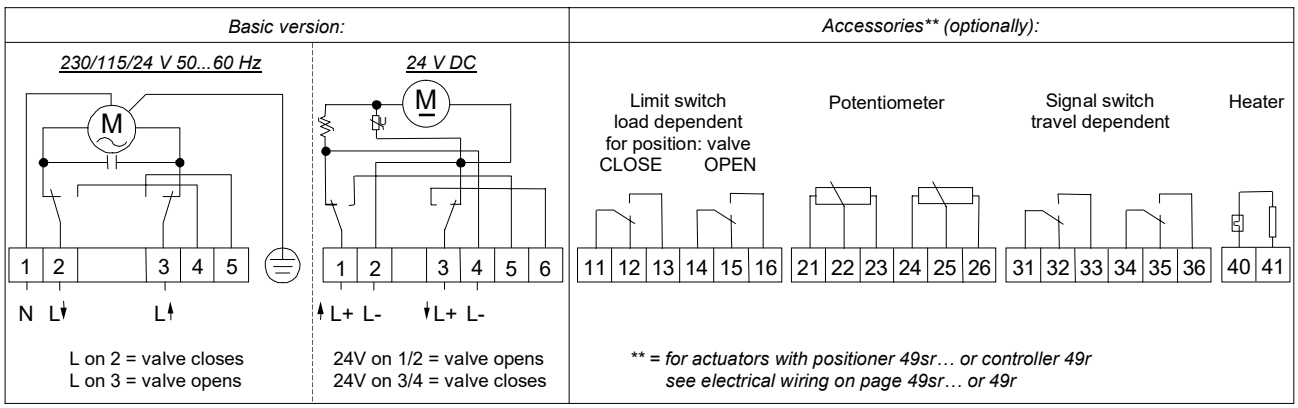
*** = higher closing pressures see page 451He/f/h, DN200: see page 451420Hf/h/i/k, DN>200 on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H*	661	675	669	676	681	683	813	814	821	924	940
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	17	18	19	20	22	24	43	47	57	104	124

** = add. 45mm for actuators with positioner 49sr… or controller 49r*

Electrical wiring:



Motor control valve in two way form with bellow sealing, DN50-150 PN 16 / 25, with 8-15kN actuator



Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 451 **4** . . H ., PN25: 451 **5** . . H ., PN25: 451 **6** . . H ., PN25: 451 **E** . . H ._p2
Accessories: . . .

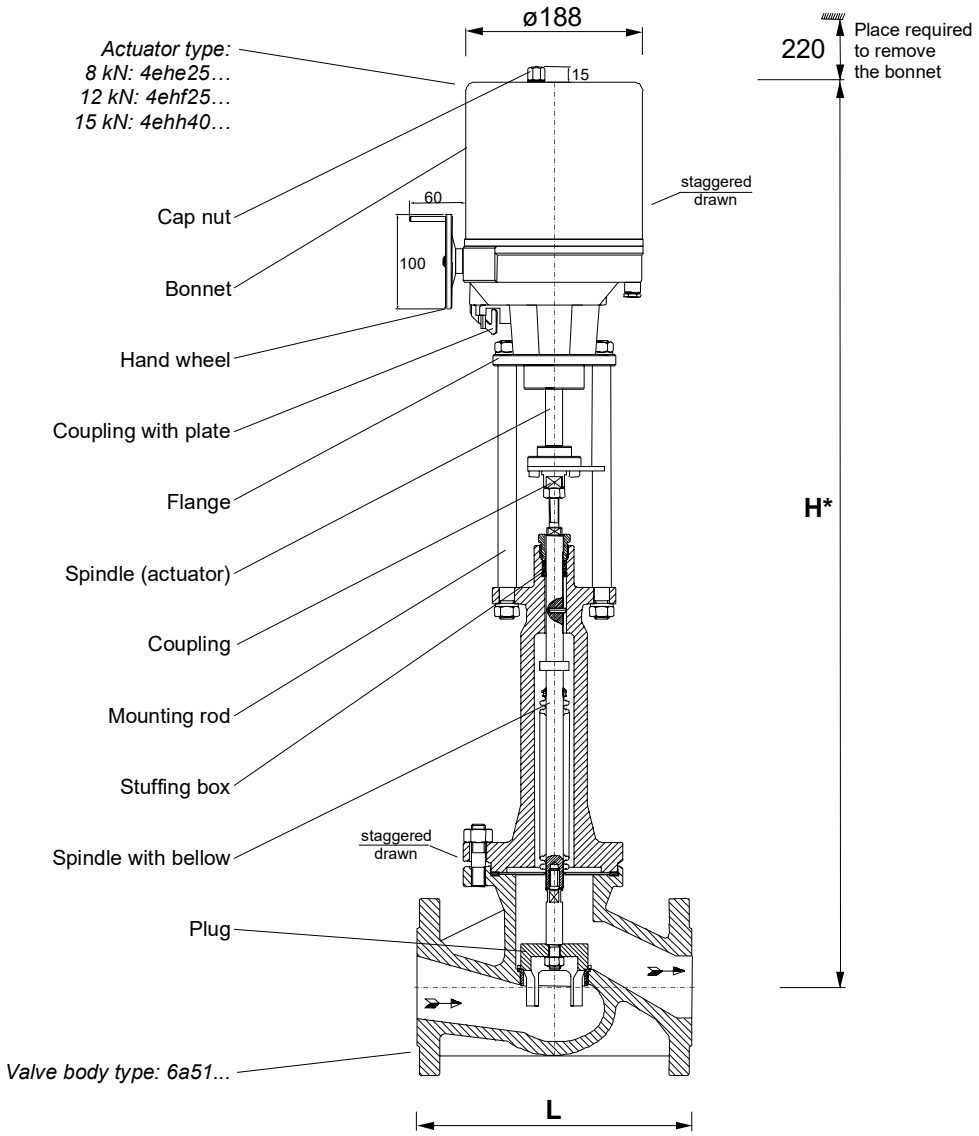
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	451 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	451 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	451 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	451 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	List-No. PN16	PN25	PN25	PN25	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure** (bar) 8kN	12kN	15kN
50	451 405He	451 505He	451 605He	451 E05He_p2	40	20	48	25,0		
	451 455He	451 555He	451 655He	451 E55He_p2	25	20	48	25,0		
	451 475He	451 575He	451 675He	451 E75He_p2	16	20	48	25,0		
65	451 406H.	451 506H.	451 606H.	451 E06H._p2	63	30	72	20,4	25,0	
	451 456H.	451 556H.	451 656H.	451 E56H._p2	40	20	48	25,0		
	451 476H.	451 576H.	451 676H.	451 E76H._p2	25	20	48	25,0		
80	451 408H.	451 508H.	451 608H.	451 E08H._p2	100	30	72	13,4	21,0	25,0
	451 458H.	451 558H.	451 658H.	451 E58H._p2	63	20	48	20,4	25,0	
	451 478H.	451 578H.	451 678H.	451 E78H._p2	40	20	48	25,0		
100	451 410H.	451 510H.	451 610H.	451 E10H._p2	150	30	72	8,4	13,3	17,0
	451 460H.	451 560H.	451 660H.	451 E60H._p2	100	30	72	20,4	25,0	
	451 480H.	451 580H.	451 680H.	451 E80H._p2	63	22	53	20,4	25,0	
125	451 412H.	451 512H.		.	230	40	96	5,2	8,4	10,8
	451 412H._140a	451 512H._140a			140	30	72	8,4	13,3	17,0
	451 412H._100a	451 512H._100a			100	30	72	13,4	21,0	26,6
150	451 415H.	451 515H.			330	40	96	3,5	5,7	7,4
	451 415H._250a	451 515H._250a			250	40	96	5,2	8,4	10,8
	451 415H._150a	451 515H._150a			150	30	72	8,4	13,3	17,0

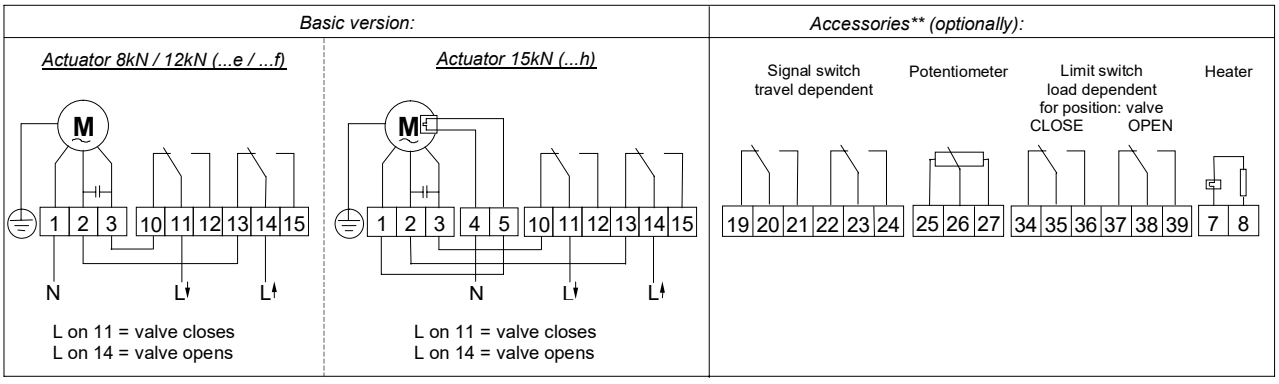
*** = higher closing pressures on request, DN200: see page 451420Hf/h/i/k, DN>200 on request*



DN	50	65	80	100	125	150
Height H*	793	923	924	931	1033	1048
Length L	230	290	310	350	400	480
Weight kg	22	39	46	56	103	123

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

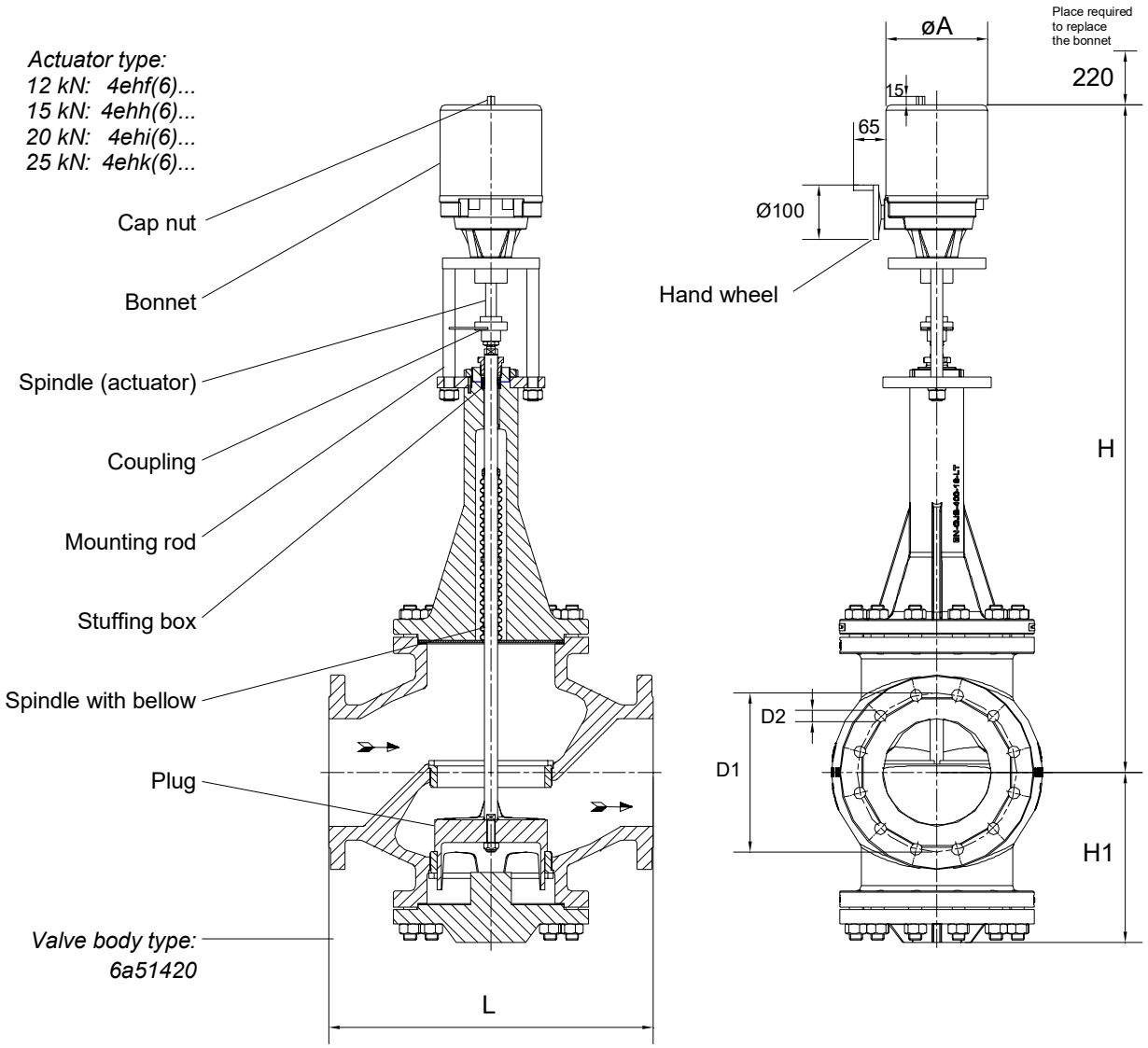
Order text:
Motor control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 630
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 451 420 H . , accessories . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No. PN 16	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 12 kN	15kN	20kN	25kN
200	451 420Hf	630	60	72	3,1			
200	451 420Hh	630	60	90		4,0		
200	451 420Hi	630	60	72			5,6	
200	451 420Hk	630	60	72				7,1

** higher closing pressure on request*



Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	1240	1315
Length H1	315	315
Length L	600	600
Weight kg	310	315
Diameter A	188	216

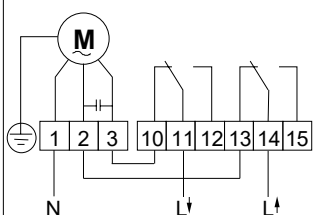
Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz*:*

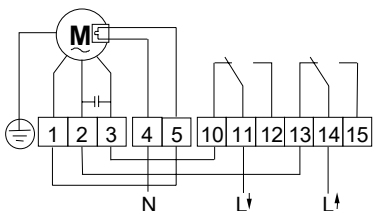
Basic version:

Actuator 12kN (...f)



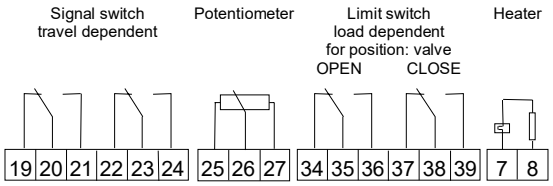
L on 11 = valve opens
L on 14 = valve closes

Actuator 15-25kN (...h, ...i, ...k)



L on 11 = valve opens
L on 14 = valve closes

Accessories (optionally):*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in three way form with bellow sealing, DN15-150 PN 16 / 25



Body: three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
5500 N / 28 VA (appendix ...d)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 461 **4** . . , PN25: 461 **5** . . , PN25: 461 **6** . . , PN25: 461 **E** . ._p2
Accessories: . . .

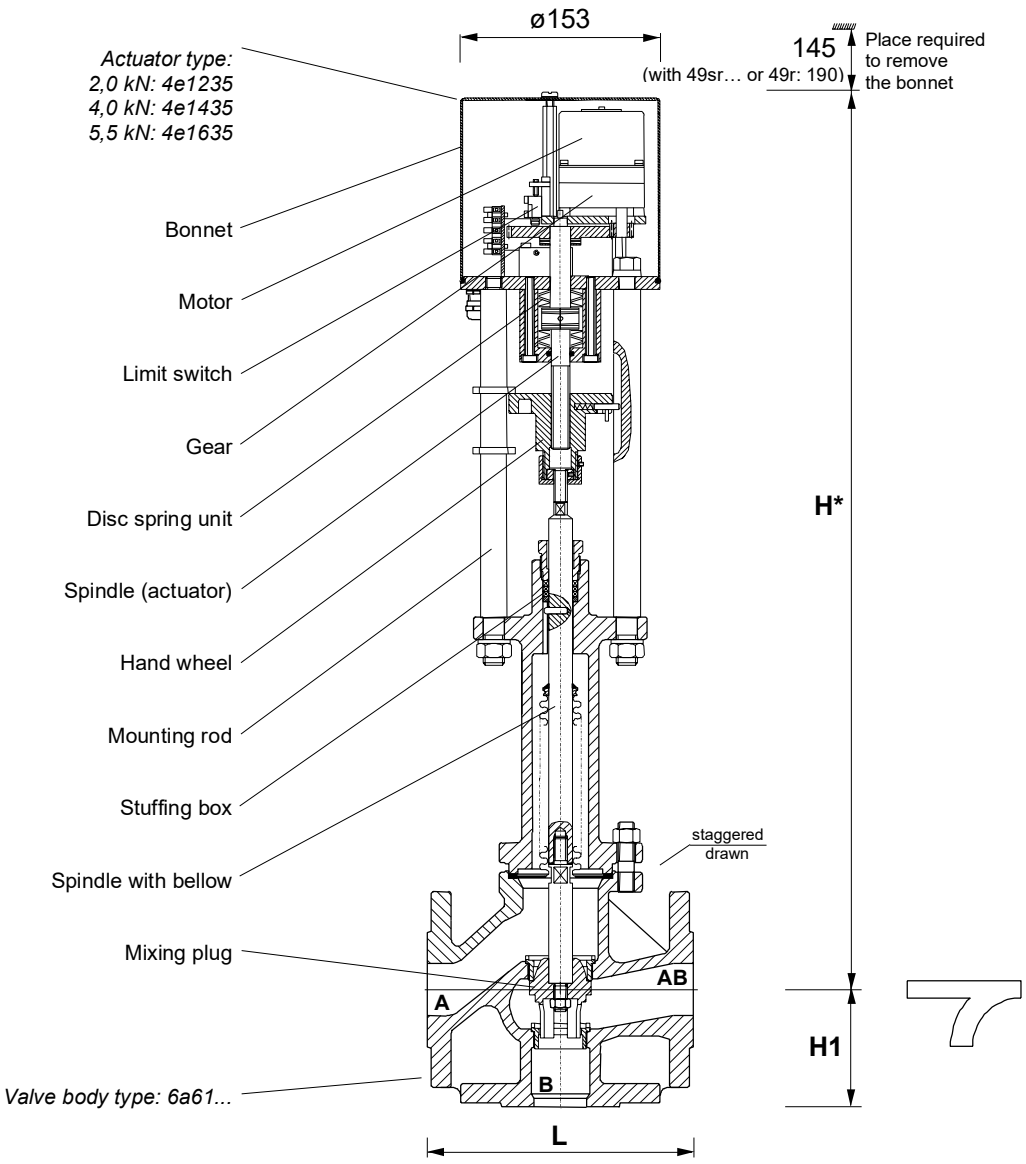
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	461 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	461 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	461 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	461 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	PN25	PN25	m³/h	mm	sec	2000N	4000N	5500N
15	461 400	461 500	461 600	461 E00_p2	4	20	66	25,0		
20	461 401	461 501	461 601	461 E01_p2	6,3	20	66	25,0		
25	461 402	461 502	461 602	461 E02_p2	10	20	66	25,0		
32	461 403.	461 503.	461 603.	461 E03._p2	16	20	66	17,3	25,0	
40	461 404.	461 504.	461 604.	461 E04._p2	25	20	66	10,8	25,0	
50	461 405.	461 505.	461 605.	461 E05._p2	40	20	66	6,6	16,0	23,0
65	461 406.	461 506.	461 606.	461 E06._p2	63	30	99	3,4	9,1	13,3
80	461 408.	461 508.	461 608.	461 E08._p2	100	30	99	2,0	5,8	8,6
100	461 410.	461 510.	461 610.	461 E10._p2	150	30	99	1,1	3,5	5,4
125	461 412.	461 512.			230	35	116		2,1	3,3
150	461 415.				330	38	126		1,3	2,1

*** = higher closing pressures on request, DN200: see page 461420Hf/h/i/k, DN>200 on request*

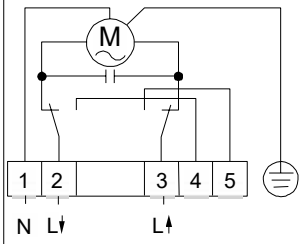


DN	15	20	25	32	40	50	65	80	100	125	150
Height H*	661	675	669	676	681	683	813	814	821	924	940
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	16	17	18	21	22	25	44	48	62	116	137

** = add. 45mm for actuators with positioner 49sr… or controller 49r*

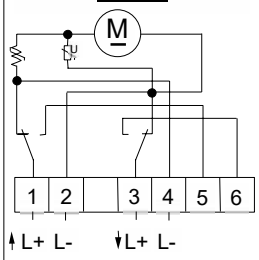
Basic version:

230/115/24 V 50...60 Hz



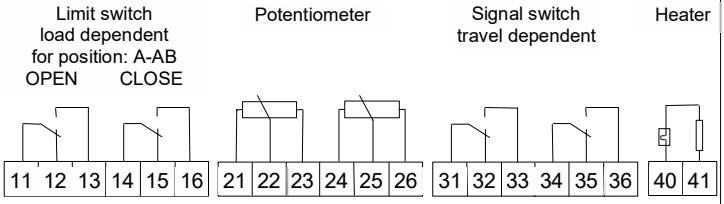
L on 2 = A-AB opens
L on 3 = A-AB closes

24 V DC



24V on 1/2 = A-AB closes
24V on 3/4 = A-AB opens

*Accessories** (optionally):*



*** = for actuators with positioner 49sr… or controller 49r see electrical wiring on page 49sr… or 49r*

Motor control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 630
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 461 420H . , accessories . . .

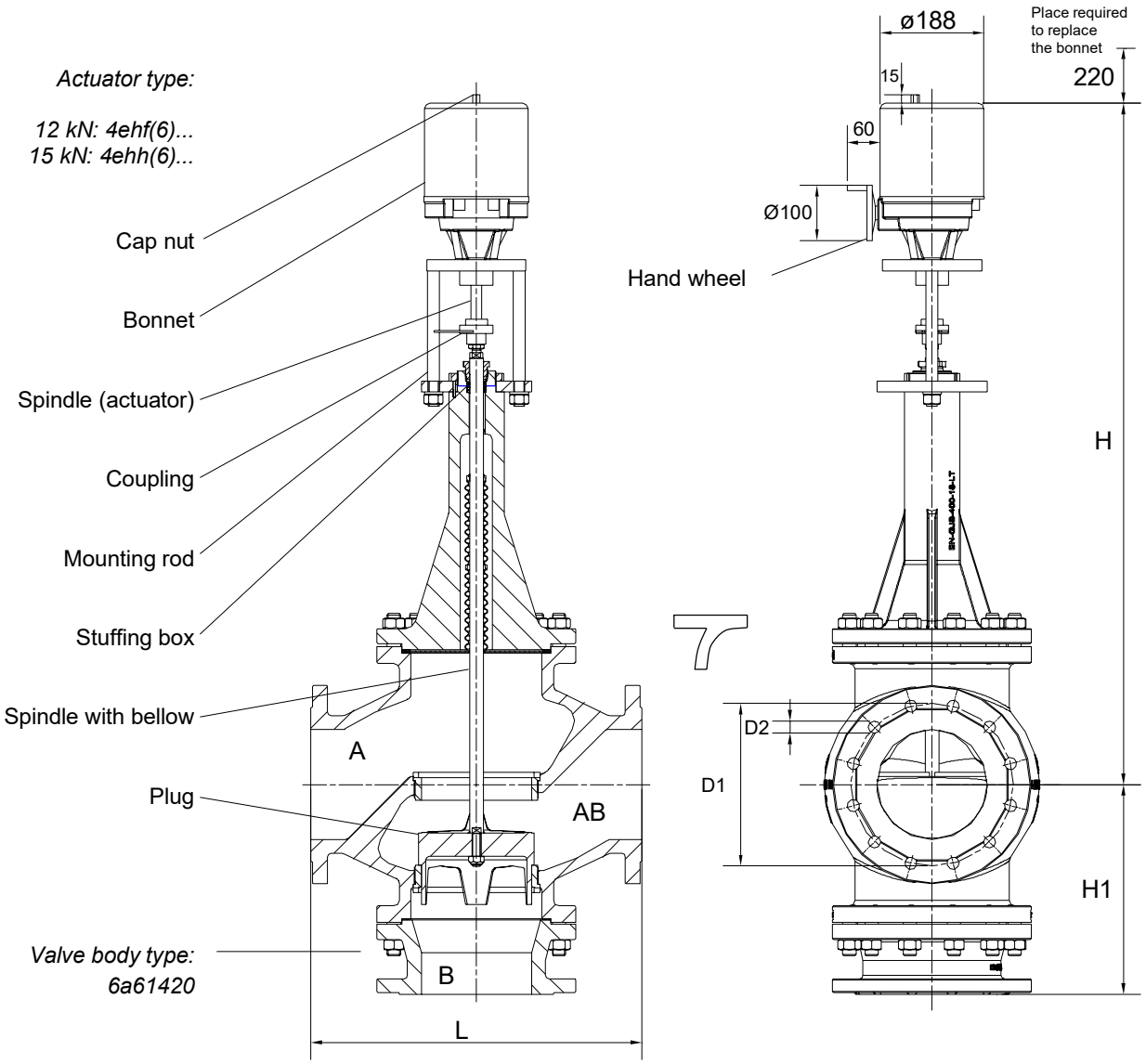
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure*** (bar) 12 kN	15kN
200	461 420Hf	630	60	72	3,1	
200	461 420Hh	630	60	90		4,0

** higher closing pressure on request*

Motor control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16



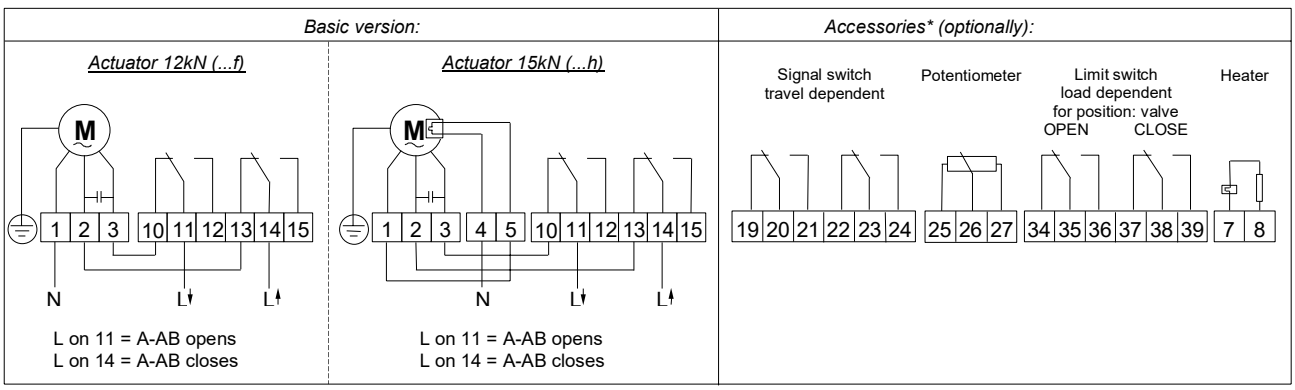
Dimensions

DN	200
Height H	1240
Stud length H1	380
Length L	600
Weight kg	325

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve for diverting function three way form with bellow sealing, DN32-150 PN 16 / 25



Body: three way form
Version with diverting plug, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
5500 N / 28 VA (appendix ...d)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 462 **4** . . , PN25: 462 **5** . . , PN25: 462 **6** . . , PN25: 462 **E** . ._p2
Accessories: . . .

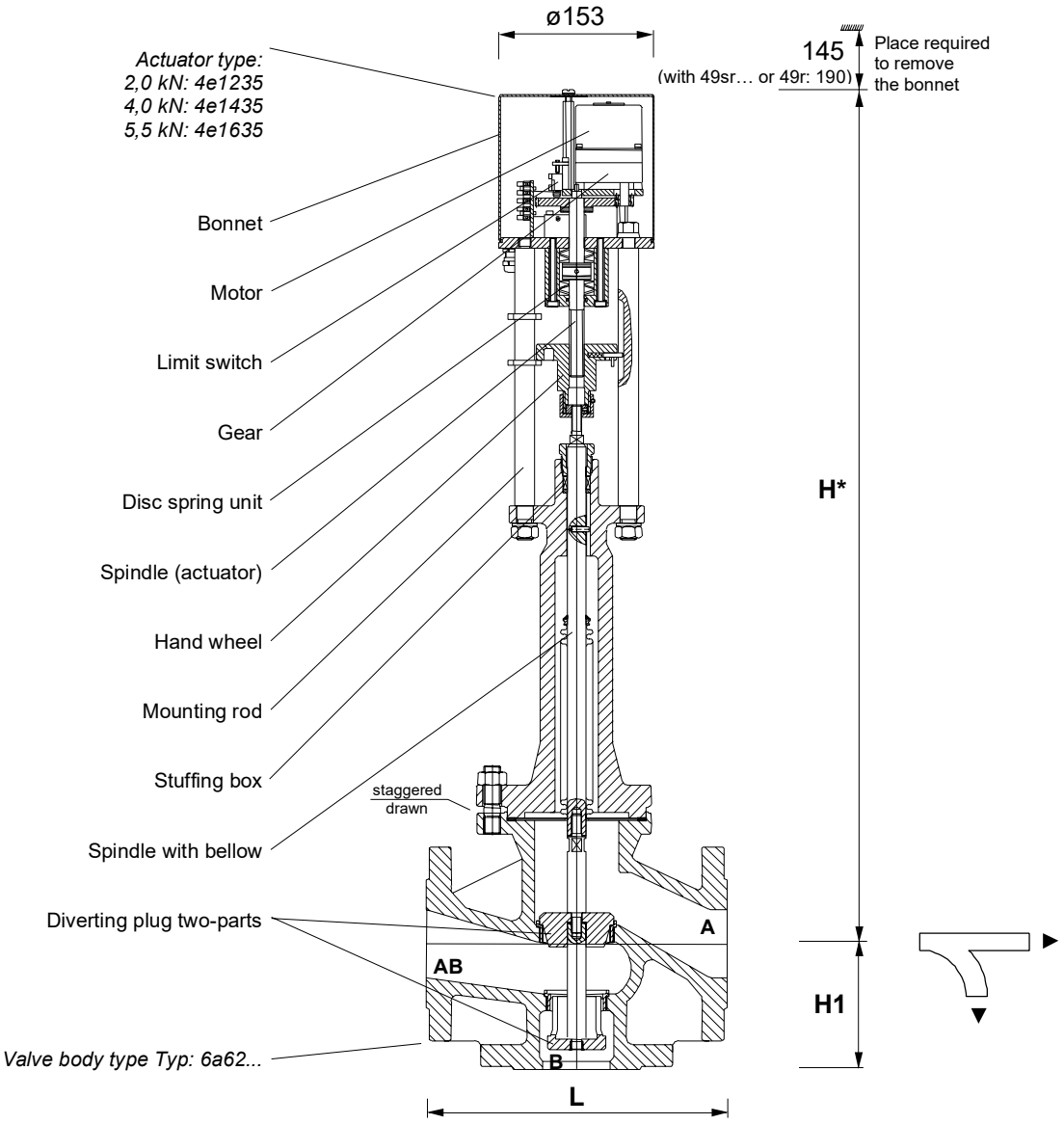
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	462 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	462 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	462 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	462 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	PN25	PN25	m³/h	mm	sec	2000N	4000N	5500N
32	462 403.	462 503.	462 603.	462 E03._p2	12	20	66	17,3	25,0	
40	462 404.	462 504.	462 604.	462 E04._p2	20	20	66	10,8	25,0	
50	462 405.	462 505.	462 605.	462 E05._p2	27	20	66	6,6	16,0	23,0
65	462 406.	462 506.	462 606.	462 E06._p2	50	30	99	3,4	9,1	13,3
80	462 408.	462 508.	462 608.	462 E08._p2	83	30	99	2,0	5,8	8,6
100	462 410.	462 510.	462 610.	462 E10._p2	123	30	99	1,1	3,5	5,4
125	462 412.	462 512.			190	35	116		3,5	5,4
150	462 415.				250	35	116		2,3	3,6

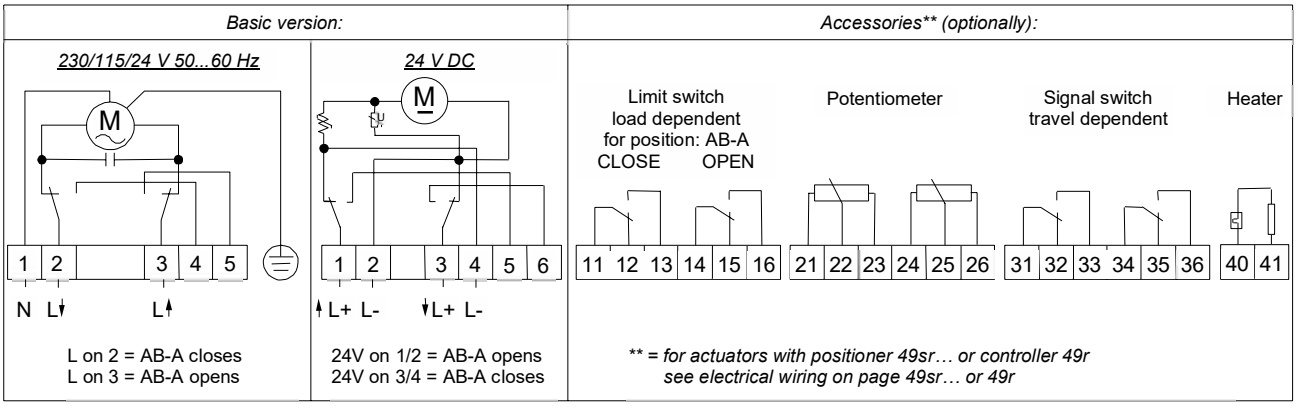
*** = higher closing pressure see page 462He/f/h, DN200: see page 462420Hf/h/i/k, DN>200 on request*



DN	32	40	50	65	80	100	125	150
Heigth H*	676	681	683	813	814	821	924	940
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	22	23	26	43	47	59	115	135

** = add. 45mm for actuators with positioner 49sr… or controller 49r*

Electrical wiring:



Motor control valve for diverting function with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with diverting plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs



Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

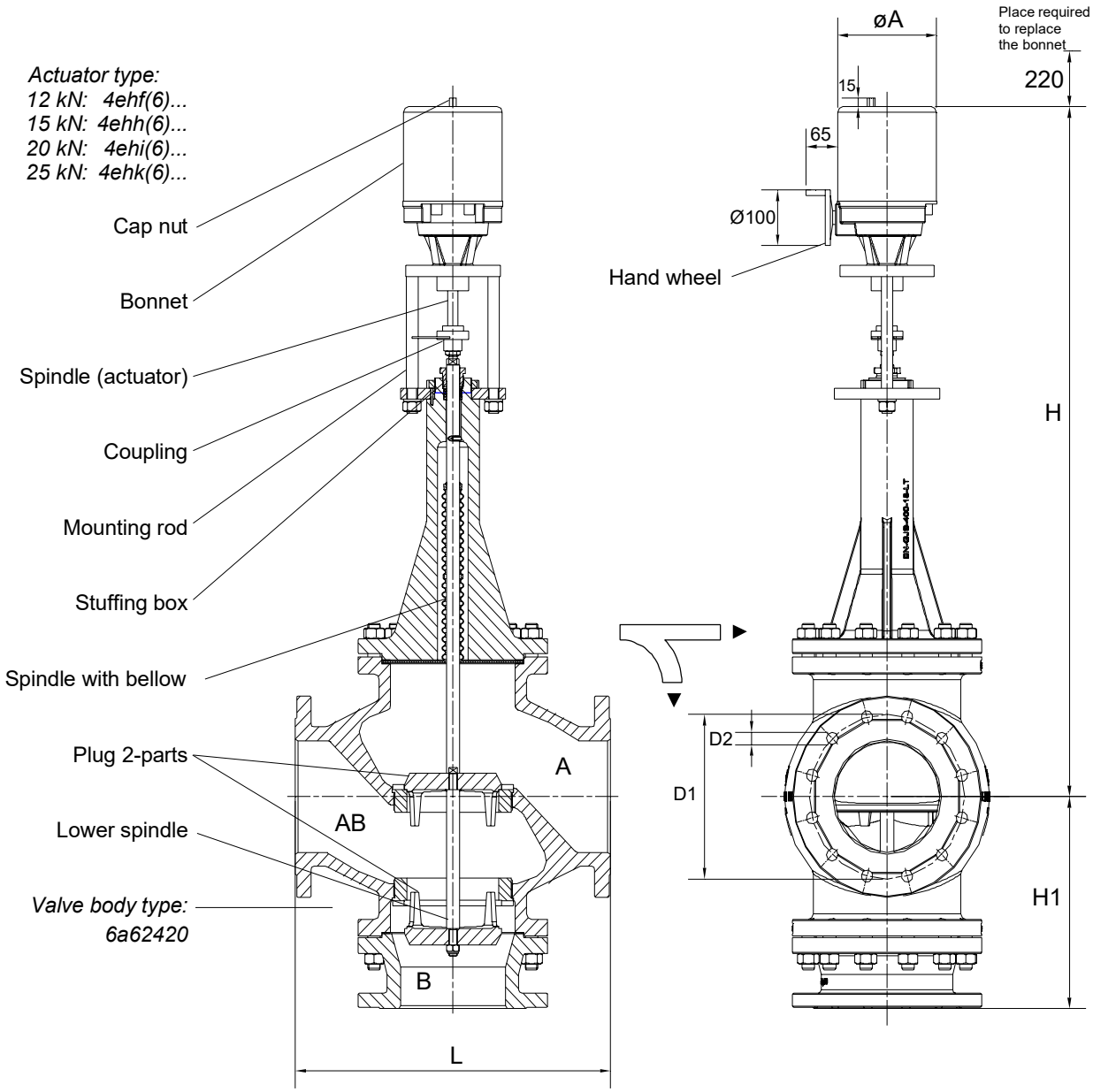
Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 470
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 462 420H . , accessories . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No. PN 16	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 12 kN	15kN	20kN	25kN
200	462 420Hf	470	50	60	4,1			
200	462 420Hh	470	50	75		5,3		
200	462 420Hi	470	50	60			7,4	
200	462 420Hk	470	50	60				9,4

** higher closing pressure on request*



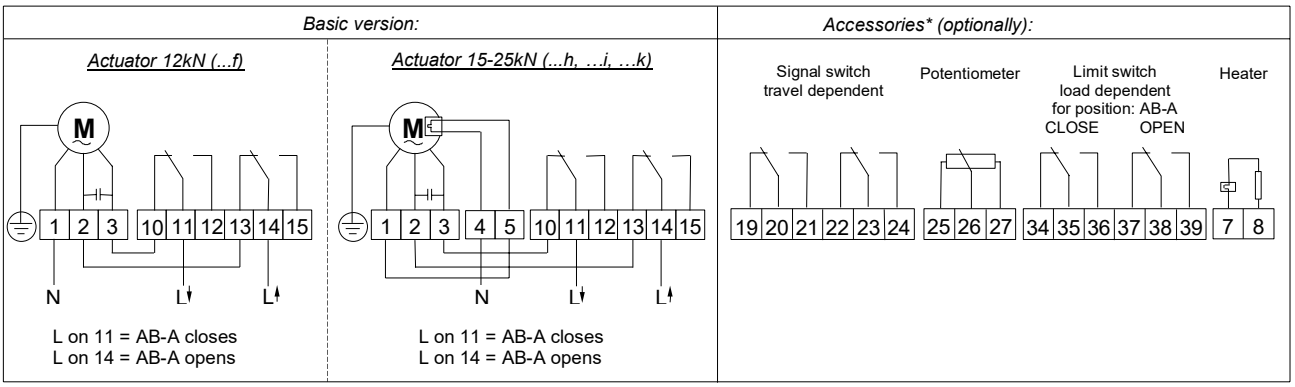
Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	1240	1315
Length H1	380	380
Length L	600	600
Weight kg	325	330
Diameter A	188	216

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”

Body: Bronze CC491K (Rg5)
for water 0...130°C
Internal thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron
optionally of bronze
Pressure range: PN16
Spindle sealing: EPDM-O-ring
Plug: brass CW614N
Spindle: stainless steel 1.4122
Flow characteristic: A-AB equal percentage
B-AB linear
Positioning ratio: DN15: 50:1
DN20-50: 100:1
Leakage: EN1349 – seat leakage VI G 1 (tight sealing)



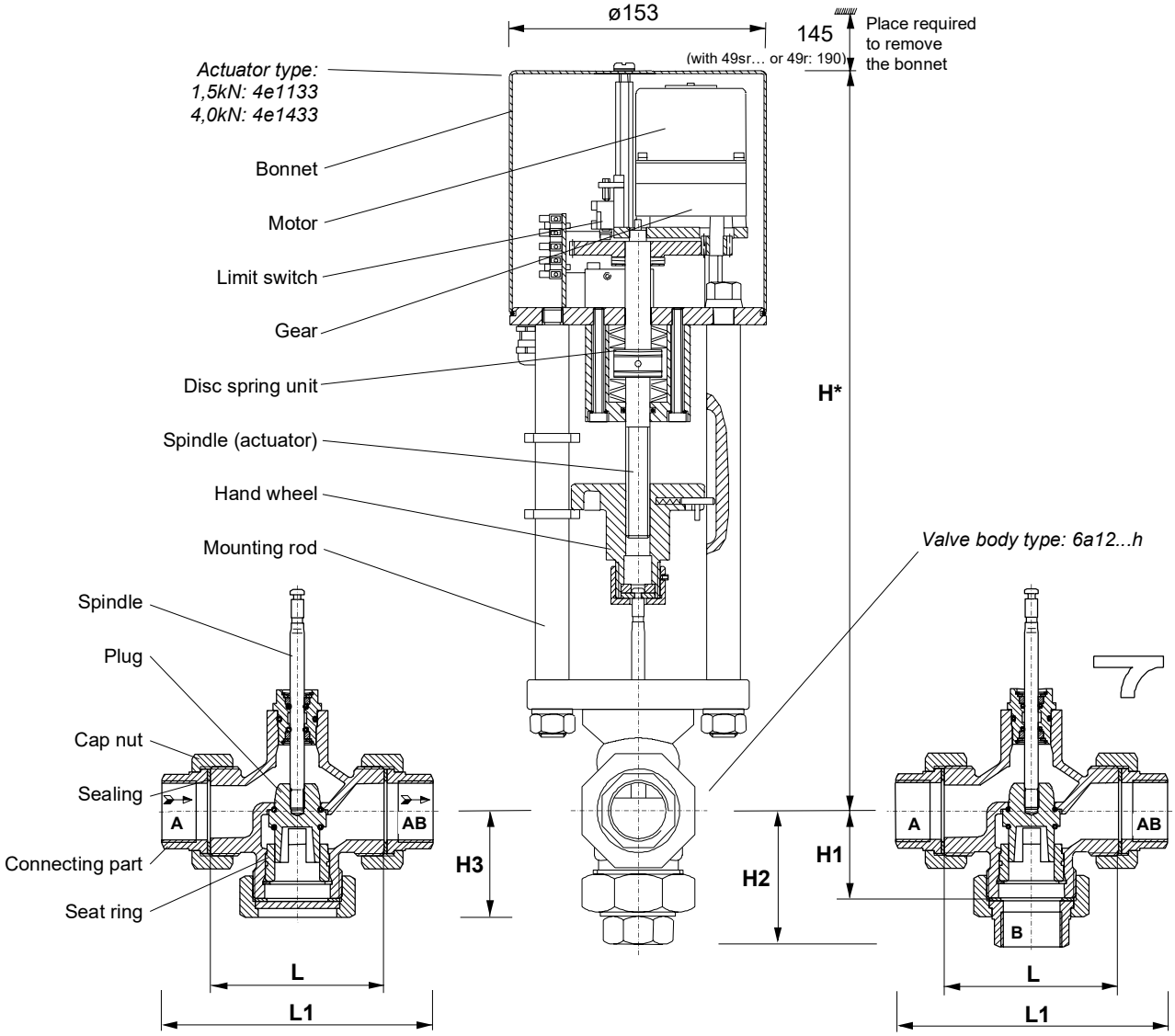
Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)

Order text:
Motor control valve in two way / three way form
Bronze CC491K, PN 16, DN . ., Kvs . . .
Spindle sealing with O-Ring
Power supply . . ., closing pressure . . . bar
List-No.: two way form: 481 **2** . . . , three way form: 481 **3** . . .
Accessories: . . .

DN	List-No. 2-way	List-No. 3-way	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure (bar) 1500N	4000N
1/2"	4812 100	4813 100	4	12	40	16,0	
3/4"	4812 101	4813 101	6,3	12	40	16,0	
1"	4812 102	4813 102	10	14	47	16,0	
1 1/4"	4812 103.	4813 103.	16	14	47	11,8	16,0
1 1/2"	4812 104.	4813 104.	25	14	47	7,2	16,0
2"	4812 105.	4813 105.	40	14	47	4,2	16,0

Motor control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”



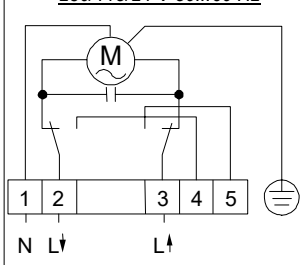
DN	1/2”	3/4”	1”	1 1/4”	1 1/2”	2”
Height H *	390	393	396	405	408	408
Length L	62	75	80	120	130	150
Length ~L1	114	127	138	184	198	222
Stud length H1	40	41	45	55	60	65
Stud length ~H2	66	67	74	89	94	101
Stud length ~H3	48	53	57	68	73	78
Weight kg	7,7	8,2	8,5	9,2	9,8	11,4

** = add. 45mm for actuators with positioner 49sr… or controller 49r*

Electrical wiring:

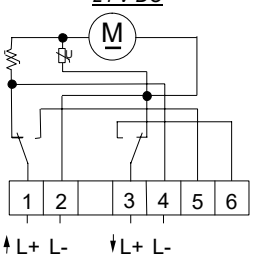
Basic version:

230/115/24 V 50...60 Hz



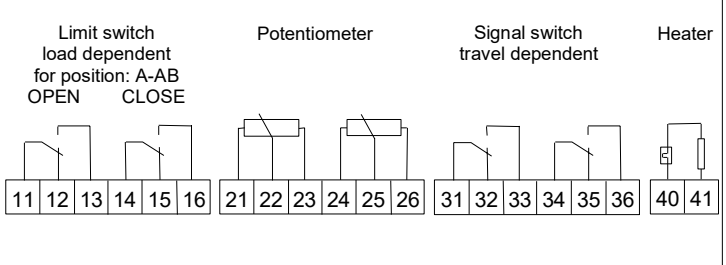
L on 2 = A-AB opens
L on 3 = A-AB closes

24 V DC



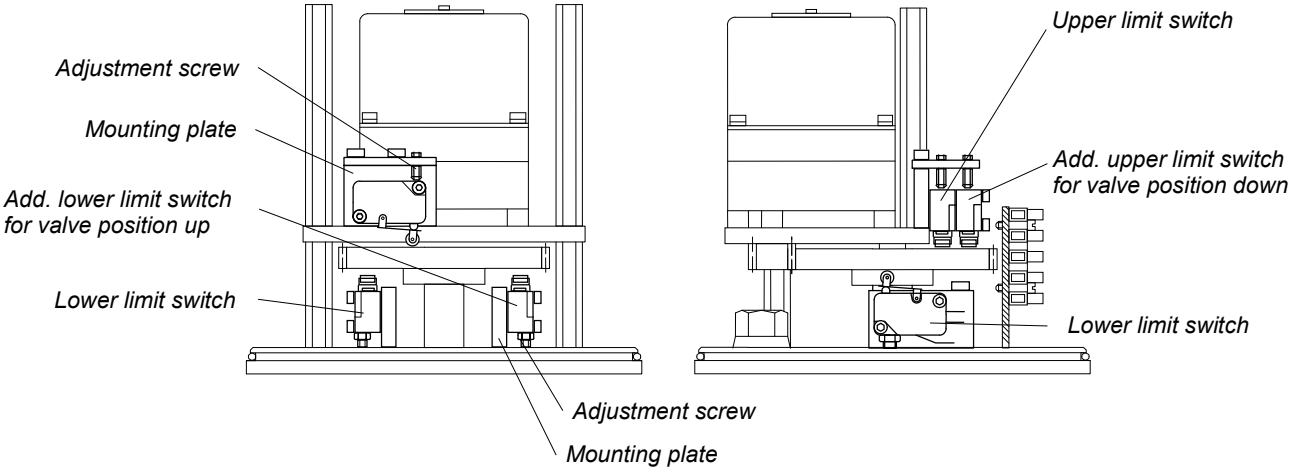
24V on 1/2 = A-AB closes
24V on 3/4 = A-AB opens

*Accessories*** (optionally):*

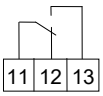


**** = for actuators with positioner 49sr… or controller 49r*
see electrical wiring on page 49sr… or 49r

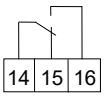
Electric actuators type 4e1 can be equipped with an additional load dependent limit switch for valve position up and down. The zero-potential change-over switches have a contact rating of 250V / 2A.



Additional Terminals:



Switch for valve position down

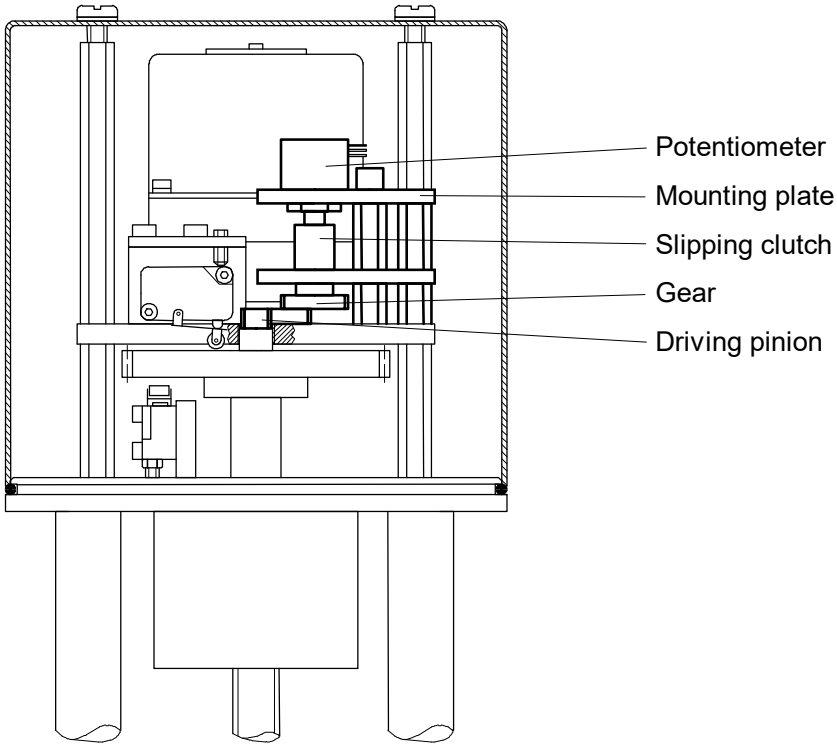


Switch for valve position up

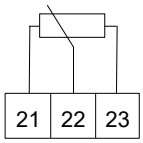
Electric actuators type 4e1… can be equipped with a potentiometer for position feedback.

The potentiometer is connected to the actuator by a slipping clutch. This effects an auto-adjustment after each manual operation and prevents damages by exceeding of the end position.

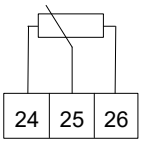
Attention! The potentiometer has to be readjusted after each manual operation with hand wheel. To readjust the potentiometer, the actuator has to be driven electrically in both end positions.



Additional terminals:



Potentiometer 1

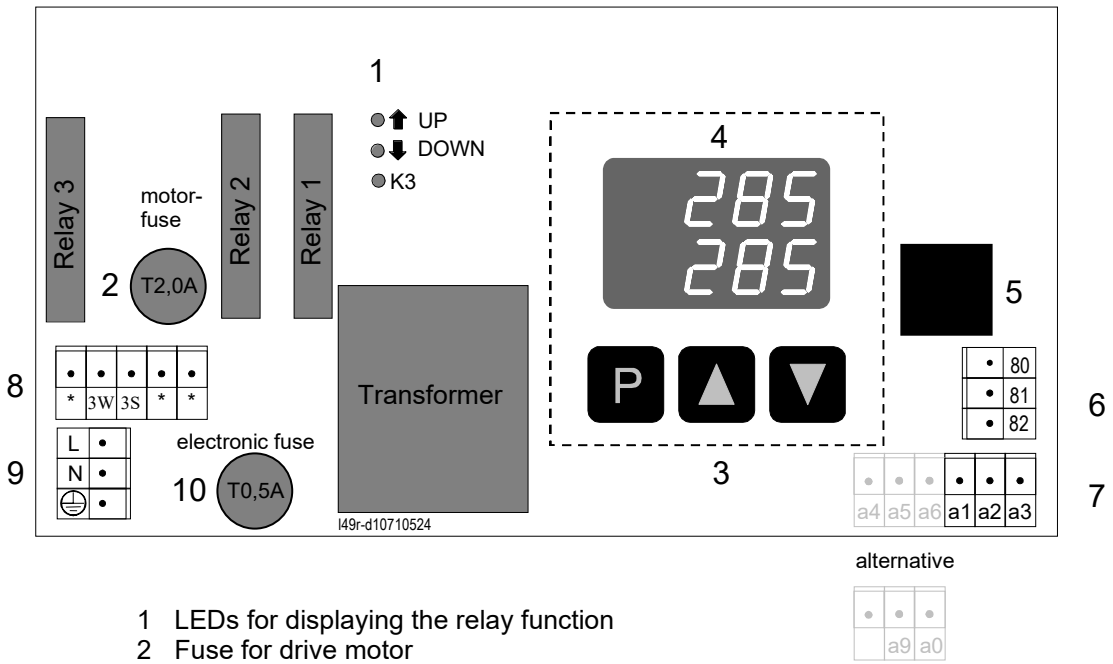


Potentiometer 2

Type summary:

49f	**x**	**x**	**x**	
			2	Double potentiometer
		1		100 Ohm
		2		200 Ohm
		5		500 Ohm
		0		1000 Ohm *
	1			Stroke 15 mm
	2			Stroke 20 mm
	3			Stroke 30/35 mm
	4			Stroke 40 mm

** default value: standard potentiometer 1000 Ohm*



1 LEDs for displaying the relay function
2 Fuse for drive motor
3 Operating keys for set values and parameters
4 Digital displays for actual value and second display value (if active)
5 Connection for interface or external operating unit
6 Connector plug for signal output (option)
7 Connector plug for measuring inputs
8 Connector plug for additional switching contact K3 (optionally) and actuator*
9 Connector plug for mains voltage
10 Fuse for electronic
*= internal wiring

Description

The KFM 49r is a series of microcomputer-based industrial regulators intended for mounting directly into actuator drives. The entire control loop is very compact once the sensor has been connected.

All versions can conveniently be operated, parameterised and configured through the interface.
Depending on the version, an operating and display unit or a potentiometer is included for specifying the set value and adjusting the parameters.

Alternatively it is possible to connect a mobile display and operating unit instead of the interface adapter.

Type summary	**Li.no.**
Basic version for external operation (operating unit or PC)	**49r700**
Basic version with operating and display unit	**49r70d**
Basic version with potentiometer operation	**49r70p**
Additional fittings:	
special voltage (without = 100-250V AC, 02=24V AC, 08=24V DC)	**49r7..__**
With additional, freely configurable switch contact (only 100-250V AV version)	**49r71**...
With signal outputs 0/4...20mA / 0/2...10V	**49r7..o.**
With RS485 interface, KFM 2.0 protocol	**49r7...s**
With Profibus DP interface	**49r7...p**
Mobile display and operating unit	**49sr59z**
Measuring inputs	**type suffix**
Pt100 DIN, 0...400°C	**none**
standard signal 0(4)...20mA, 0(2)...10V	**…e.**
Optional: additional input for position feedback	

Technical data:

Input*:	0 / 4...20 mA or 0 / 2...10 V Pt 100 DIN Remote resistance sensor 0 ... 100 - 1000 Ohm Other values optional
Output*:	3 relays, 230V max. 2 A 0 / 4...20mA for signal output, 500 Ohm load
Status indicator:	2 digital displays 2 LEDs for function display relay 1 and 2
Optional interfaces:	RS 485 / KFM 2.0 protocol, Profibus DP, others **= depending on the particular model*

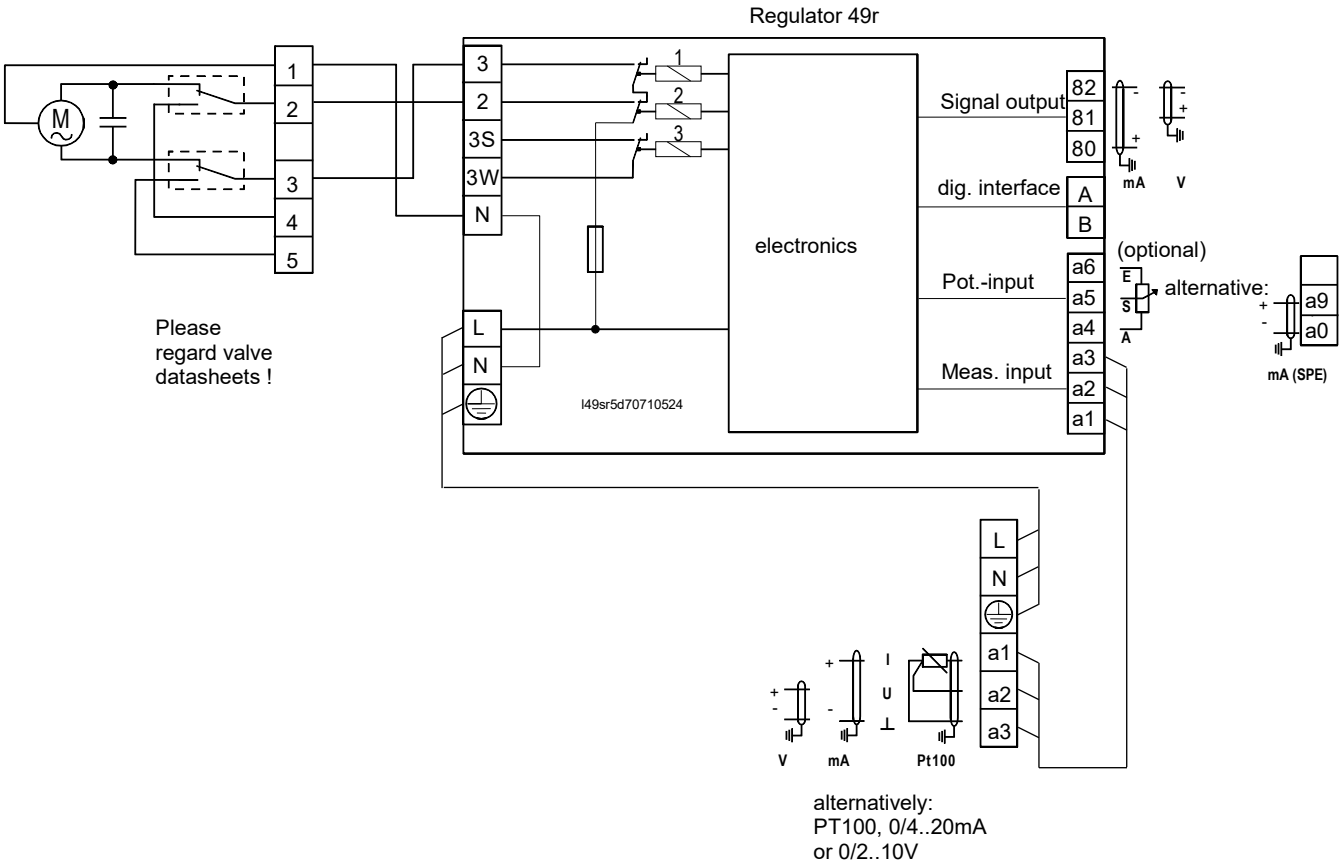
Other operating data:

Mains connection:	230V +/- 10 %,48...62Hz,approx.3VA alt.115 V,other voltages by request
Permissible ambient temp.:	0...60°C, nominal temperature 20 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation,
Interference emission/immunity:	In accordance with EN 61326, industrial requirements

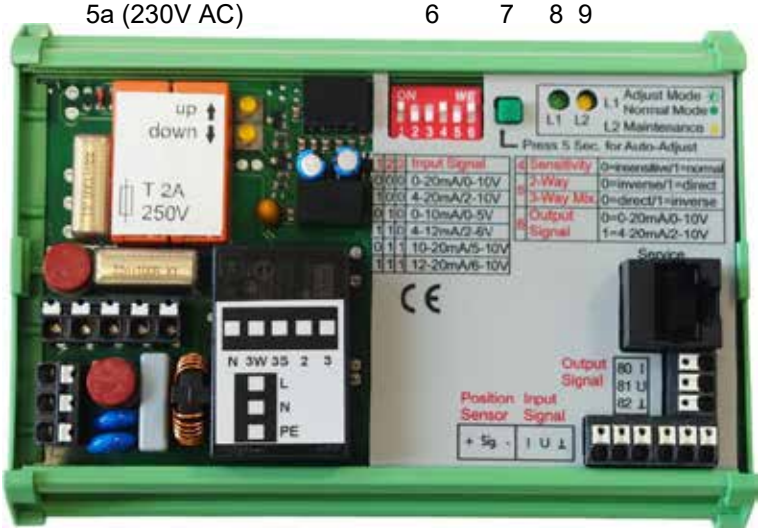
Characteristic values *(depending on type and version):*
Set in parameter level. Factory preset if desired.

Proportional range Xp:	0,1...999,9 %
Integral action time Tn:	0.0...999.9 min
Derivative action time Tv:	0.0...99.9 min
Response sensitivity Xsh:	0,1...1,0 %
Motor run time Tm:	6...600 sec
Characteristic curve change.:	direct / inverse
Switching point diff.SA (add.contact):	0..100.0 K
Switching difference Sd:	0.1...100.0 K

Connection and block diagram: Variant showing maximum configuration; some connections may not be available, depending on the version. The actual connection diagram (as supplied) is shown on the respective device.







1 connection mains voltage*
2 fuses for electronics
3 connection limit switch and drive motor*
4 fuse for drive motor
5a relays with status LEDs
5b ditto, but changeable relays (24V DC only)
6 coding switch for input and output section, direction of action and sensitivity
7 button for start of automatic travel adjustment
8 status LED L1
9 maintenance LED L2
10 connection for service interface, external operating unit
11 connection signal output
12 connection for position signal *
13 connection drive signal*
* =internal wiring

Description

The positioner turns an incoming drive signal into the correct drive position by comparing the signal with the position feedback of a sensor which is installed in the drive and adjusting the drive with the up and down relays. There is a signal for travel feedback 0/4..20 mA / 0/2..10 V by default. Optionally, an additional contact relative to the actuator position is possible, e.g. to limit the valve stroke to a min. or max. opening degree.

The device is integrated in the actuator without operation and normally also maintenance-free. In case of special operating conditions (very frequent switching, unfavorable optimization), the relays can be replaced, e.g. in case of wear or stuck contacts (24V DC version only). All important basic settings for direction of action and sensitivity are specified by way of the coding switches. Communication with leading systems is also possible via bus adapter, e.g. for Profinet KFM item nr. 99spne.., for data acquisition or remote maintenance purposes as well as for the execution of digital positioning commands.

The commission (if necessary, please refer page 3) consists merely of a check of the settings and a single operation of the calibration key. After this LED L1 will show if the automatic adjustment of the final positions is finished. Subsequently the device is ready for use.

Predictive Maintenance:

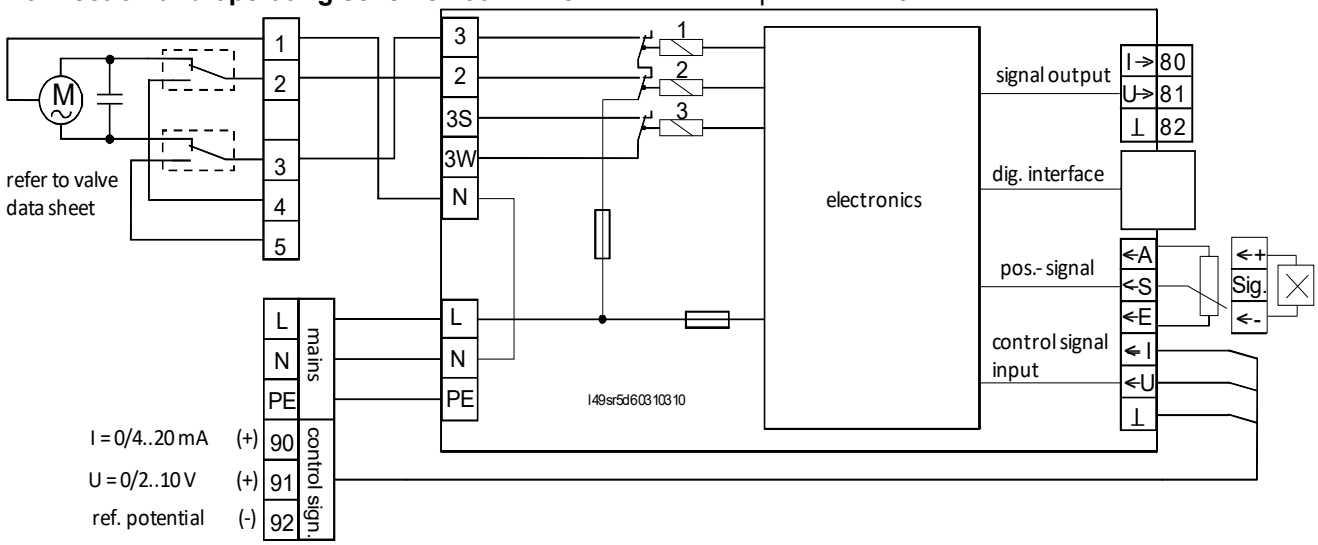
For predictive maintenance of the actuator, a signal is output by LED L2 if the previous use of relays (switching operations) or of the spring assembly (approach of the end positions) requires a check of the drive.
The wear status of the actuator can be read with the PC software PKS at any time, as well as the history of setpoint, actual value and drive position which are saved in the integrated datalogger.

Type list	**Li.Nr.**
Basic model with non- contact transmitter	**49sr7..h**
Extras:	
Special voltage (1=115 V AC, 2=24V AC, 8=24V DC), others on request	**49sr7_ ..**
Additional contact (Relays, potential free NO contact 250V, 2A)	**49sr7..1**

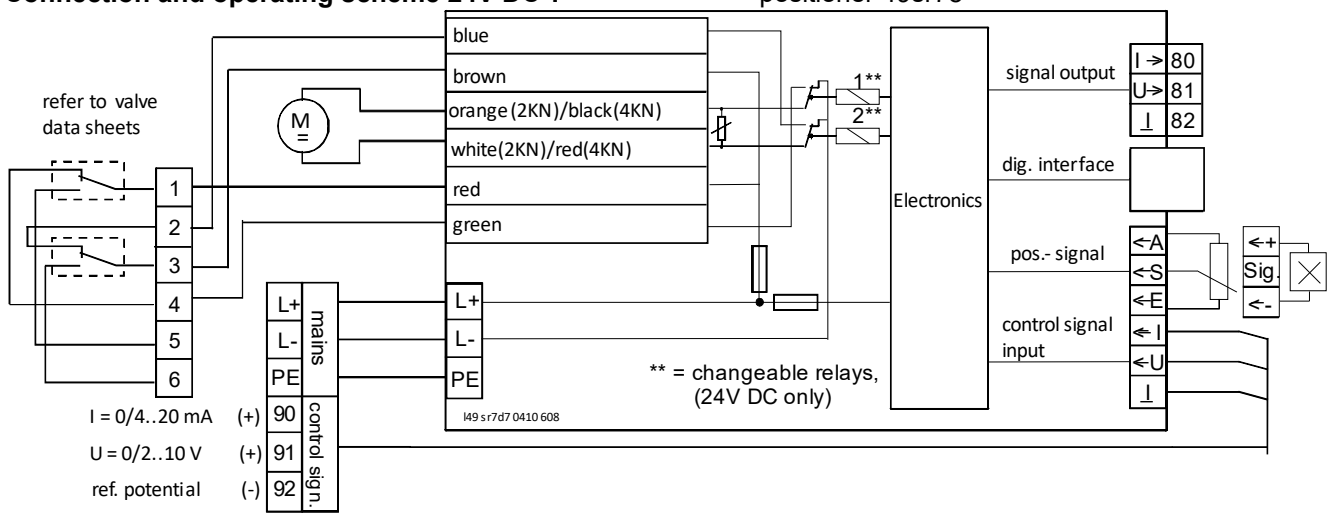
Technical data:

Input (adjustable):	0...20mA / 0...10V 4...20mA / 2...10V 0...10mA / 0...5V 4...12mA / 2...6V 10...20mA / 5...10V 12...20mA / 6...10V
Response sensitivity:	switchable normal / reduced
Output:	up to 3 relays, max. 250V , 2 A (Fuse protection 24V DC: T 1,6A) 0/4...20mA for position feedback, load < 500 Ohm, 0/2...10 V, load > 500 Ohm
Direction of action:	adjustable: *direct*: increasing input signal opens (straight) passage *inverse*: increasing input signal closes (straight) passage
Operating display:	2 status LEDs for adjustment, normal operation, error and maintenance 2 (3) LEDs for function display relays 1 and 2 (3)
Mains connection:	230V +/- 10 %, 48...62Hz, approx. 3VA alternative 115V/24V AC or 24V DC, other voltages on request
Interface:	service interface KFM 2.0 RJ45 (socket)
Allowed ambient temperature:	0...60°C, nominal temperature 20°C

Connection and operating scheme 230V / 115V / 24V AC*: positioner 49sr7



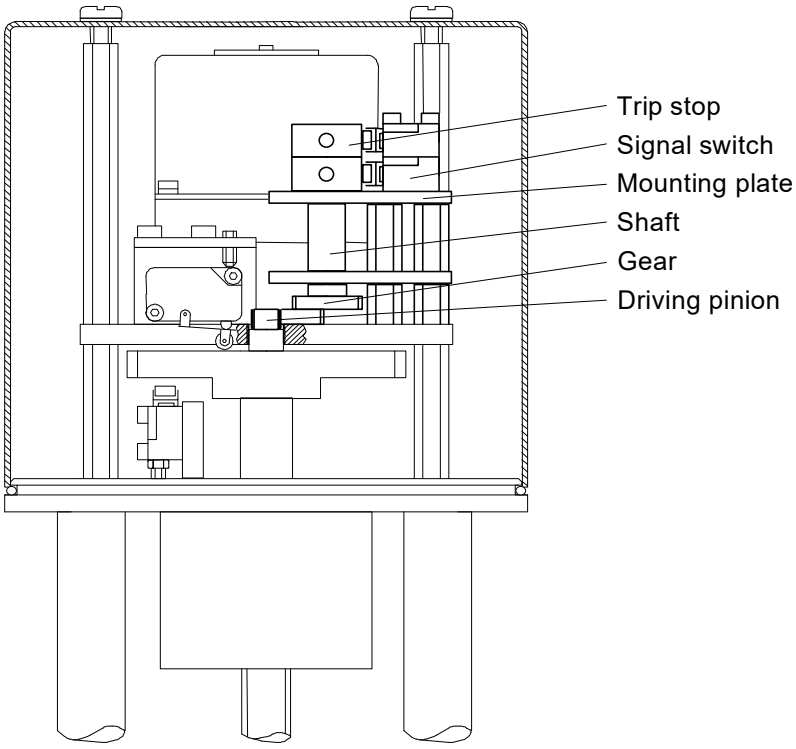
Connection and operating scheme 24V DC*: positioner 49sr78



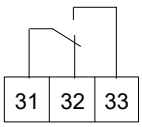
* maximum version, some connections may not exist depending on version. Decisive for the delivered version is the connection diagram on the device.
Hint: Control signals must be shielded, maximum cable length 30 meters.

Electric actuators type 4e1... can be equipped with 1 or 2 additional travel dependent switches.
The zero-potential change over switches have a contact rating of 250V / 2A (ohmic load).

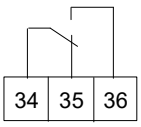
Attention! The signal switches have to be readjusted after each manual operation with hand wheel.



Additional terminals:



Signal switch 1



Signal switch 2

Type summary:

49w	**x**	**x**	
		2	2 travel dependent signal switches
	1		Stroke 15 mm
	2		Stroke 20 mm
	3		Stroke 30/35 mm
	4		Stroke 40 mm

Technical data:

Thrust:	1500 N / 2000 N / 4000 N / 5500 N
Power input:	12 VA / 12 VA / 26 VA / 26 VA
Stroke:	41 mm
alternatively:	51 und 65 mm (on request)
Limit switches:	1 changeover switch for each end position load dependent, rating 250V / 2A
Positioning time:	3,3 s/mm
alternatively:	2,2 s/mm (option 49t12)
Controlling:	with 3-point step controller
alternatively:	4...20 mA / 0...10 V (option 49sr…)
Power supply:	230V / 50...60Hz
alternatively:	115V / 50...60Hz (option 49u1) 24V / 50...60Hz (option 49u2) 24V DC (option 49u8)
Protection class:	IP 65
Manual emergency operation:	with hand wheel
Mounting position:	vertical to horizontal
Max. ambient temperature	-15...60° C
Weight:	7 kg



Accessories, special types**:**
Add. limit switches load dependent (see page 49ev)
Add. signal switches travel dependent for max. 40mm stroke (see page 49w)
Feedback potentiometer for max. 40mm stroke (see page 49f)
Integrated positioner for max. 40mm stroke (see page 49sr…)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V for max. 40mm stroke
Actuator heater (on request)
Other positioning speed (on request)

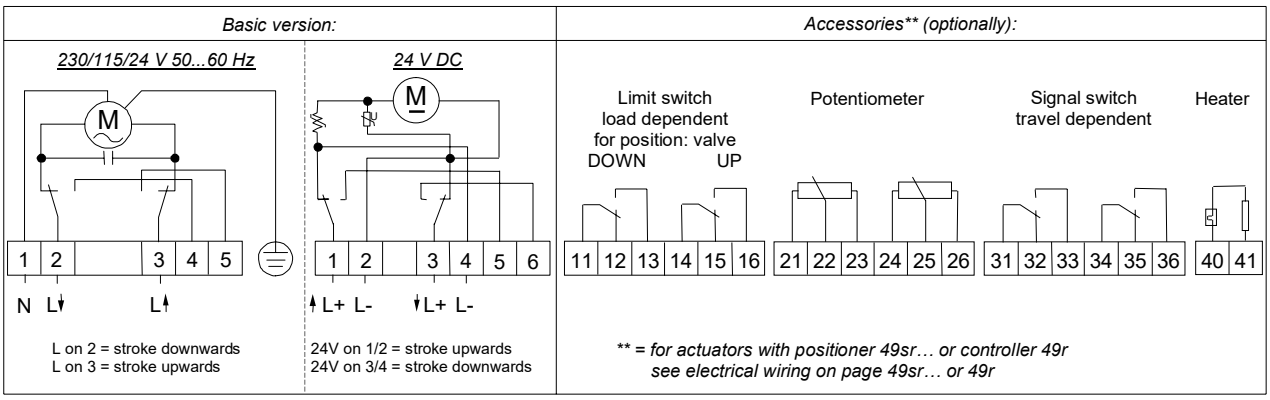
Order text:
Electrical actuator for stroke . . . mm, thrust . . . N
Power supply . . ., positioning time . . . s/mm
Mounting rods . . . mm
List-No. 4e1 . . .
Accessories: . . .

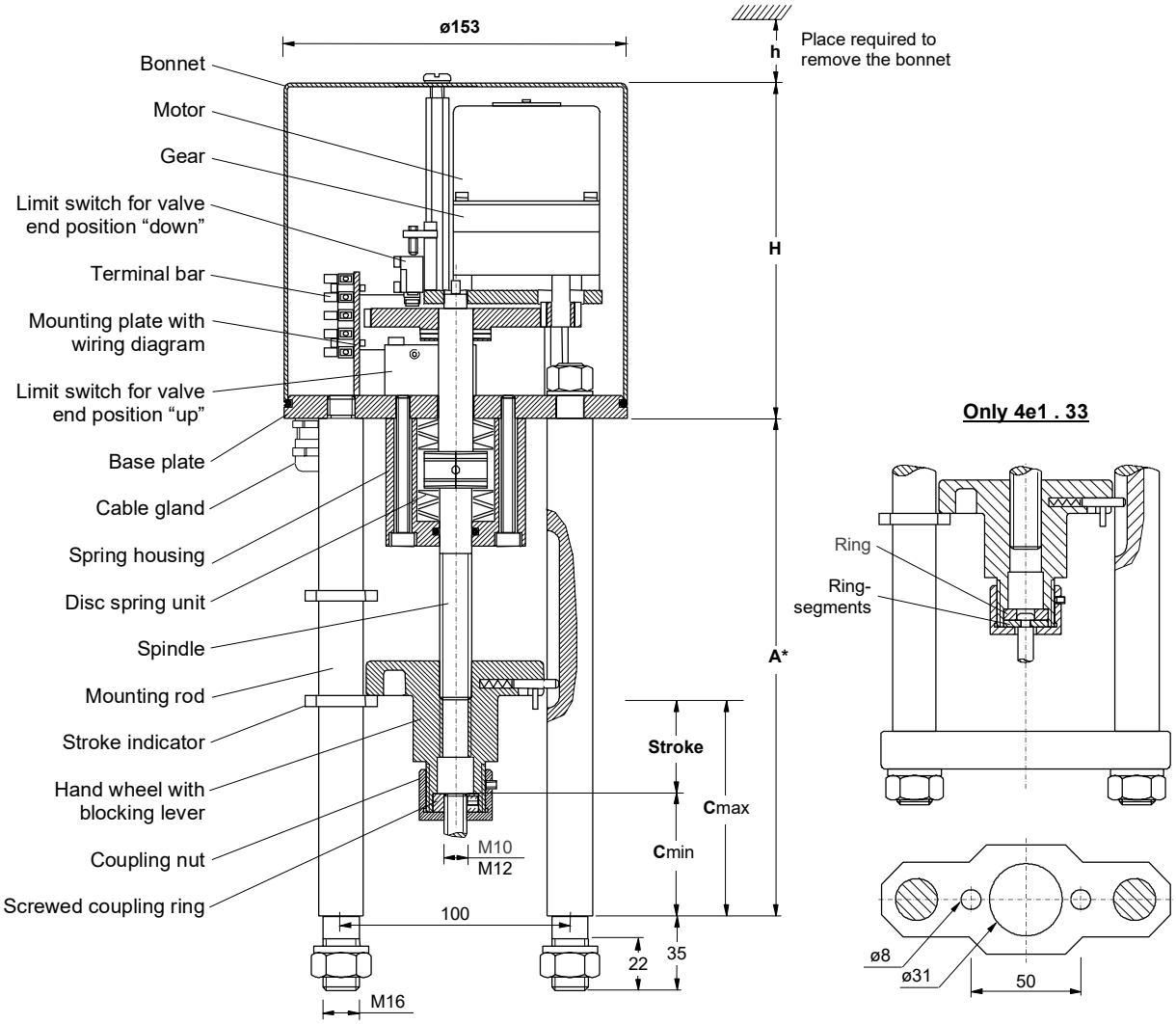
Type summary:

Mounting rod length: (mm) *		195	200		218		231		250		295
Stroke (mm)		41	41	51	41	51	41	51	41	51	65
Thrust (N)	1500	4e1133	-	-	-	-	-	-	-	-	-
	2000	-	4e1230	4e1250	4e1231	4e1251	4e1232	4e1252	4e1235	4e1255	-
	4000	4e1433	4e1430	4e1450	4e1431	4e1451	4e1432	4e1452	4e1435	4e1455	4e1466
	5500	-	4e1630	4e1650	4e1631	4e1651	4e1632	4e1652	4e1635	4e1655	4e1666

** = other mounting rod lengths on request*

Electrical wiring:





Type	A* mm	Stroke max. mm	Cmin mm	Cmax mm	H mm		h mm	
					without 49r…/49sr	with 49r…/49sr	without 49r…/49sr	with 49r…/49sr
4e1 . 33	195	41	40	81	146	191	145	190
4e1 . 30	200	41	45	86				
4e1 . 31	218	41	63	104				
4e1 . 51	218	51	37	88				
4e1 . 32	231	41	76	117				
4e1 . 52	231	51	50	101				
4e1 . 35	250	41	95	136				
4e1 . 55	250	51	69	120				
4e1 . 66	295	65	96	161				

** = other mounting rod lengths on request*

**Electrical, explosion proof actuator type 4ex.. (ExRun),
alternatively suitable for most KFM-control valve types (appendix ...X.)**

EU-type-tested in accordance to ATEX directive 2014/34/EU
For all types of gas, mixtures, vapours and dust for use in zone 1, 2, 21, 22
With manual emergency operation and load dependent limit switches



Protection class:	II 2 (2) G Ex db eb [ib Gb] IIC T6, T5 Gb II 2 (2) D Ex tb [ib Db] IIIC T80°C, T95°C Db
Control mode:	OPEN/CLOSE, 3-point optionally 4-20mA / 0-10V
Supply voltage:	24 ... 240V AC/DC, +/- 10%, self adjustable
Frequency:	50 ... 60Hz +/- 20%
Thrust (selectable):	0,5 / 1,0 kN (4exa...) 2,5 / 5,0 kN (4exb...) 7,5 / 10,0 kN (4exc...)
Positioning time (selectable):	2 / 3 / 6 / 9 / 12 s/mm (4exa… and 4exb…) 4 / 6 / 9 / 12 / 15 s/mm (4exc...)
IP-Protection EN 60529:	IP66
Motor rating standard: EN 60034-1	S3 - 50%ED – max. 300 c/h
Stroke (adjustable):	5 ... 60mm
Ambient temperature:	-20 ... +40°C at T6 / -20 ... +50°C at T5
Integrated heater:	standard

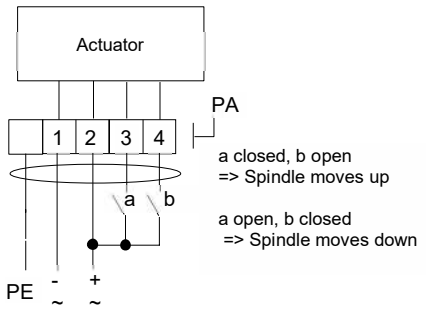
Accessories, special types**:**
2 add. signal switches, adjustable (49xw2)
Integrated positioner 4-20mA / 0-10V (49xsr)
Feedback signal 4-20mA / 0-10V (49xsrü)

Order text:
Electrical, explosion proof actuator, thrust . . .,
Mounting rod length . . ., coupling M. ., accessories . . .
List-No. 4ex . . .

Electrical wiring:

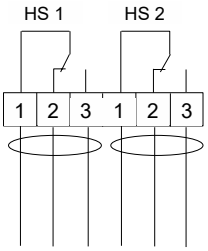
Basic version:

24 ... 240 VAC/DC



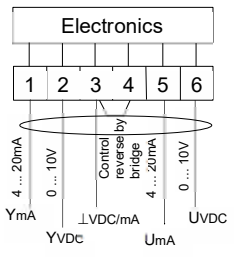
Accessories(optionally):

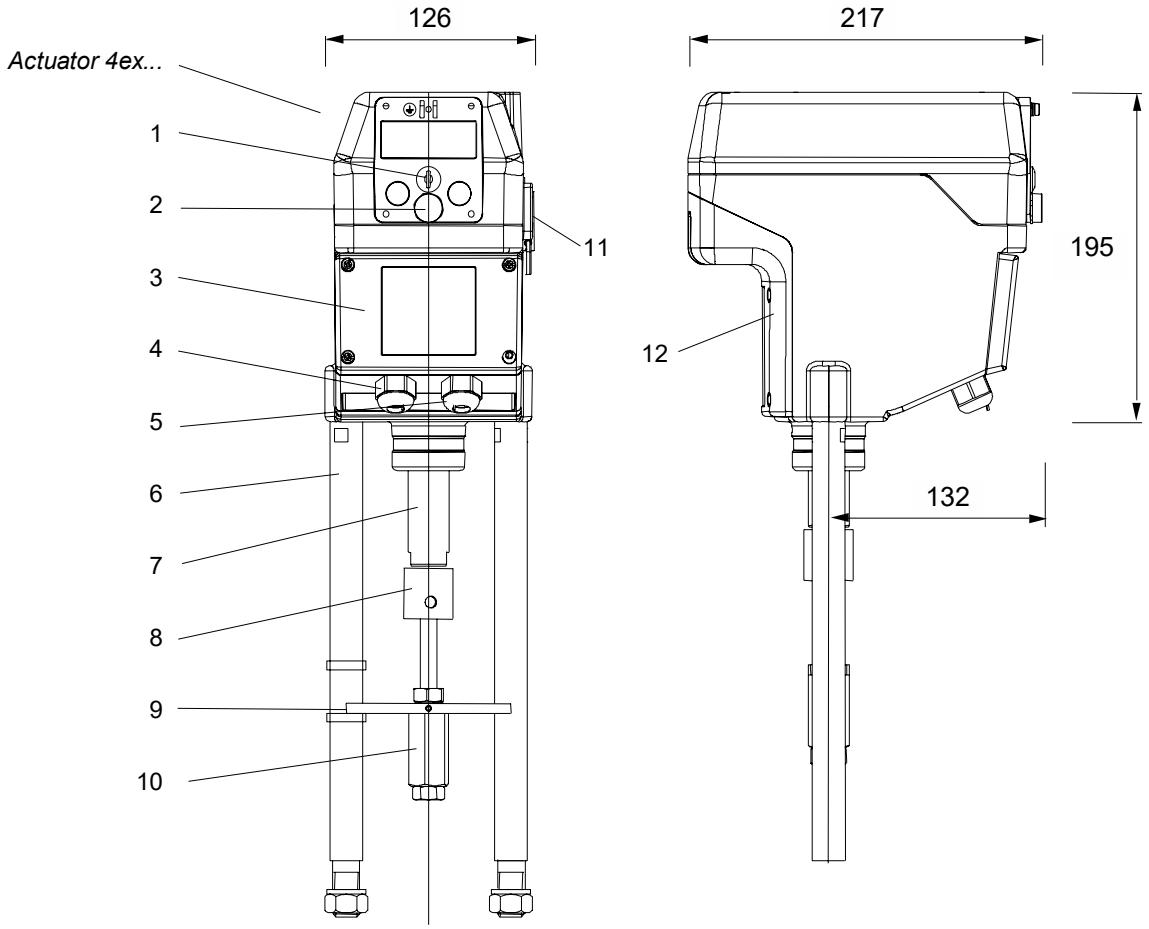
Add. signal switches
49xw2



Positioner 4-20mA / 0-10V
49xsr

Feedback signal 4-20mA / 0-10V
49xsrü





1	Switch for force and positioning time adjustment (behind blanking plug)
2	Button for automatic stroke adjustment and LED operating display (behind blanking plug)
3	Junction box
4	Cable screw connection (control signal, feedback signal, potentiometer, button)
5	Cable screw connection (supply voltage, control)
6	Mounting rod, mounting rod length depending on the valve type
7	Actuator spindle
8	Coupling nut
9	Stroke indicator
10	Coupling, thread depending on the valve type
11	Switch for manual operation
12	Cover for gear (stroke adjustment)

Overview Group 5
Control valves with emergency functions

Motor control valve in three way form with emergency close-function..... 531 ...
PN 16 / 25 / 40
Spindle sealing with PTFE-V-ring unit

Motor control valve in three way form with emergency close-function..... 561 ...
PN 16 / 25
Spindle sealing with bellow

Emergency stop or outlet valves see group 6

Motor control valve in three way form with PTFE-V-ring sealing, PN 16 / 25 / 40, DN15-100 with 2,8kN actuator with emergency close function

Body: three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 450°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs



Electro-hydraulic actuator: with emergency close function
(straightway A-AB closed by power failure)
and integrated manual emergency function
Thrust: 2800 N
Power input: DN15...50: 17VA
DN65...100: 28VA
Power supply: 230V/50...60Hz
Alternatively: 24V AC (only with positioner 59sr)
for input 0…10V or 4…20mA)
Protection class acc. to DIN EN 60529: IP54

Function:
In normal operation the electric pump generates pressure on the piston and moves the valve spindle (stroke) and simultaneously the return spring (preloading) downwards. In emergency (by power failure) the solenoid valve opens the pressure container and the return spring moves the piston and the valve spindle upwards and closes the straightway of the valve.

Accessories, special types**:**
Add. signal switches (59e)
Feedback potentiometer (59f)
Integrated positioner (59sr)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Electro-hydr. control valve in three way form with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., with emergency close function, closing pressure . . . bar
List-No.: PN16: 531 **4** . . , PN25: 531 **5** . . , PN40: 531 **7** . . , PN40: 531 **E** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

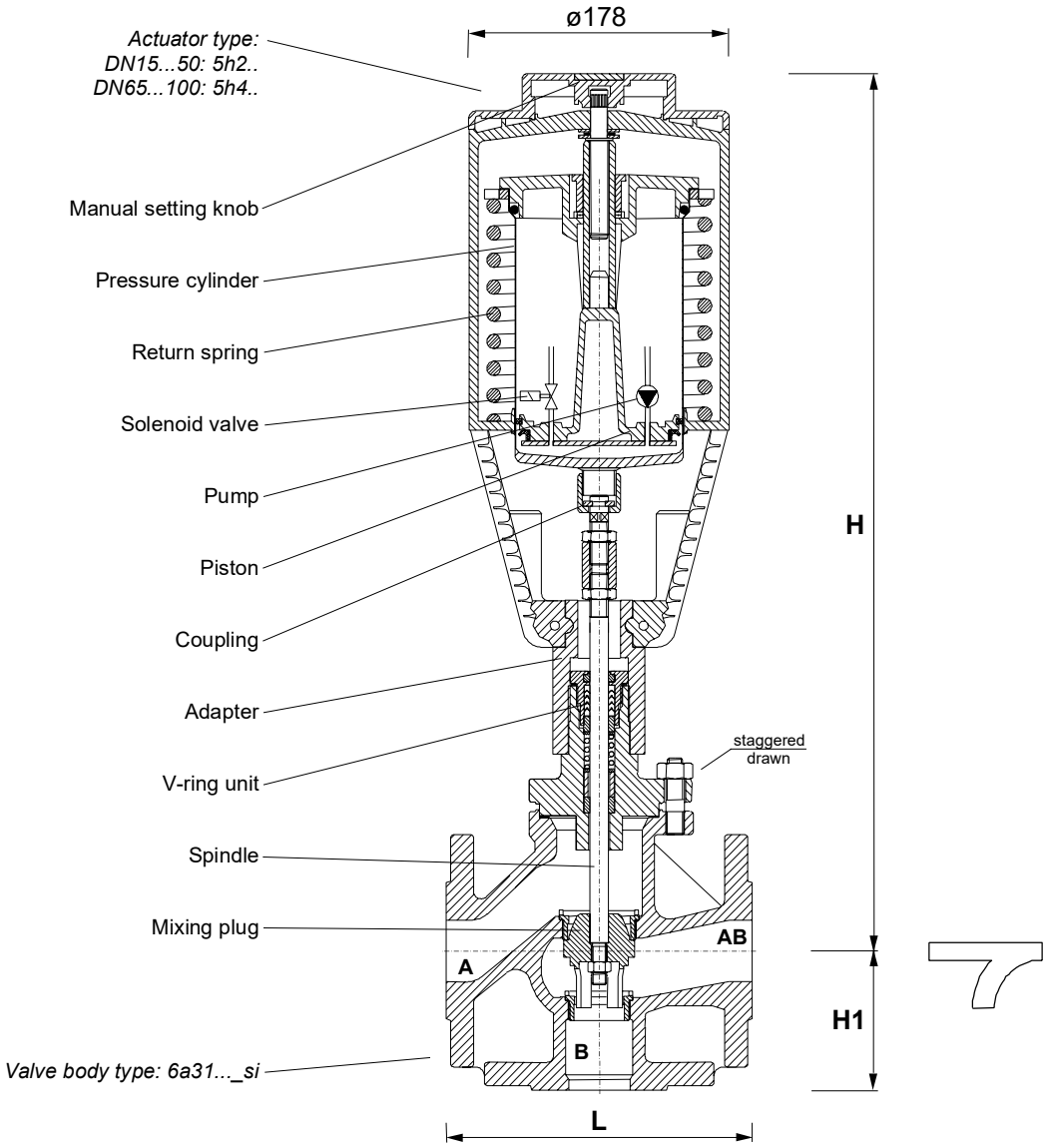
by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	531 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	531 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN40	531 **7**	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	13,2	bar
PN40	531 **E**	GX5CrNiMo19-11-2	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6	-	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN**	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Emergency close time**		**Closing pressure**
								230V	24V+59sr	
	PN 16	PN 25	PN40	PN40	m³/h	mm	sec	sec	sec	bar
15	531 400	531 500	531 700	531 E00	4	20	120	10	10	40,0
20	531 401	531 501	531 701	531 E01	6,3	20	120	10	10	40,0
25	531 402	531 502	531 702	531 E02	10	20	120	10	10	40,0
32	531 403.	531 503.	531 703	531 E03	16	20	120	10	10	26,1
40	531 404.	531 504.	531 704	531 E04	25	20	120	10	10	16,5
50	531 405.	531 505.	531 705	531 E05	40	20	120	10	10	10,4
65	531 406.	531 506.	531 706	531 E06	63	30	90	18	20	5,7
80	531 408.	531 508.	531 708	531 E08	100	30	90	18	20	3,5
100	531 410.	531 510.	531 710	531 E10	150	30	90	18	20	2,1

*** = bigger DN on request*

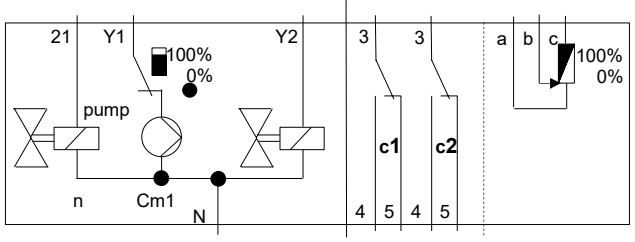
Motor control valve in three way form with PTFE-V-ring sealing, PN 16 / 25 / 40, DN15-100 with 2,8kN actuator with emergency close function



DN	15	20	25	32	40	50	65	80	100
Height H	555	569	563	570	575	578	621	622	629
Stud length H1	65	70	75	80	90	100	120	130	150
Length L	130	150	160	180	200	230	290	310	350
Weight kg	16	18	19	21	22	26	43	48	61

Electrical wiring:

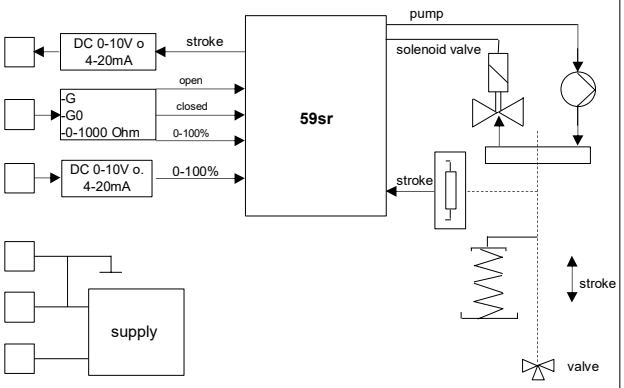
optionally:



Cm1	Limit switch	Y1	Straightway A-AB opens
n	Solenoid valve	Y2	Straightway A-AB closes
c1, c2	Signal switch	N	Neutral conductor
a,b,c	Potentiometer	21*	Voltage*

*= - *Voltage has to be always connected here*
- *Disconnection/power failure activates emergency close function (A-AB closed)*

24V AC with positioner 59sr..., 0-10V / 4-20mA:



U	Position feedback signal	G0	Power supply 24V AC
Z	Override control		System neutral (SN)
Y	Control signal	G	Power supply 24V AC
M	Measuring neutral		System potential

Motor control valve in three way form with bellow sealing, PN 16 / 25, DN15-100 with 2,8kN actuator with emergency close function



Body: three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Electro-hydraulic actuator: with emergency close function
(straightway A-AB closed by power failure)
and integrated manual emergency function
Thrust: 2800 N
Power input: DN15...50: 17VA
DN65...100: 28VA
Power supply: 230V/50...60Hz
Alternatively: 24V AC (only with positioner 59sr)
for input 0…10V or 4…20mA)
Protection class acc. to DIN EN 60529: IP54

Function:
In normal operation the electric pump generates pressure on the piston and moves the valve spindle (stroke) and simultaneously the return spring (preloading) downwards. In emergency (by power failure) the solenoid valve opens the pressure container and the return spring moves the piston and the valve spindle upwards and closes the straightway of the valve.

Accessories, special types**:**
Add. signal switches (59e)
Feedback potentiometer (59f)
Integrated positioner (59sr)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Electro-hydr. control valve in three way form with mixing plug
Material . . . , PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., with emergency close function, closing pressure . . . bar
List-No.: PN16: 561 **4** . . , PN25: 561 **5** . . , PN25: 561 **6** . . , PN25: 561 **E** . ._p2
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

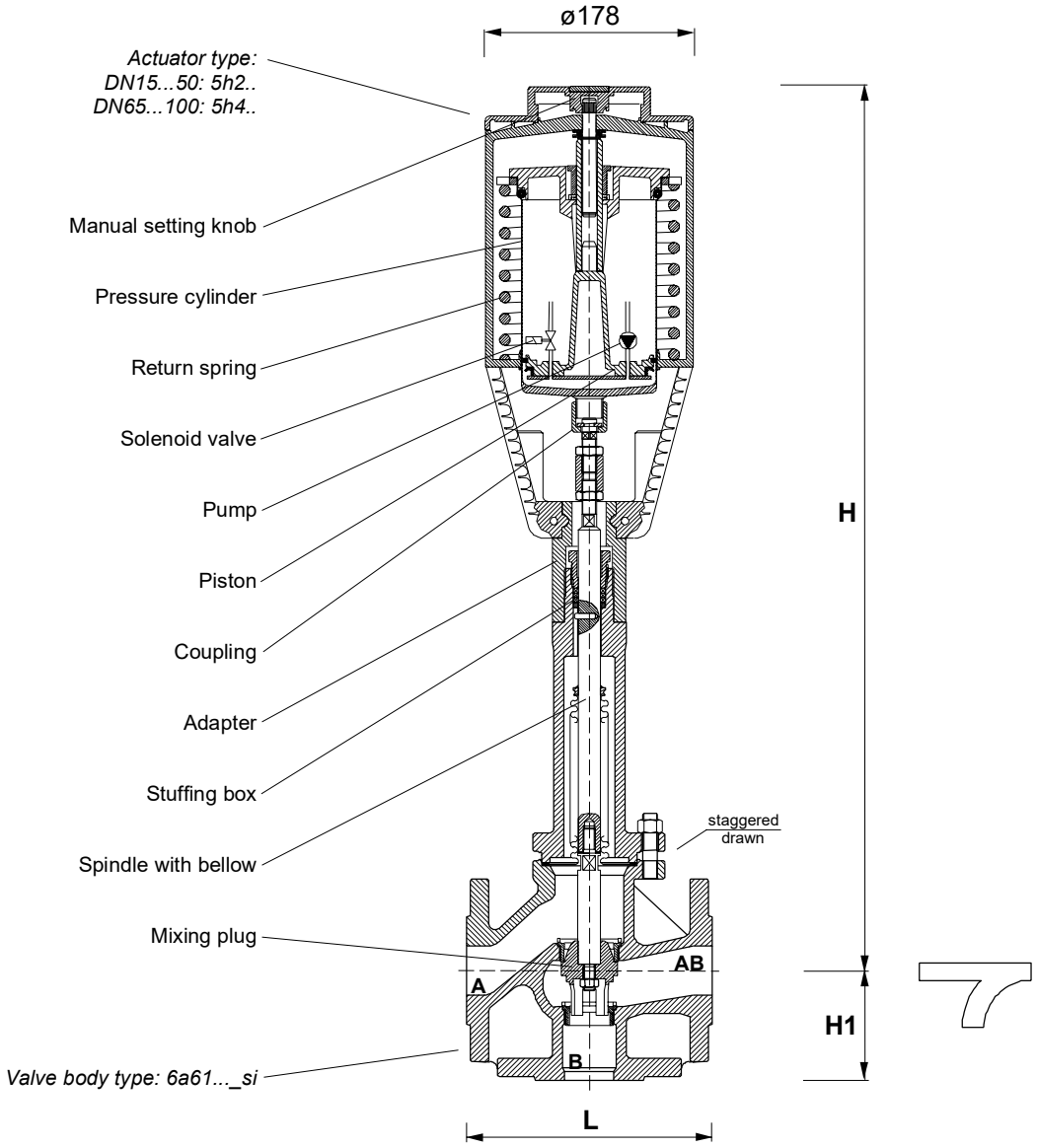
by:			-10...50	100	150	200	250	300	350	400	450	°C
PN16	561 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	561 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	561 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	561 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

DN**	**List-No.**				**Kvs**	**Stroke**	**Pos. time**	**Emergency close time**		**Closing pressure**
								230V	24V+59sr	
	PN 16	PN 25	PN25	PN25	m³/h	mm	sec	sec	sec	bar
15	561 400	561 500	561 600	561 E00_p2	4	20	120	10	10	25,0
20	561 401	561 501	561 601	561 E01_p2	6,3	20	120	10	10	25,0
25	561 402	561 502	561 602	561 E02_p2	10	20	120	10	10	25,0
32	561 403.	561 503.	561 603	561 E03_p2	16	20	120	10	10	25,0
40	561 404.	561 504.	561 604	561 E04_p2	25	20	120	10	10	16,5
50	561 405.	561 505.	561 605	561 E05_p2	40	20	120	10	10	10,4
65	561 406.	561 506.	561 606	561 E06_p2	63	30	90	18	20	5,7
80	561 408.	561 508.	561 608	561 E08_p2	100	30	90	18	20	3,5
100	561 410.	561 510.	561 610	561 E10_p2	150	30	90	18	20	2,1

*** = bigger DN on request*

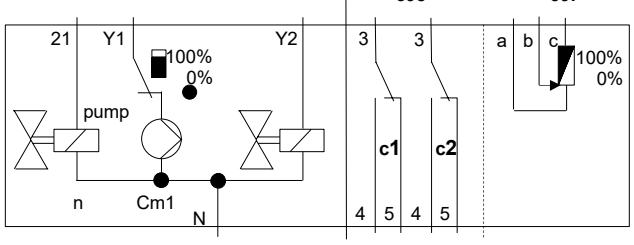
Motor control valve in three way form with bellow sealing, PN 16 / 25, DN15-100 with 2,8kN actuator with emergency close function



DN	15	20	25	32	40	50	65	80	100
Height H	714	728	722	729	734	737	867	868	875
Stud length H1	65	70	75	80	90	100	120	130	150
Length L	130	150	160	180	200	230	290	310	350
Weight kg	17	18	19	22	23	26	47	51	64

Electrical wiring:

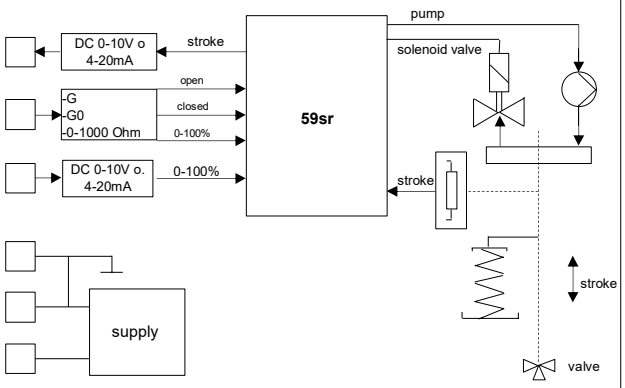
optionally:



Cm1	Limit switch	Y1	Straightway A-AB opens
n	Solenoid valve	Y2	Straightway A-AB closes
c1, c2	Signal switch	N	Neutral conductor
a,b,c	Potentiometer	21*	Voltage*

*= - *Voltage has to be always connected here*
- *Disconnection/power failure activates emergency close function (A-AB closed)*

24V AC with positioner 59sr..., 0-10V / 4-20mA:



U	Position feedback signal	G0	Power supply 24V AC
Z	Override control		System neutral (SN)
Y	Control signal	G	Power supply 24V AC
M	Measuring neutral		System potential

Overview Group 6
Other valves

Emergency stop valve in two way form ..... 640 4...sav
PN 16, EN-GJS-400-18-LT
Spindle sealing with bellow

Emergency outlet valve in two way form ..... 640 4...oa
PN 16, EN-GJS-400-18-LT
Spindle sealing with bellow

Overflow valve in two way form ..... 651 ...
PN 16 / 25
Spindle sealing with bellow

Air vent valve ..... 691...
for heat transfer oil systems

Control valves with emergency functions see group 5

Emergency stop valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16

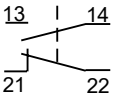
640 4..sav E



Body: EN-GJS-400-18-LT two way form
for heat transfer oil
Pressure range: PN16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel

Quick closing device : acc. to DIN 4754
for shut off by emergency
and simultaneous disconnecting of burner
by electrical signal contact
Operated by release cord (supplied by customer)

Limit switch:

Switching element:	1 normally open / 1 normally closed contact
Switching system:	snap action, positive break, normally closed contact
Contact material:	fine silver
Temperature range:	-20°C to +80°C
Electrical loading:	400V AC, 6A (AC-13)
Minimum loading:	24V AC/DC, 10mA
Short circuit protection:	6A (slow blow)
Electrical construction:	IEC 947-5-1, electrically isolated switching inserts
Cable inlet:	3x M16x1,5
Protection class:	IP65 acc. to EN 60529 / DIN VDE 0470-1
Housing:	GD-Al alloy, painted
Electrical wiring:	

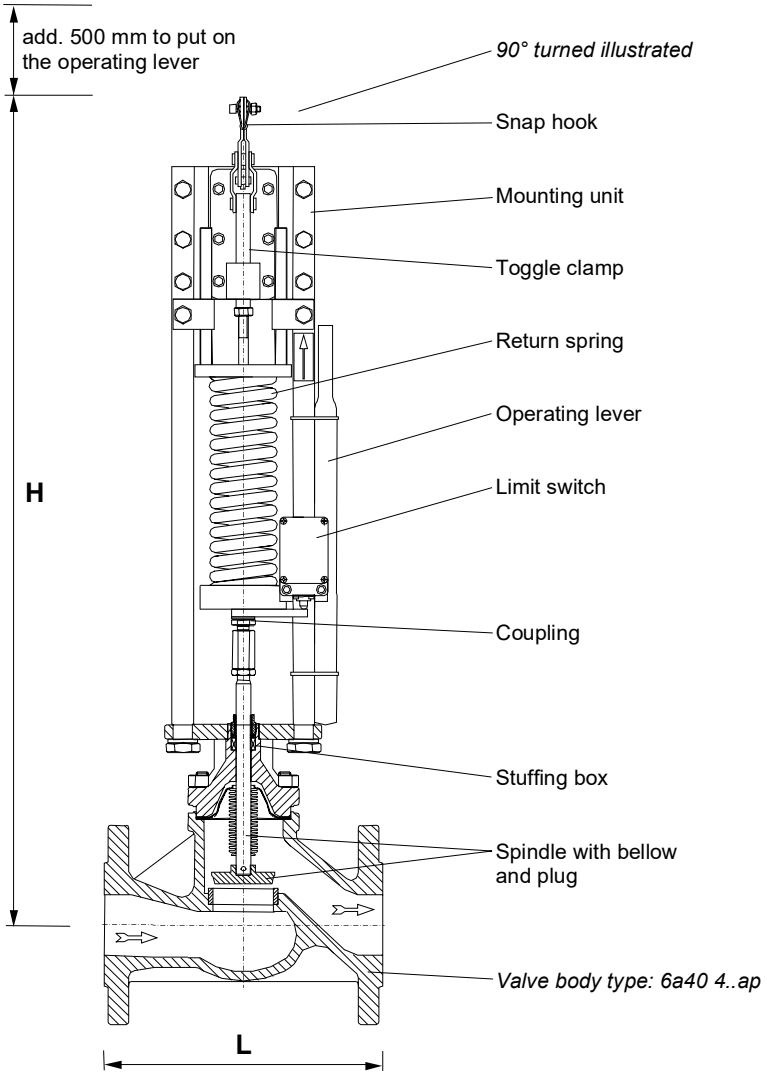
Order text:
Emergency stop valve
EN-GJS-400-18-LT, PN 16, DN . .
List-No. 640 4 . . sav

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No.	Kvs m³/h	Stroke mm
20	640 401sav	7,2	6
25	640 402sav	12,0	8
32	640 403sav	16,0	8
40	640 404sav	28,5	13
50	640 405sav	43,0	13
65	640 406sav	75,0	16
80	640 408sav	105,0	20

Emergency stop valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16



Emergency stop valve

Shown in operating state

DN	20	25	32	40	50	65	80
Height H*	710	715	720	735	740	755	775
Length L	150	160	180	200	230	290	310
Weight kg	11	12	14	16	18	22	28

** = add. 500mm to put on the operating lever*

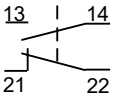
Emergency outlet valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16

Body: EN-GJS-400-18-LT two way form
for heat transfer oil
Pressure range: PN16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel



Quick opening device :
for discharge by emergency
with simultaneous disconnecting possibility
by electrical signal contact
Operated by release cord (supplied by customer)

Limit switch:

Switching element:	1 normally open / 1 normally closed contact
Switching system:	snap action, positive break, normally closed contact
Contact material:	fine silver
Temperature range:	-20°C to +80°C
Electrical loading:	400V AC, 6A (AC-13)
Minimum loading:	24V AC/DC, 10mA
Short circuit protection:	6A (slow blow)
Electrical construction:	IEC 947-5-1, electrically isolated switching inserts
Cable inlet:	3x M16x1,5
Protection class:	IP65 acc. to EN 60529 / DIN VDE 0470-1
Housing:	GD-Al alloy, painted
Electrical wiring:	

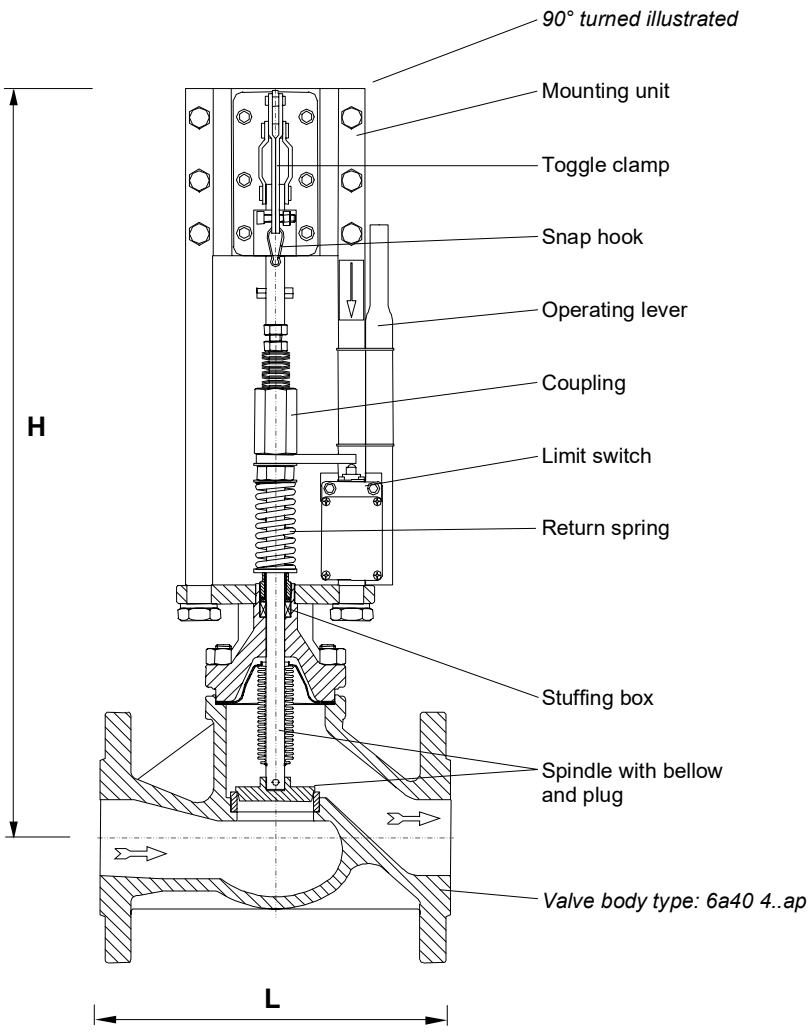
Order text:
Emergency outlet valve
EN-GJS-400-18-LT, PN 16, DN . .
List-No. 640 4 . . oa

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No.	Kvs m³/h	Stroke mm
20	640 401oa	7,2	6
25	640 402oa	12,0	8
32	640 403oa	16,0	8
40	640 404oa	28,5	13
50	640 405oa	43,0	13
65	640 406oa	75,0	16
80	640 408oa	105,0	20

Emergency outlet valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16



Emergency outlet valve

Shown in operating state

DN	20	25	32	40	50	65	80
Height H	420	425	430	445	450	465	485
Length L	150	160	180	200	230	290	310
Weight kg	9	10	11	13	15	20	25

Overflow valve in two way form with bellow sealing, DN25-80 PN 16 / 25

Body: two way form
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)



Function:
The valve opens the straightway against outside spring when the differential pressure on the valve plug is rising.
Response pressure: adjustable 1...4 bar with a wrench (width across flats 17 mm)

Order text:
Overflow valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Adjustable overflow pressure 1…4 bar
List-No.: PN16: 651 **4** . . , PN25: 651 **5** . . , PN25: 651 **6** . . , PN25: 651 **E** . ._p2

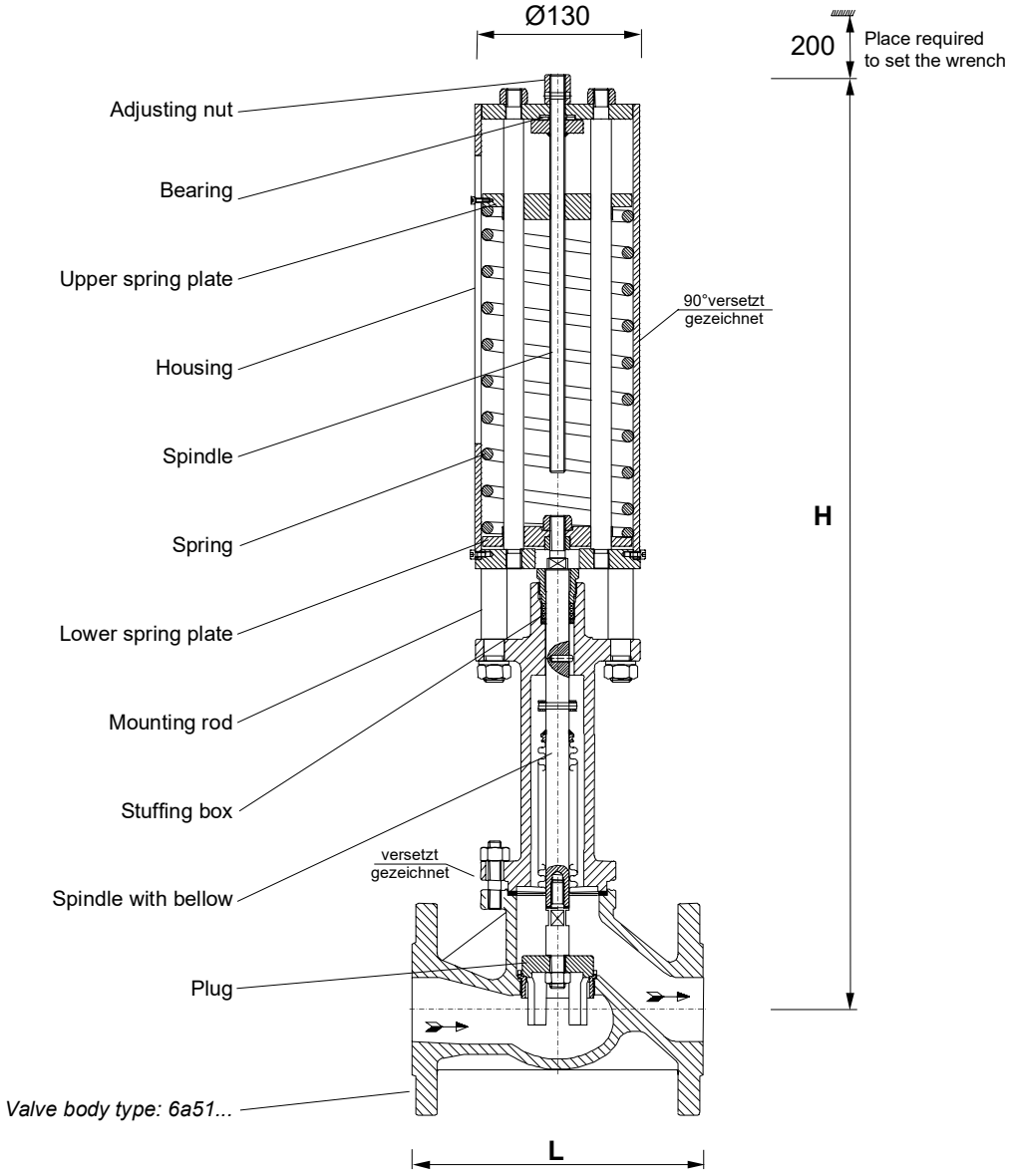
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:			-10...50	100	150	200	250	300	350	400	450	°C*
PN16	651 **4**	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	-	bar
PN25	651 **5**	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	-	bar
PN25*	651 **6**	GP240GH+N	25	25	25	25	25	25	24	21	13,1	bar
PN25	651 **E**	GX5CrNiMo19-11-2	25	25	22,7	21	19,8	18,5	17,4	17,1	-	bar

** = acc. to KFM norm*

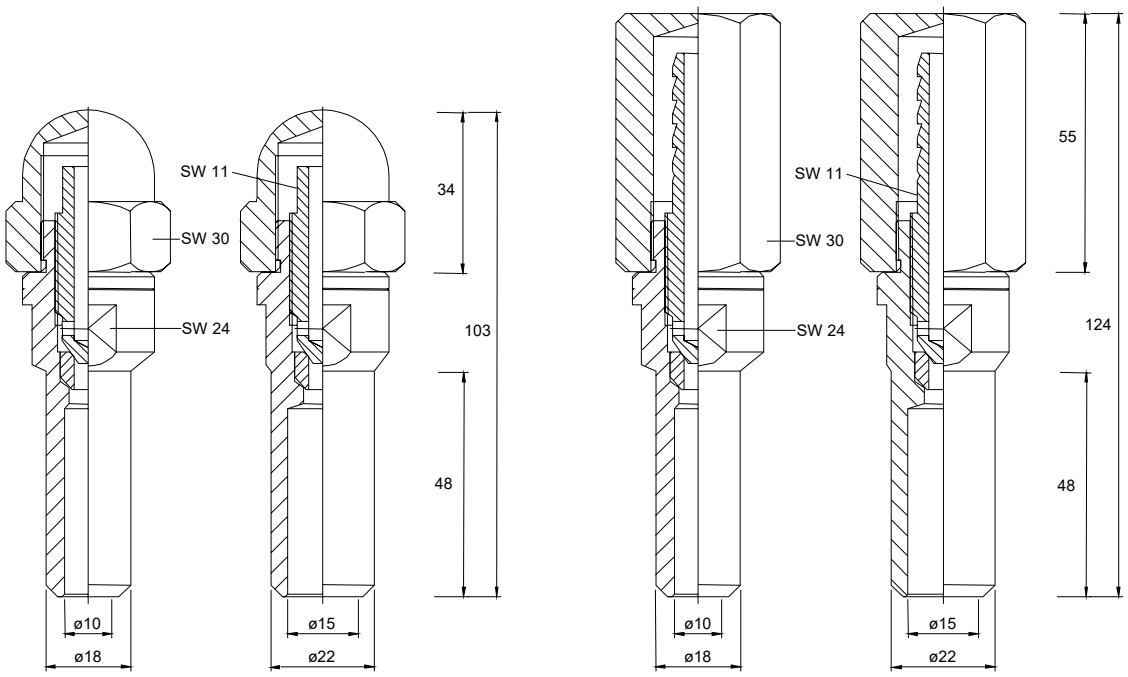
DN	**List-No.**				**Kvs**	**Stroke**
	PN 16	PN 25	PN25	PN25	m³/h	mm
25	651 402	651 502	651 602	651 E02_p2	10	20
32	651 403	651 503	651 603	651 E03_p2	16	20
40	651 404	651 504	651 604	651 E04_p2	25	20
50	651 405	651 505	651 605	651 E05_p2	40	20
65	651 406	651 506	651 606	651 E06_p2	63	30
80	651 408	651 508	651 608	651 E08_p2	100	30

Overflow valve in two way form with bellow sealing, DN25-80 PN 16 / 25



DN	25	32	40	50	65	80
Height H	721	728	732	735	920	921
Length L	160	180	200	230	290	310
Weight kg	15	17	18	21	37	40

Air vent valve for heat transfer oil, P250GH (C22.8), PN25



List-No.: **691 511c** **691 512c** **691 521c** **691 522c**



Technical data:

Body:	P250GH (C22.8)
Seat and plug:	Stainless steel
Locking cap:	Steel, galvanized; SW 30
Pressure range:	PN 25
Nominal diameter:	DN 10, DN 15
Connection:	Weld-on ends
Operation:	Square shaft SW 11
Weight:	0,3 kg (69151.c) 0,4 kg (69152.c)

Pressure-temperature ratings:

by:	-10…100	150	200	250	300	350	°C
PN 25	25	22	19	18	16	15	bar

Type summary:

List-No.	DN	List-No.	DN
691511c	10 without tube nozzle	**691521c**	10 with tube nozzle
691512c	15 without tube nozzle	**691522c**	15 with tube nozzle

Overview Group 7
Primary elements

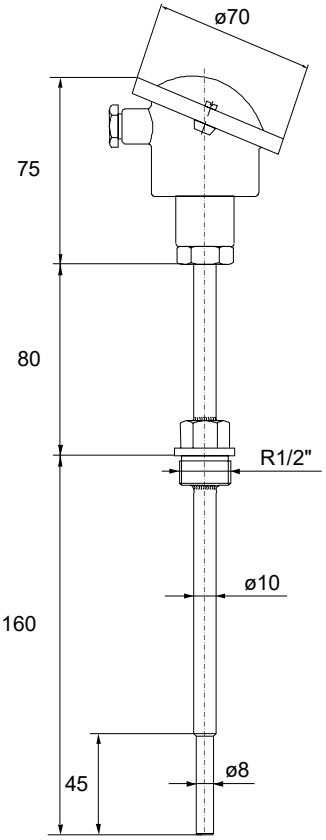
Resistance thermometer for liquid media ..... 713 4..
with terminal head form B

Resistance thermometer for gaseous media ..... 713 5..
with terminal head form B

Resistance thermometer, straight type ..... 714 400p3..
with fixed measuring cable

Resistance thermometer with weld-in immersion shell ..... 715 …
with terminal head form B

Resistance thermometer for liquid media with terminal head form B





Screw-in resistance thermometer with terminal head, measuring resistance 1x PT100 fixed built-in
alternatively: replaceable

Technical data:

Sensor:

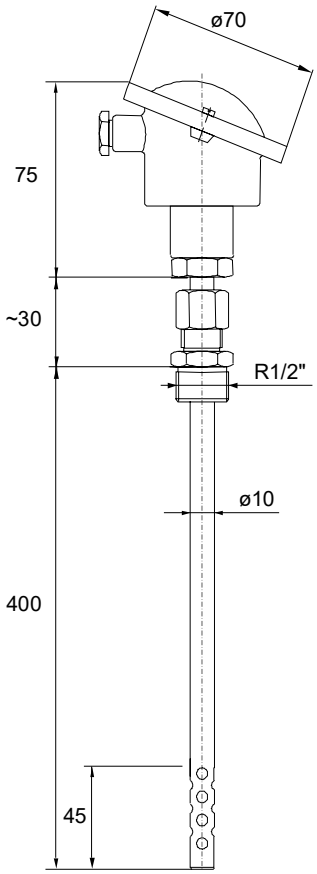
Terminal head:	Form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø10 x 80 mm
Connection:	R 1/2"
Material of sensor tube:	1.4541
Installation length:	160 mm

Measuring resistance:	**List-No.:**	**Reaction times** (water 0,4 m/s)**:** *t05 in s*	*t09 in s*
Fixed built-in	713411	12	40
Replaceable	713411a	15	50

Order text:

Resistance thermometer 1xPT100 DIN
with terminal head form B
installation length 160mm
measuring resistance fixed built-in / replaceable
List-No. 713411 .

Resistance thermometer for gaseous media with terminal head form B





Screw-in resistance thermometer with terminal head and movable screw joint, measuring resistance 1x PT100 fixed built-in.

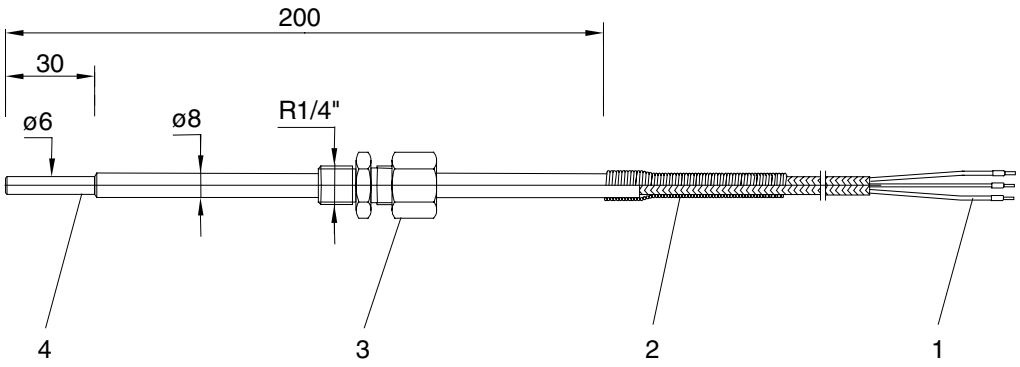
Technical data:

Sensor:

Terminal head:	Form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø10 mm
Connection screw joint:	movable
Connection:	R 1/2"
Material of sensor tube:	1.4541
Installation length:	400 mm, 45 mm perforated
Reaction times (air 1 m/s):	t05 = 50 s t09 = 150 s

Order text:

Resistance thermometer 1xPT100 DIN
with terminal head form B
installation length 400mm
measuring resistance fixed built-in
List-No. 713514



1. Cable terminal
2. Protective spring
3. Screw joint
4. Protective tube

Resistance thermometer, 3-wire-type with slidable screw joint and 3 m fixed PTFE measuring cable with alloy steel schielding and protective spring, wires with cable terminals.

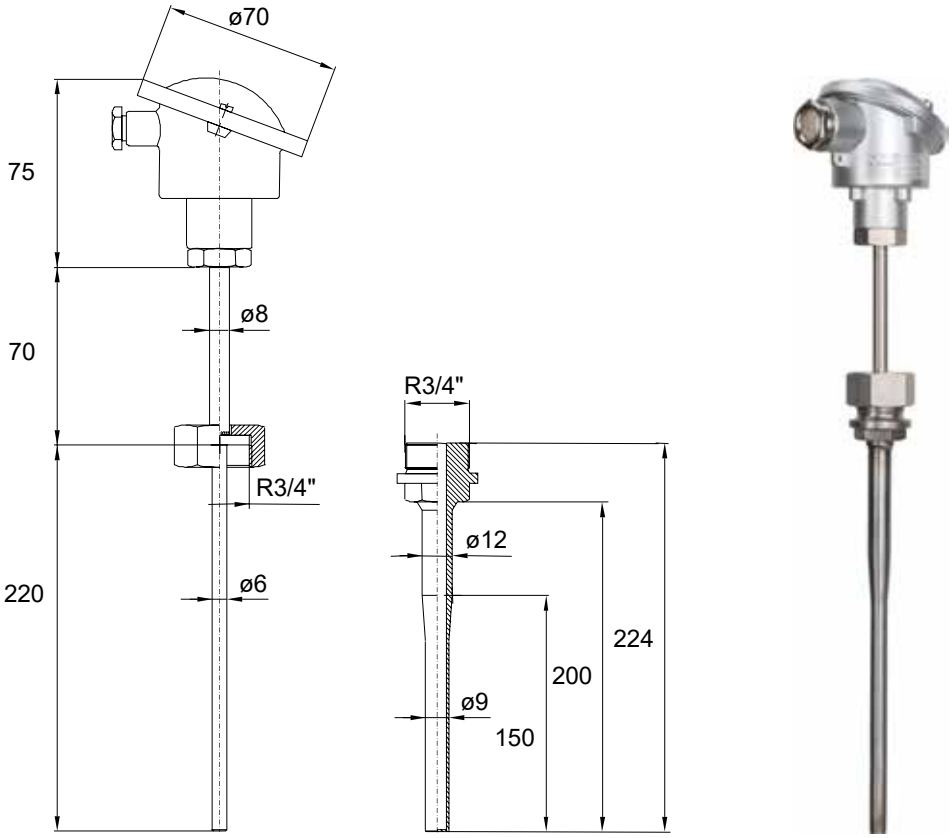
Technical Data:

Measuring jaw:	1 x Pt100 DIN, poured in, vibration safe
Transmit times (air 1 m/s	t_{05} = 50 s $_{09}$ = 150 s
Protective tube:	VA, 200 x 8 mm / measuring tip 30 x 6 mm
Cable:	3 m PTFE measuring cable for max. 280°C
Protective spring:	VA, 40 mm
Screw joint:	R 1/4"

Order text:

Resistance thermometer 1 x PT100 DIN
with 3m fixed PTFE measuring cable,
three-wire-type,
VA-protective tube 200 x 8 mm / 30 x 6 mm,
slidable screw joint R 1/4"
List-No.: 714 400p3

Resistance thermometer with immersion shell with terminal head form B



Screw-in resistance thermometer with additional immersion shell. Component tested for heat transfer oil installations acc. to DIN 4754

Technical data:

Sensor:

Terminal head:	form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø8 mm
Connection:	Cap nut R 3/4"
Sensor tube:	1.4541, 220 x ø6 mm
Reaction times (water 0,4 m/s):	t05 = 40 s t09 = 120 s

Immersion shell:

Material:	St 35.8
Installation length:	200 mm
Max. media temperature:	400°C

Types overview:	**List-No.:**
Resistance thermometer **1**x PT100 DIN incl. immersion shell of St 35.8	715**1**2
Resistance thermometer **2**x PT100 DIN incl. immersion shell of St 35.8	715**2**2

Overview Group 8
Programmable logic control, switching and monitoring devices

Programmable logic control

Industrial- Touchpanel 7"....801

Programmable logic control in modular construction....802

Programmable logic control with integrated display....803

Industrial- PC 12,1" with touchscreen....808

Switching and monitoring devices

Malfunction alarm display for single inputs....821

Malfunction alarm display with new value messages....822..na
series 822..na for single and chain alarm inputs

Modular malfunction alarm display....826

Data logger....83

Digital temperature switch....842 2

Electronic safety temperature limiter with LED- display....845 2
digital, with DIN part number

Electronic safety temperature limiter with TFT- display....846
digital, with DIN part number

Modular hardware....852

Industrial compact controller with TFT display, 45 mm wide, for DIN rail mounting....8521

Accessories

Safety barriers....889 5

Lockable transparent door....889 9

Blind cover for switchboard cut-outs....889 92

Electronic measuring transducer....899 95

801 000



General overview

The industrial touch panels in the KFM 801 000 series can be used for process visualisation. Operation and display are via a capacitive 7-inch touchscreen with a resolution of 800 x 480 pixels.

The KFM PCS software provides not only control and display elements that can be freely positioned on any background image, but also ready-made pages for parameters, data loggers and history, etc.

Data from various KFM devices can be acquired and processed via the integrated interfaces for KFM Service 2.0, hardware expansion and I/O units.
Furthermore, communication via standardised bus systems such as Modbus TCP/IP or Profinet is also possible with third-party devices equipped accordingly.

Configuration can be carried out via USB-C or a USB stick.

Example diagram:



KFM 852.. KFM 801 000 KFM 903..

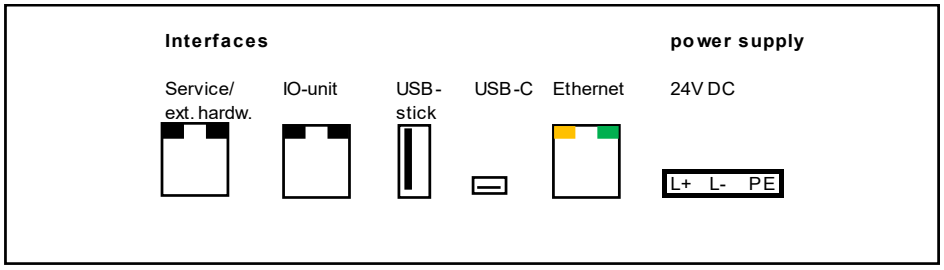
Technical data

801 000:

Housing:	For panel mounting
Screen diagonal:	7 inches (5:3 / WVGA)
Display type:	TFT
Resolution:	800 x 480
Number of colours:	16.7 million (24-bit)
Brightness:	800 cd/m²
Backlight:	50,000 hours (at 25 °C)
Controls:	Multi-touch screen, capacitive
Supply voltage:	24 V DC, approx. 15 VA
Interfaces:	5, • Service / external hardware interface KFM 2.0 (TTL, RJ45) • I/O Unit 801h (TTL, RJ45) • USB memory stick, max. 100mA (USB 2.0 host, Type A plug, socket) • Service interface KFM 2.0 (USB-C 2.0 Type B) • Profinet / Modbus TCP-IP (Ethernet RJ45)
Protection rating:	IP65 (front), connections IP20
Permissible ambient temp.:	0...60 °C
Rated temperature:	20 °C
Permissible relative humidity:	75 % annual average (KWF in accordance with EN 60529) without condensation
Interference emission/immunity:	In accordance with EN 61326

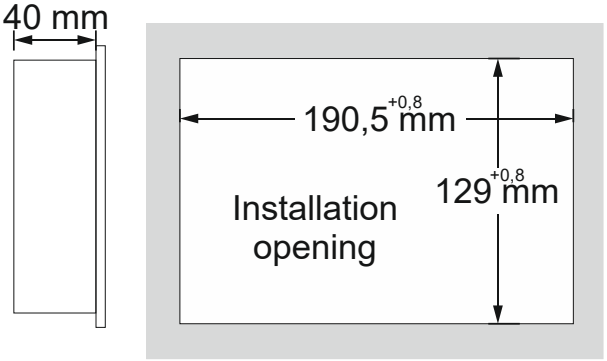
Wiring diagrams:

801 000: *Bottom view*



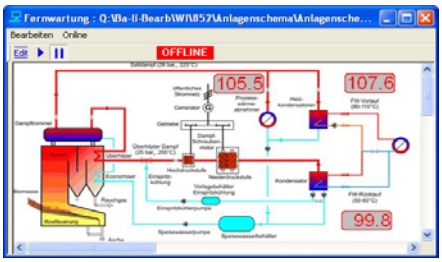
Installation dimensions:

801 000





Programmable functional units KFM 802.



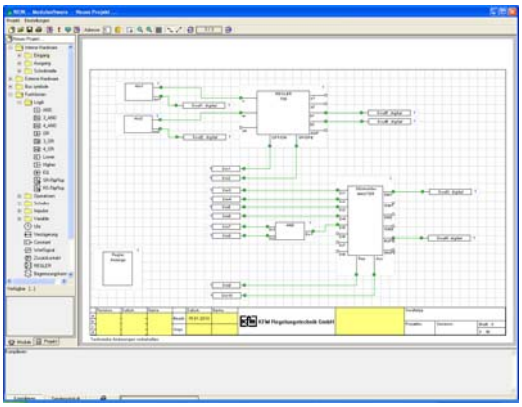
Visualisation of custom specific installation- and process schemes with KFM PCS

General:

KFM 802.. is a modular expandable compact- control for medium size control tasks in housing for DIN rail mounting. Required hardware can easily be added to the programmable logic control as an assembly modul.

The special advantage of this series lies in the fact that there is no specific programming knowledge required. Configuration, operating, and visualisation take place with PC / IPC using the supplied software.

The devices are optionally put together and programmed ready for operation according to the customers´ needs.



Graphical programming software for easy configuration:

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the device series 803..

Possible range of functions (extract):
Impulse-, switching-, logic or control functions, also custom specific, operators, interface functions, real time clock.

Module overview

Basic modules:

802620	CPU- module

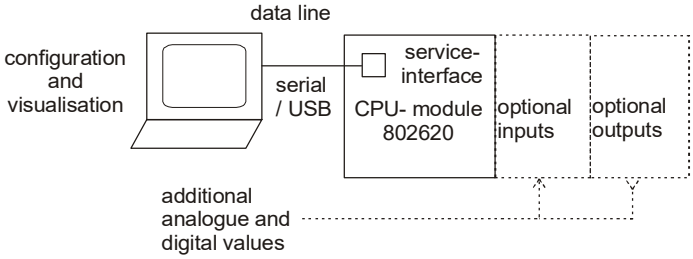
Power supply modules:

802500	Power supply module 100-230V AC
802508	Power supply module 24V AC or DC

Additional modules:

802220	Module with 2 analogue inputs Pt100 / stand. signal, range 0..400 / adjustable
802280	same as 802220, but range -200..+800 / adjustable
8023801	Module with 8 binary inputs 230VAC,1 relay contact (pot. free changeover)
8023881	Module with 8 binary inputs 24VDC,1 relay contact (pot. free changeover)
802750	Module with 5 relay outputs (changeover, max. 250V 2A)

Flow chart:



Interfaces:
1 x service interface KFM 2.0 (TTL), CPU-module 802620 only

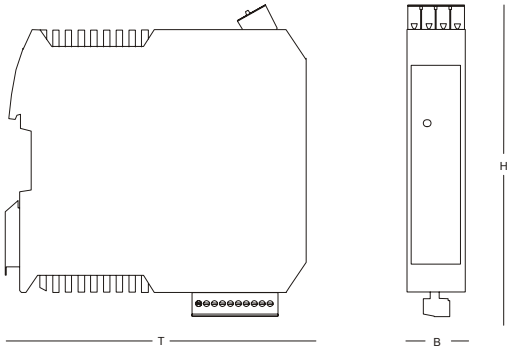
Technical data:

Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
optional: bin. inputs:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
optional: anal. inputs:	Pt100/ standard signal, range 0..400 resp. -200..+800°C / adj.
optional: relay output:	230 V / max. 2 A
optional: anal. output:	0/4…20 mA, 0/2…10V (load <= 500Ω)

Other operating data:

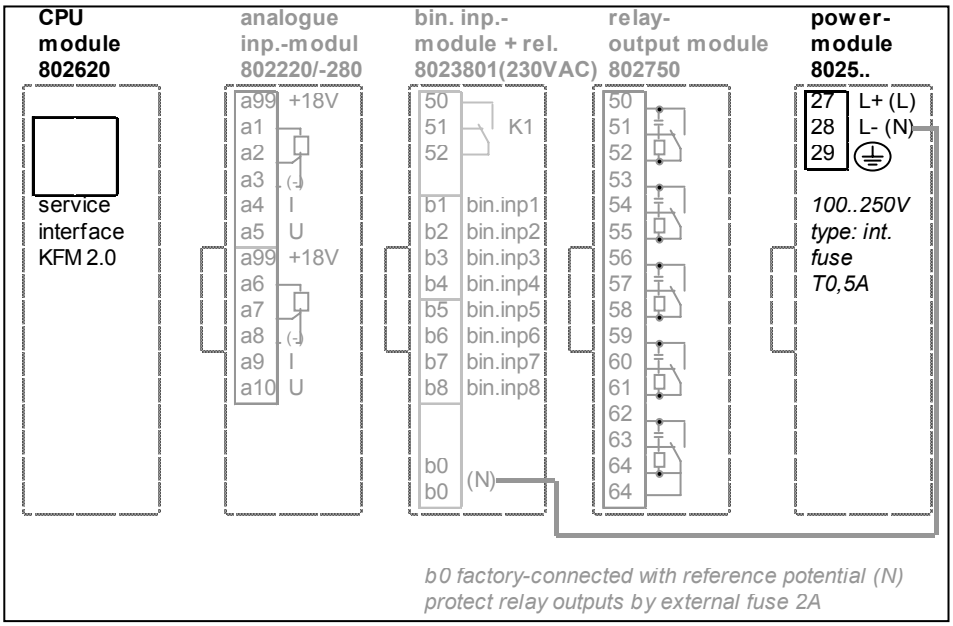
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)



H= 124mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered device is the wiring diagram on its casing only.)





programmable logic control KFM 803



Hardware-expansion modules 852..,

General:

KFM 803 is a compact- control with integrated, arbitrary expandable hardware, for medium size control tasks.

The special advantage of this series lies in the fact that there is no specific programming knowledge required. The graphical programming software provides the creation of applications in a quick and easy way. Furthermore, operating and visualization is integrated in the the device- version 803, so that separate operating- and display units are unnecessarry. Optionally with touch operation.

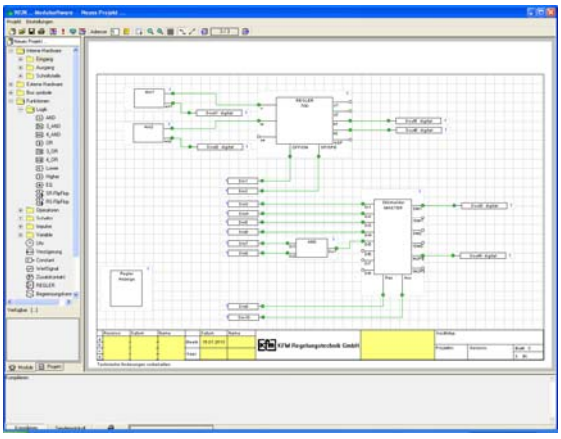
The housing in control panel format 96x96mm contains a variety of possible analogue and binary in- and outputs and other additional functions. There are several interface- adapters for the communication with control systems available. The display is switchable from the normal view (values, status) to pages for data logger, binary message lists, history or further, custom specific pages as well as ready to use elements and bitmaps.

The devices are optionally programmed ready for operation according to the customers´ needs.

Graphical programming software for easy configuration:

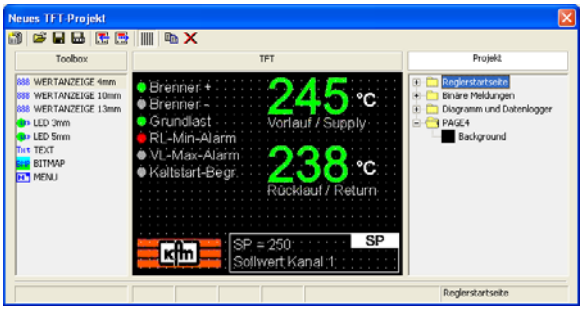
The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the series 803..

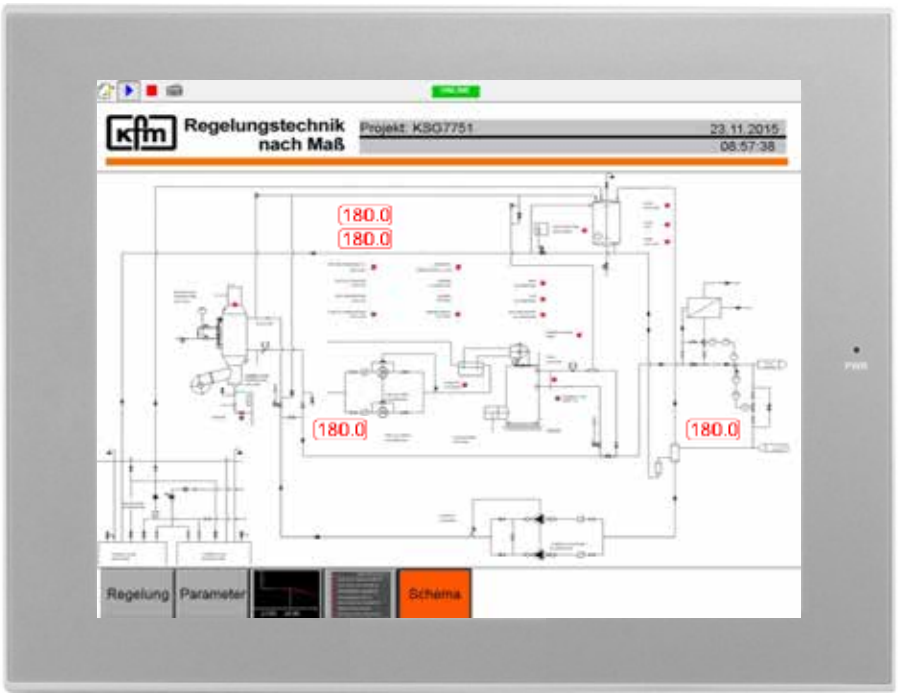
Possible range of functions (extract):
Impulse-, switching-, logic or control functions, also custom specific, operators, interface functions, real time clock.



Configuration of the controller display:

The factory- preadjusted display pages of the TFT-display can be optionally freely designed. Process indicated diagrams and custom specific logos can be uploaded as a bitmap file easily.





Industrial PC with touchscreen

complete overview

The KFM 808 000 industrial PC with 12.1" touch panel is used to operate and visualize processes using Windows© KFM-PCS software and connect KFM devices.

In addition to control panels for control functions, KFM 808 000 and KFM-PCS also offer displays for fault messages and operating statuses. Elements for operating visualization, control, parameters, data loggers, fault messages in plain text with history, and optional maintenance counters are also available.

Creating visualization projects with graphical design tools and operating them using KFM-PCS software is extremely easy. The visualization projects are stored on the IPC-KFM 808 000. The digital and analog data from the connected KFM hardware can be networked using KFM-PCS.

KFM 808 000 communicates with the connected KFM hardware via USB, serial, or Ethernet interface. For further details on connection, see sheets 99s and 99se (Ethernet).

For further details on the software, see sheet 99PCS..

sample diagram:



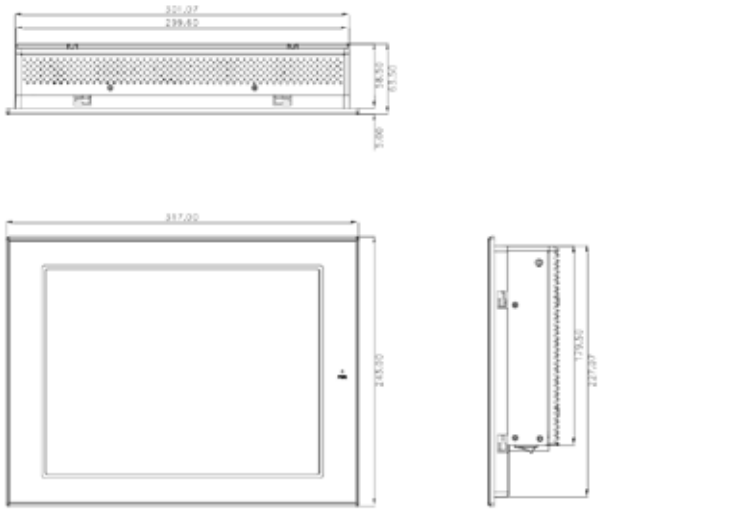
KFM 85.. KFM 808 000 KFM 903..

Technical specifications

808

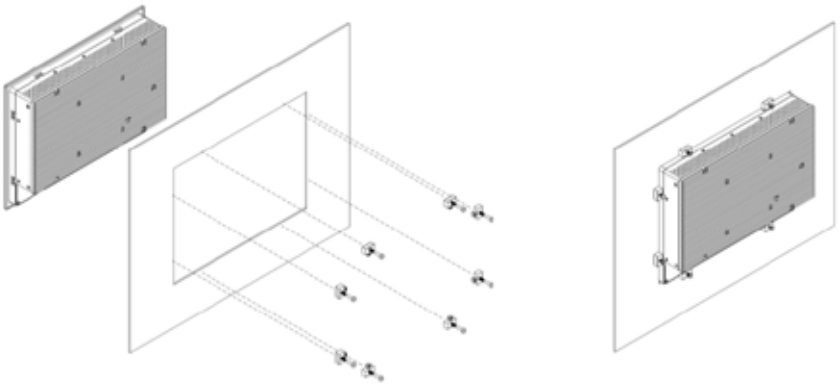
screen diagonal:	12,1 inch
display type:	TFT
resolution:	1024 x 768 (XGA)
colors:	16.2M
backlighting:	LED, ca. 50 000h
controls:	Touch, analog resistive (5-wire)
supply voltage:	24V DC
interfaces:	2x Ethernet (RJ45) 4x USB 3x RS-232 1x RS-485/422/232
ethernet:	10/100/1000 BASE-TX
protection type:	IP65 (frontseitig)
permissible ambient temp.:	0...50 °C without ventilation, 0...55 °C with ventilation
nominal temperature:	20°C
permissible relative humidity :	10...95% bei 40 °C, without condensation
interference emission/immunity:	CE/FCC class A
installation:	panel mounting, VESA 100

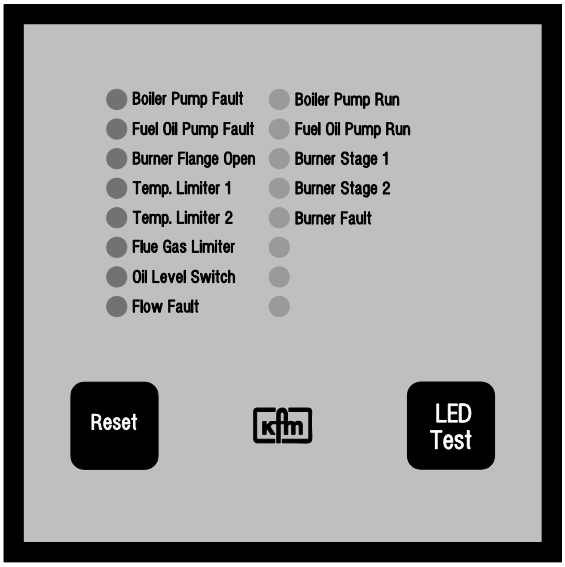
installation dimension:



Control panel cut-out: Height = 227.07 mm; Width = 301.07 mm

panel mounting:





General description:

Compact unit in the 96 x 96 mm switch panel format for operating and fault messages in control and monitoring systems.

Faults are displayed by red LEDs on the front panel, operations are displayed by green LEDs. (Optional colours can be supplied).

Operating displays are triggered by contact inputs and have a mere display function.
In addition, fault messages entail an internal, automatically interlocking alarm circuit (relay k1).

The 'reset' - button releasing the alarm locking situation is mounted on the front panel, together with a lamp-test button. One further optional button can be provided.

The legend film is behind the front film and can be accessed following the removal of the front frame. Legends can either be produced by the supplier according to instructions, or by the user on a laser printer or copier.

Types (Examples):

821 0016a	16 operation displays
821 0808a	8 malfunction warnings, 8 operation displays
821 1006a	10 malfunction warnings, 6 operation displays
821 1600a	16 malfunction warnings
...e	Option first- value message

Additional devices:

Type addition **"i."**	all malfunction indication inputs with inverted function for message chains
Type addition **".z"**	all malfunction indication inputs with 5 sec time delay
821 9s	Interface

Malfunction alarm display with single inputs
Type KFM 821

Functions:
Operating displays have a mere display function. Their display is by green LEDs (optional colours can be supplied).

Fault messages are grouped as a multi-input fault warning message by relay k1. When a fault has occurred on one of these inputs, the collective relay is switched off, the attendant red LED flashes. Once the *Reset button* on the front is actuated, the fault warning LED has steady light now. *Following* the remedy of the malfunction, the fault warning LED extinguishes and the collective relay is switched on again automatically.

Normal logic: In the event of further faults occurring in addition to existing faults, the LEDs of all faults that have already been acknowledged will have steady light, whilst the LEDs of the messages that have not yet been acknowledged will flash. The collective relay is switched on for a short time (about 2 sec.) additionally.

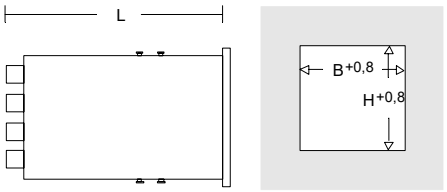
Option “first-value message” (type add-on ...e): In the event of a further fault occurring in addition to an existing, not yet acknowledged fault, the LED of the new fault message will have steady light, whilst the LED of the first fault message will continue to flash.

The button "LED test" is intended for a light diode function check.

Technical data:

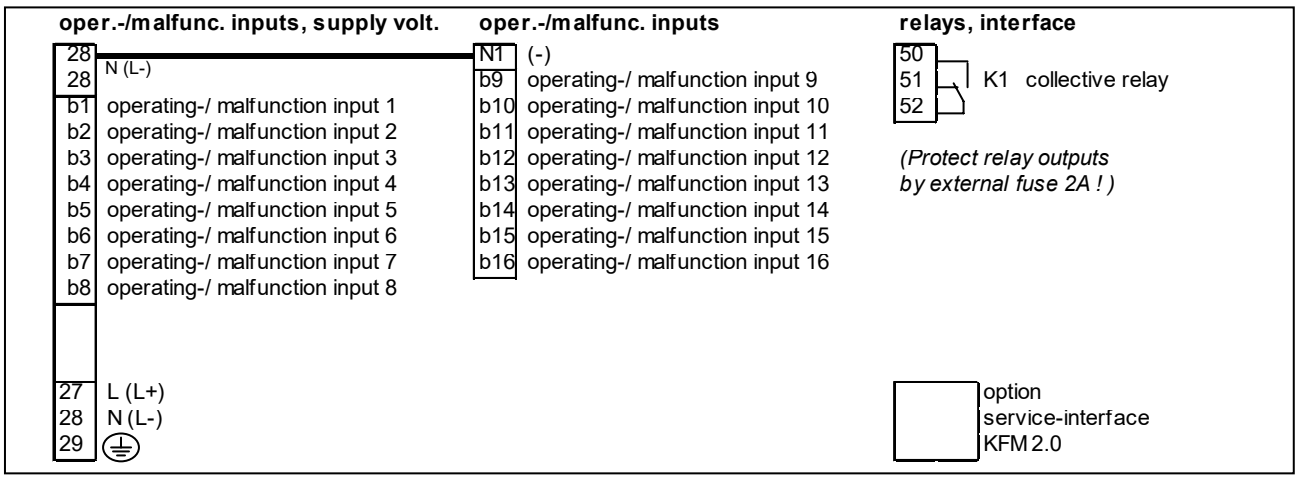
Operating- and fault- Display Inputs :	230 V, 48...62 Hz
Input current :	2 mA
Supply voltage :	230 V, approx. 3.5 VA
Relay outputs :	potential free change-over contacts for max.230 V / 2 A
Type of protection acc. DIN 40050 :	IP 54 (terminals IP 20)
Permissible ambient temperature :	0...60°C, nominal temperature: 20°C
Service position :	optional
Permissible relative humidity :	75 % average annual value (group F DIN 40040), without dew formation

Installation dimensions:



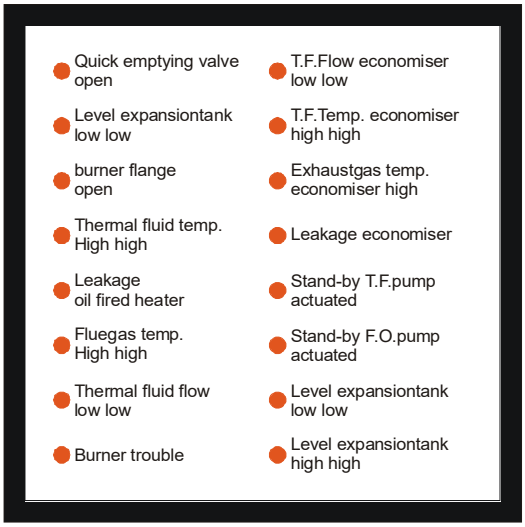
L = 150 mm, B = 92 mm, H = 92 mm

Connecting diagram:
(Example: 821 0808a, depending on sub type there may be some additional details or some details are missing ; valid for each version is the wiring diagram on its casing only.)



Malfunction alarm display with new value messages series 822..na for Single and Chain Alarm Inputs

822..na E



General description:
Compact device in 96x96 mm switch panel format for operating and malfunction indication in control and monitoring equipment.

Red LED's are used to indicate malfunctions, yellow for pre-alarms and green for operating indications on the front plate (other colours are possible as options).

Operating indications are controlled by contact inputs, and have a pure display function;
In addition, pre-alarms are switched to a collective relay.
Malfunction indications also initiate an internal, self-latching alarm circuit, switched to a collective relay.
Furthermore an additional relay exists for new value messages.

All operating functions are routed on terminals. The functions "Reset" and "LEDTest" are available by connecting external keys. This allows for each operating function also to be executed on multiple devices by a common key.

The labeling is done by the manufacturer with adhesive labels, according to customised specifications using a template file.

Type summary:

Type	Malfunction indications	Pre-alarms	Operating indications	Collective relay	Collective relay pre-alarms	New value relay	Keys
822 004.na	0	0	4x4	0	0	0	1
822 040.na	0	4x4	0	0	1	0	2
822 103.na	1x4	0	3x4	1	0	1	2
822 202.na	2x4	0	2x4	1	0	1	2
822 211.na	2x4	1x4	1x4	1	1	1	2
822 301.na	3x4	0	1x4	1	0	1	2
822 400.na	4x4	0	0	1	0	1	2
822 000_.....na	*	*	*	1	0	1	2

* = Freely selectable segmentation by two up to maximum 16 operating and malfunction indications (e.g. 822 000_**0214**.na = 2 malfunction indications, 14 operating indications)

model designation voltage (seventh position, e.g. 822 202**8**na**)**

0	230V AC supply voltage, operating / malfunction and external key inputs
8	24V DC supply voltage, operating / malfunction and external key inputs
type addition **".z"**	all malfunction indication inputs with 5 sec time delay
type addition **".i"**	all malfunction indication inputs with inverted logic (failsafe)

Supplementary equipment:

829s	Serial interface according to the KFM protocol 2.0 (service interface, e.g. permits connection of PROFIBUS-DP adapter 99spde.. for transmission of single indications)

Functions:
Depending on type there are operating, pre-alarm and malfunction-displays and -functions existing.

Operating displays have a mere display function. Their display is by green LEDs (optional colours can be supplied).

When a pre-alarm is registered at one of the *pre-alarm* inputs, the pre-alarm collective relay K3 (depending on type) operates and the associated yellow LED flashes.

After the external *reset* key is pressed, the pre-alarm LED now has steady light.

After the pre-alarm has been corrected the pre-alarm collective relay is reset, i.e. it drops out again and the pre-alarm LED goes out.

When a malfunction is registered at one of the *malfunction* inputs, the malfunction collective relay K1 operates and the associated red LED flashes. Additionally the new value relay operates for 3 sec.

After the external *reset* key is pressed, the malfunction LED now has steady light.

After the fault has been corrected the malfunction collective relay is reset, i.e. it drops out again and the malfunction LED goes out.

If another malfunction, in addition to the existing malfunction, occurs, the LED for the malfunction input that has now become active flashes and the new value relay operates for 3 sec.

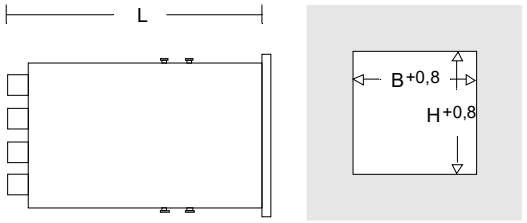
Option "Time delay" (type add-on z): The malfunction signal is only evaluated if it continues for a minimum of 5 seconds. This allows short and intermittent disturbances to be suppressed.

The function "LED-Test" serves to test the function of the light diodes.

Technical data:

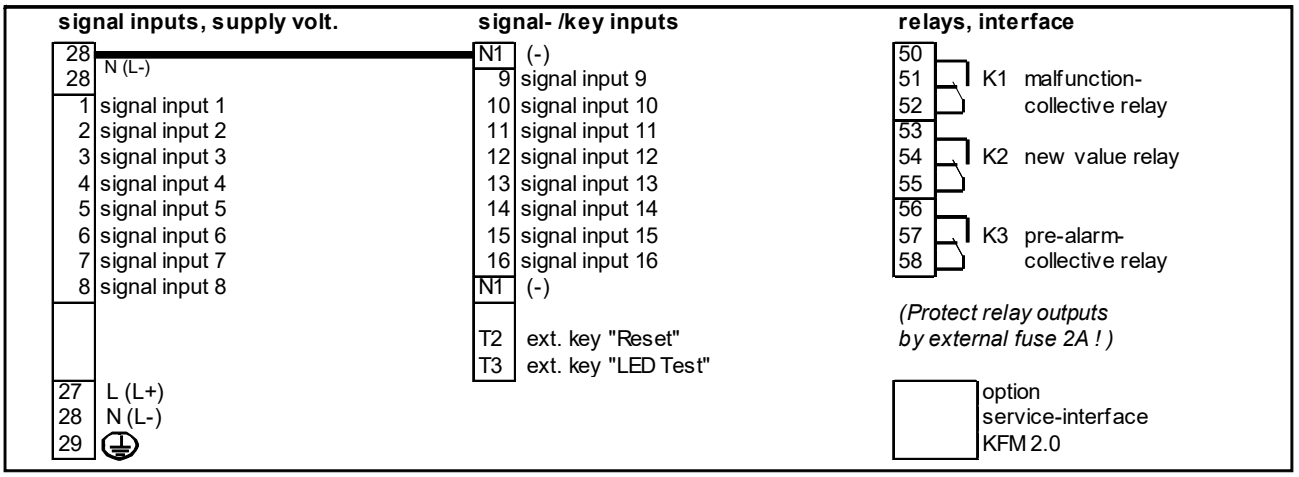
Signal inputs:	230 VAC / 24VDC, approx. 2 mA
ext. key inputs:	230 VAC / 24VDC, approx. 2 mA
Supply voltage:	230 VAC / 24VDC, approx. 3,5 VA
Relay outputs:	230 V / max. 2 A
Protective system EN 60529:	IP54 (terminals IP20)
Permissible ambient temp.:	0...60°C, rated temp. 20°C
Service position :	optional
Relative humidity:	<= 75 % yearly average, no condensation
Climatic category:	KWF to EN 60529
EMC:	referring to EN 61326

Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Connection diagram: (example)



1 Status-LED (CPU-module)
2 RJ-45 connector for KFM controller 902 / 93
3 Configuration interface (service) for PC connection
4 Binary input modules with relay
5 Power-LED (power supply module)



General description:

Compact device for operating and malfunction indication in control and monitoring equipment. In conjunction with KFM-controller 902 / 903 / 93.. operating and malfunction messages can additionally be displayed in plain text-messages on the controller. A message list shows the resp. texts for all activated binary inputs in the order of their occurrence. Additionally, a history can be displayed depending on the version. The messages can be assigned to relays for collective or first-value message optionally.

The device is modular in structure for mounting on DIN rail. It consists of a CPU- and a power-module and, depending on the number of required binary hardware inputs, of one ore more input modules, each with 8 binary inputs and one relay contact implemented as potential-free changeover contact.

The configuration of the inputs, the assignment to the collective relay and the entry of the texts can easily be modificated by WinPKS-PC-software.

Types:

CPU-modules:

826260	CPU-module with interface for plain text-messages
826264	CPU module with interfaces for plain text-messages on devices 902/93 (LC-display) and for the connection of a bus adapter or additional device, for example, profibus or external setpoint.
826265	CPU module with interfaces for plain text-messages and history on devices 903/93 (TFT-display) and for the connection of a bus adapter or additional device, for example, profibus or external setpoint.

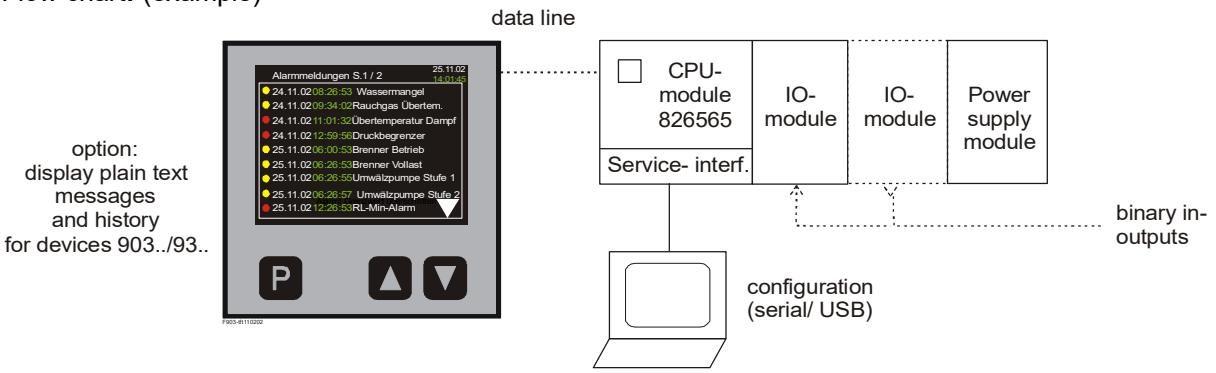
Binary in- output modules:

826230	Module with 8 binary inputs 230VAC,1 relay contact (pot.free changeover)
826238	Module with 8 binary inputs 24VDC,1 relay contact (pot.free changeover)

Power supply modules:

826250	Power supply module 100-230V AC
826258	Power supply module 24V AC or DC

Flow chart: (example)



Technical data:

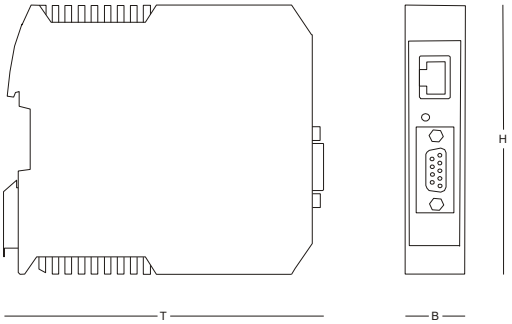
Operating- / malfunction inputs*:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
Button inputs*:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
Relay output :	230 V / max. 2 A

* = Depending on different wire connention to the terminals, the use of external voltage alternatively to potential-free change-over switches is possible.

Other operating data:

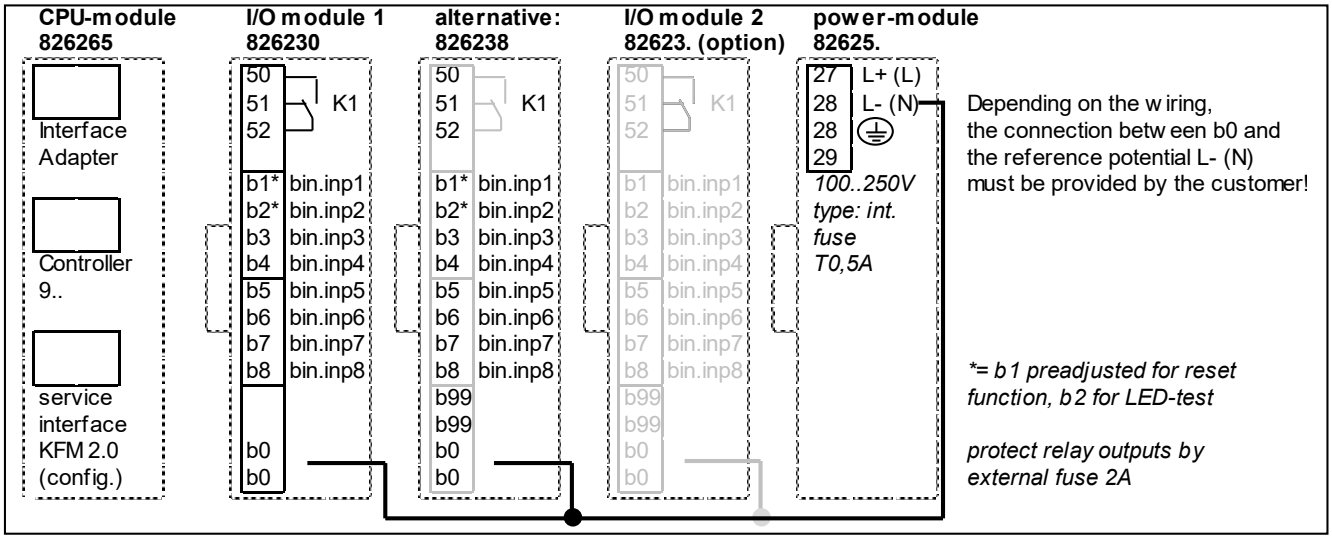
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)

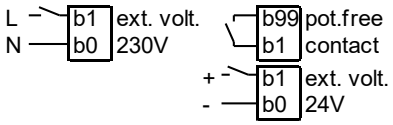


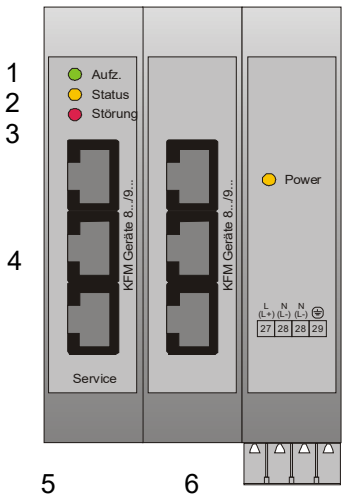
H= 99mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only.)



Wiring, example inp. 1:





1 Green LED for indication data recording
2 Yellow LED for operation mode indication
3 Red LED for malfunction indication
4 Interfaces for KFM devices
5 Own Service interface
6 Optional interface module

General description:

The KFM 834 data logger product line is used for the continuous recording and storage of operational data of KFM devices like controllers KFM 9.., malfunction alarm displays / alarm panels KFM 82 via a serial interface. Additional analogue and digital data can be handled optionally.

The devices are modular in structure, for mounting on DIN rail. The hardware basic version consists of the CPU-module 834100. and a power-module 85250. and includes 3 interfaces for connection of up to 3 KFM devices. Optional equipment: interface modules for further devices.

The Windows programs DCSLOG for reading the stored data by PC (locally or via modem) and LOGSET for changing the logger parameters are included in delivery. The adapters Type KFM 99szks2 / 4 / u have to be used for the logger`s service interface.

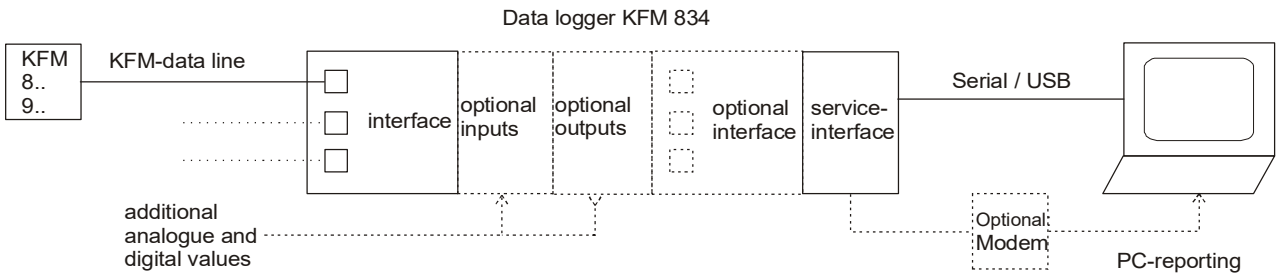
In maximum 24 analogue tracks are available.The recording period is limited by the memory capacity, the number of activated tracks and the recording cycle (example: with 4 analogue tracks and a recording cycle of 2 minutes the recording period will be about 18 days).

A ring buffer effects continuously the overwriting of the oldest stored data when the max. memory capacity is reached.Optionally an alarm contact can signalise the achievement of a certain memory utilisation ratio.

The devices are modular in structure, consisting of functional- and power supply module, alternatively type version .._i can directly be used with the power supply of already existing KFM-assemblies, e.g. series 8…

Optional equipment: Input modules for analogue and binary input for direct recording, independent from connected KFM-devices, as well as signalising modules with relay outputs (pot. free change-over contacts).

Flow chart:



Type summary:

CPU-module:

834100	Basic model
834130	Basic model, additional interfaces expandable via bus plug

Device variants (last number)

.i	Functional module for connecting power supply of already existing KFM-assemblies *(type 834100 only)*

Power supply module:

852500	Power supply module 100-250V AC
852508	Power supply module 24V AC / DC

Interface module (optional):

834030	3 x KFM interfaces for connection, connection to CPU-module via bus plug

Interfaces:
3 x KFM-devices, (optionally expandable via interface module) baudrate 9600,19200 and 38400 bit/s, connection via enclosed connecting cable.

1 x service, transfer rate 38400 bit/s for operation, data transfer and configuration.
Connection via external interface adapter for RS232, RS485 or USB (KFM-Type 99szks2 / 4 / u) resp. without access to stored data for Profibus (KFM-type 99spde.) or Modbus (KFM-type 99sm.).

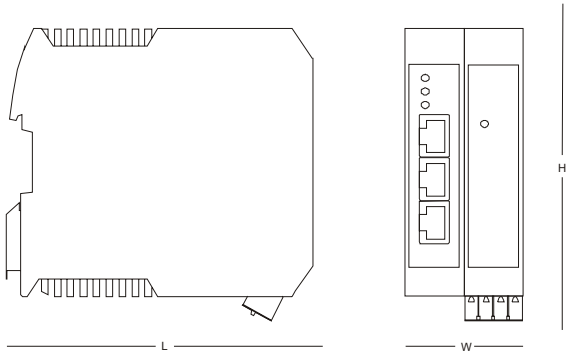
Technical data:

Power supply:	100..250 VAC, approx. 12 VA, alternative 24V AC / DC, approx. 12 VA
optionally: binary inputs:	230 VAC, approx. 2 mA, alternative 24VDC, approx. 2 mA
optionally: relay outputs :	230 V / max. 2 A

Other data:

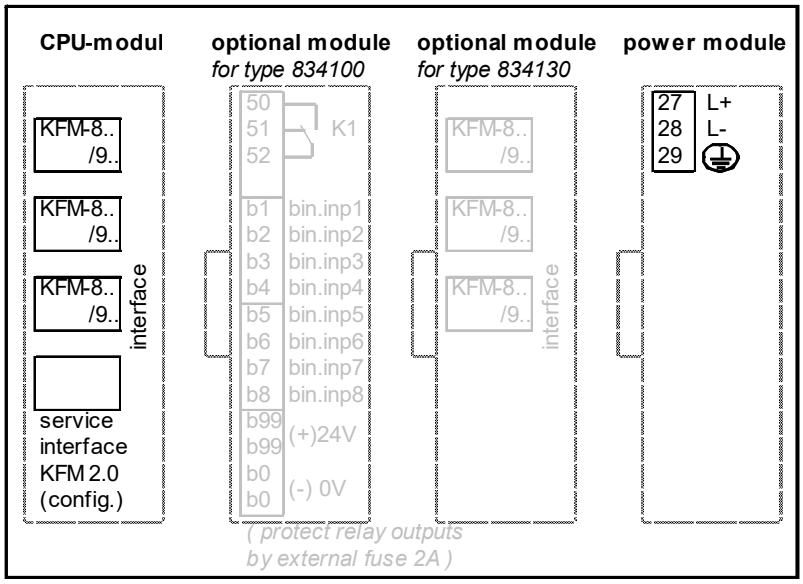
Housing:	For DIN rail
Installation orientation:	vertically, locking tab points downward
Type of protection acc. EN60529:	IP20
Permissible ambient temperature:	0...60°C,
Nominal temperature:	20°C
Relative humidity:	<= 75 % yearly average (according to EN60529), no condensation
EMC:	according to EN 61326

Dimensions (hardware basic version)

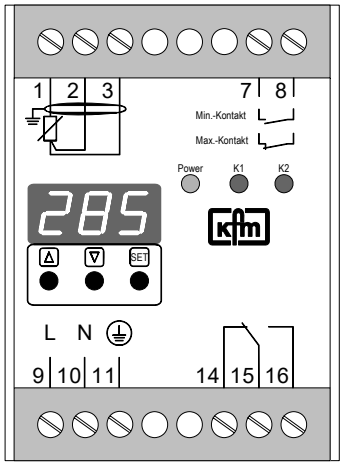


H= 124mm, W = 45mm, L = 116mm

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only.)



1 Digital display of setpoint value
2 Pushbuttons for adjusting the setpoint values
3 LEDs for operating and error indication



General:

Type 842 is a temperature switch with digital display of setpoint value and a configurable contact-function.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and ex-barrier units, as an alternative depending on the type there is a standard signal measuring input 0(4)-20mA and 0(2)-10V available.

Depending on the wiring of the binary input the device operates as a min. or max. contact.

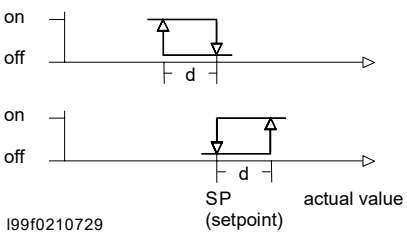
Types:	type suffix
Basic type, measuring input PT100 (0 –400°C)	without
Measuring input standard signal 0(4)..20mA, 0(2)..10V	..e

Function:

After the mains voltage has been switched on, the operating indicator and also LED K1, depending on the actual value, and the setpoint value lights up. Depending on the wiring of the binary input the characteristic of the relay can be inverse or direct, in every case the relay is released if the determined setpoint value has been reached. The relay is switched on again upon exceeding the hysteresis each.

Min. contact: (Terminals 7 and 8 not connected)
Relay K1 switches on if the actual value is lower than the setpoint (minus the hysteresis)

Max. contact: (Terminals 7 and 8 connected)
Relais K1 switches on if the actual value is higher than the setpoint (plus the hysteresis)



Actual value display:

The actual value is displayed as long as the the arrow up key is pressed.

Adjusting the setpoint value:

The mode in which the setpoint value is adjusted is activated by pressing the "SET" button, the displayed value flashes. The new setpoint value can now be adjusted using the arrow keys. The setting mode is deactivated by pressing the "SET" button again. The displayed value ceases to flash, and the adjusted value is adopted as the new set value.

Fault:

The relay is switched off if there is a fault at the measurement input. Then the display shows "---" in the actual value display mode.

Adjusting the parameters:

The mode in which the first parameter switching hysteresis "d" can be configured is entered by holding the "SET" button for 5 seconds. The display shows the short name "d" in the first position and the currently adjusted value flashing in the second and third position. The desired new value can now be adjusted using the arrow keys. By pressing the "SET" button again the adjusted value is adopted as the new switching hysteresis and, depending on the type, the mode in which the next parameter can be configured is entered. At the last parameter the device reverts to its normal operation status display after pressing the "SET" button again.

Settings in detail:
(existence depends on version and type):

Polling:press and hold the SET-button for >5 sec,
release after the display reacts.

		Factory setting:	*Notes:*
d	Hysteresis (switching difference on/off)	*8 (Type: ..e: 0,5)*	___
n	Number of decimal places of the display "-1 / 0 / 1" * (If "-1" is configured each parameter L / H is automatically multiplied by 10 for the actual value display!)	*1*	___
L / H	start / end of display range (dep. on the number of dec. places) *	*0.0 / 8.0*	___
A	Input type: "i0: 0-20mA / i4: 4- 20mA / u0: 0-10V / u2: 2...10V" * (note different terminals for I/U!)	*4...20 mA*	___

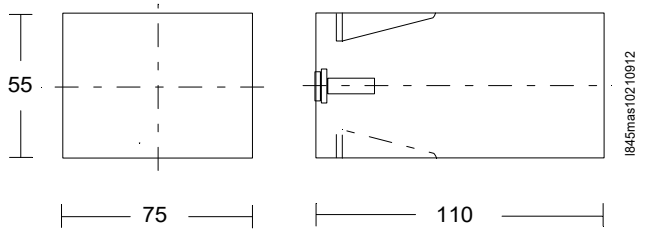
** only with input voltage / current*

***return** to operating mode*:
briefly press the SET-*button*

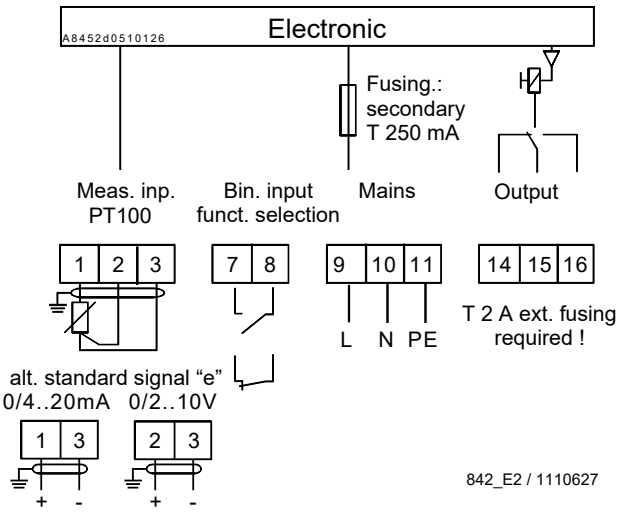
Characteristic values:

Analogue input:	1 x Pt 100 DIN, three-wire techniques, standard signal alternatively
Measuring range	0 ... 400 °C resp. adjustable
Adjusting the setpoint values:	Using recessed push-buttons
Output:	1 relay, max 250 V 2 A
Switching hysteresis:	adjustable, 1 .. 99 K
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz
alternatively:	115 VAC, 48 VAC, 24 VAC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20
Permissible ambient temperature:	0...60°C
Nominal temperature:	20°C
Storage and transport temperature:	-20 ... + 80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional

Installation dimensions:



Connection diagram:



1 Digital display of set value
2 Pushbuttons for adjusting the set values recessed and sealable
3 Internal reset pushbutton
4 LEDs for operating and error displays
5 Function check button



DIN assembly tests:

STB 1146 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0045	ref. rule 97/23/EG, modul B and D

General:
Two-channel self-monitoring safety temperature limiter, constructed to meet the requirements for increased safety (DIN EN 14597, SIL 2).

The electrical safety circuit is switched off, i.e. opened, if the set value is exceeded or if there is a fault at the measurement input or in the device. A fault signal is also provided at the terminals. The limiter can only be unlatched manually after the fault has been rectified.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and intermediate explosion arresters.

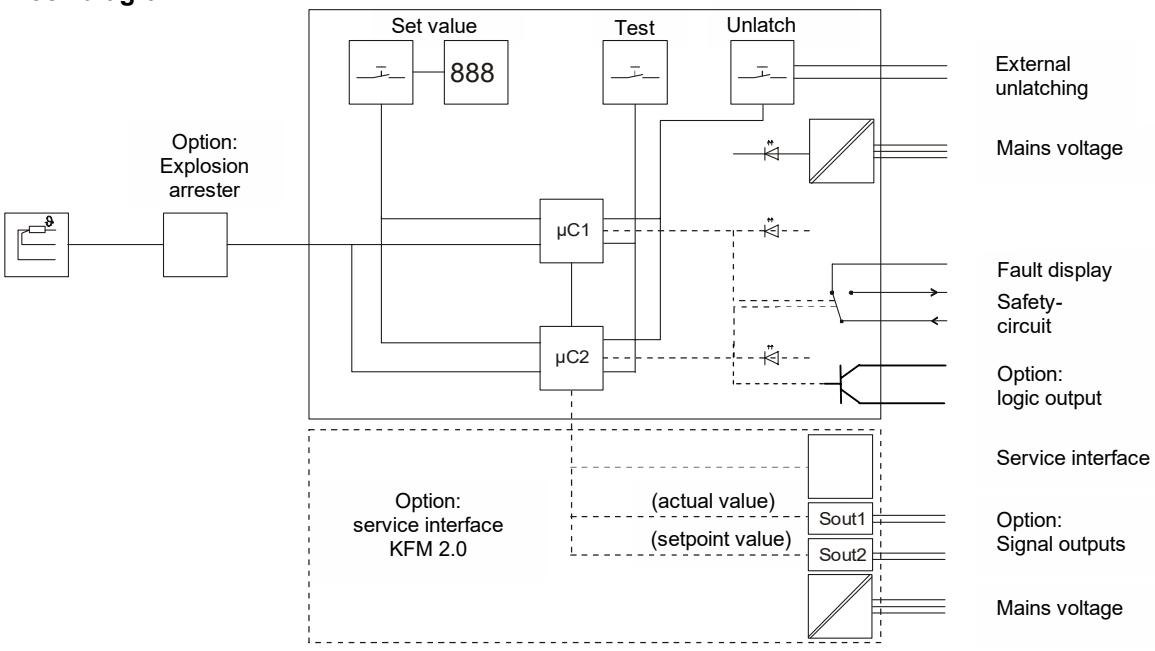
The device includes test buttons with which the specified annual function checks can be carried out very conveniently, without having to disturb the connected cables.

Actual- and setpoint value as well as the status of the relays can be transmitted by using the optional service interface (extra module), actual- and setpoint value can additionally be transmitted by optional signal outputs. In conjunction with external adapters also with Profibus, Modbus, Ethernet etc.

Models:

845 210	Model without display
845 220	Model with display
845 2 ⊿1	Model with additional logic output
845 2….-849s	Model with service interface, protocol KFM 2.0
845 2….-849og2	Model with 2 signal outputs 4..20mA
845 2….-849sog2	Model with service interface and 2 signal outputs 4..20mA
Suffix (also extra module)	without: 230V AC, 01 = 115V AC, 02 = 24V AC, 08 = 24V DC

Block diagram:



Acceptable sensors:
All temperature sensors demonstrably according to DIN EN 14597 are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet.

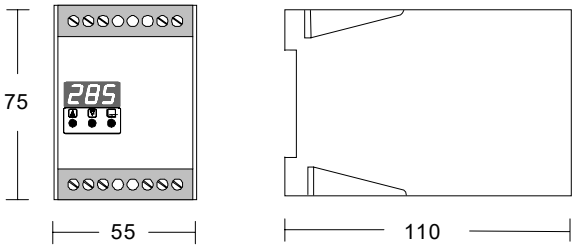
Type	Operating medium	Maximum switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

Characteristic values:

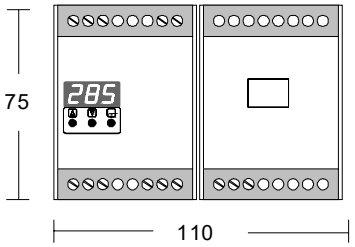
Input / Measuring range:	1 x Pt 100 DIN / -200 ... + 600 °C, others optional
Set value adjustable range:	*Note: Observe the sensor's switching point!* Type 845 210: -200 °C (+10K) ... 600 °C (-10K) Type 845 220: -99 ... 600 °C
Adjusting the set values:	Using recessed, sealable push-button
Output:	2 relays, max. 250 V 2 A*, Option: 1xLogic (open coll. max 24VDC/100mA) status display ch. 1 Option: 2 cont. outputs 4...20mA (Load<=500Ω) for actual-/ setpoint value
Switching hysteresis:	8 K +/- 1K, other values available on request (expressed as appendix to type identifier in plain text, e.g. 845 220 4K)
Process safety time (PST):	10 seconds
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz, alt. 115 VAC, 24 VAC, 24VDC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20, for mounting within a housing offering at least IP 40
Permissible ambient temperature:	0...60°C, Nominal temperature: 20°C
Storage and transport temperature:	-20 ... +80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional
Data transfer rate:	9600Bit/s

Installation dimensions:

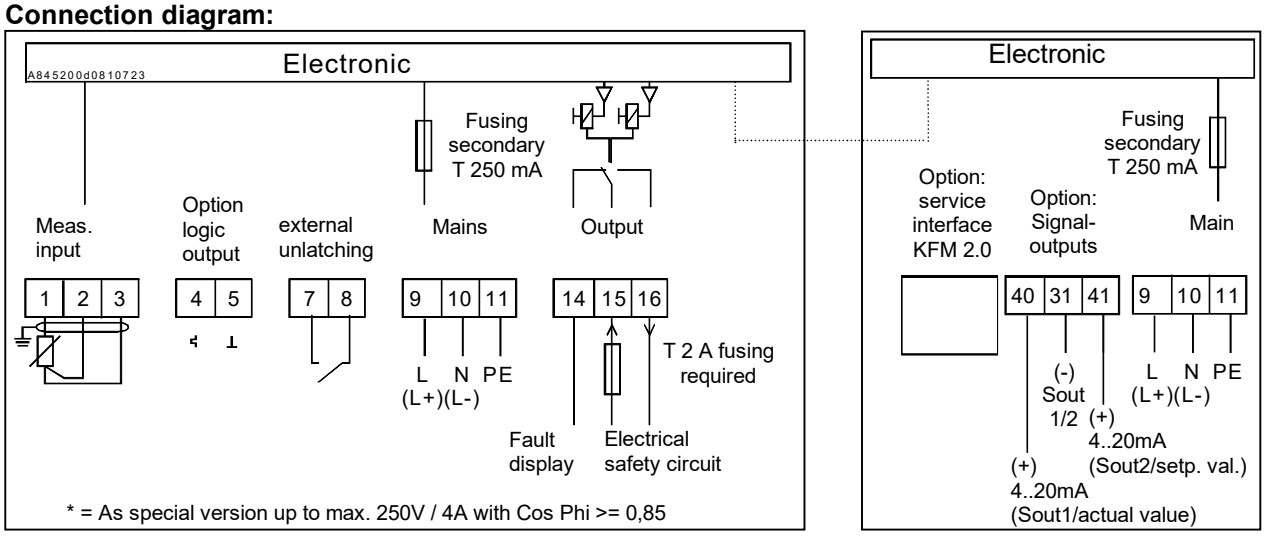
Only safety temperature limiter:



Safety temperature limiter incl. service interface / signal outputs



Connection diagram:



1 LEDs for operating and error displays
2 Pushbuttons for functional test, reset and adjusting the set values (recessed and sealable)
3 TFT display
4 Pushbuttons for operation and reset
5 Bus interface for KFM field bus adapter
6 USB service interface



type test approved:

STB / STW 1255 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0035	ref. rule 2014/68/EU

General:
Safety temperature limiter (STB) or monitor (STW) in two-channel and self-monitoring design in accordance with the requirements for extended safety (DIN EN 14597, SIL 2).

A switch-off, i.e. interruption of the safety circuit, occurs when the set limit value is exceeded (max function) or undercut (min function) as well as in case of errors in the measuring input or device. Unlocking is only possible manually and only after the fault has been eliminated (STB) or automatically (STW). Operating principle according to DIN EN 60730 Types 2B, 2H, 2K, 2P and 2V (only STB).

Depending on the version, PT100, stand. signal (4-20mA) or thermocouple are available as meas. inputs.

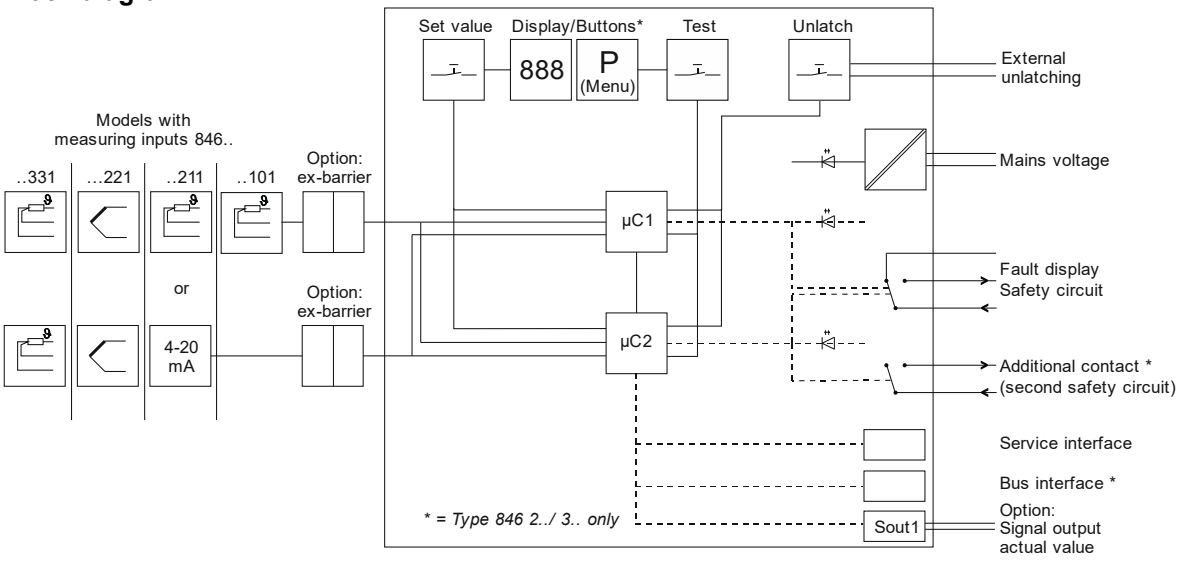
A potential-free safety-related additional contact is used for parallel output of the switching status.

The ix industrial bus interface allows the connection of KFM adapter modules, e.g. 99spne (Profinet), which allows the actual value, limit value and status of the device to be read out. When the bus interface is plugged in, safety operation is possible without any changes.
The service interface is used exclusively for parameterising the STB, e.g. during commissioning. Safety operation is not possible when the USB plug is plugged in.

Models:

846 100	Basic version STW - max, input Pt100 without TFT display
846 101	Basic version STB - max, input Pt100 without TFT display
846 211	Basic version (STB/STW), input Pt100 / 4-20mA with TFT display
846 221	Version (STB/STW) with input 2 x thermocouple
846 331	Version (STB/STW) with input 2 x Pt100
Suffix	without: 100-250 V AC, 8 = 24V DC

Block diagram:



Characteristic values:

Input / Measuring range:
Pt100 / standard signal, -200..+600 °C / adj.,
thermoelement NiCr-Ni (K) 0..1200 °C,
thermoelement Fe-CuNi (J) 0..900 °C

Set limit value adjustable range:
Pt100 / standard signal, -200..+600 °C / adj.,
thermoelement NiCr-Ni (K) 0..1200 °C,
thermoelement Fe-CuNi (J) 0..900 °C
Note: Observe the sensor´s switching point!

Output: 1 relay, max 250 V 2 A,
optional 2nd relay (only normally open contact), 1 continuous output 4...20mA (load<=500Ω) for actual value

Switching hysteresis:
8461..: 8 K +/- 1K, other val. available on request
8462/3..: adjustable

Interfaces:
Service interface KFM 2.0 micro USB 2.0 type B
Bus interface KFM 2.0 ix Industrial type A

Mains connection: (without protective conductor connection) 100-250VAC +10% / -15%, 24VDC, ca. 3 VA

housing: mounting on 35mm standard rail
Mounting position: any
Weight 8461.. / 8462..: 170 gr. / 260 gr.

Type of protection acc. EN 60529:
IP 20, for mounting within a housing min. IP 40

Permissible ambient temperature: 0..60 °C,
Storage/transport temperature: -20..+80 °C
Nominal temperature: 20 °C,transport in carton

Climatic resistance: Rel. humidity <= 75 % annual average without condensation, maximum installation altitude 3000m

Electromagnetic compatibility:
According to EN 61326, industrial requirement

Acceptable sensors:

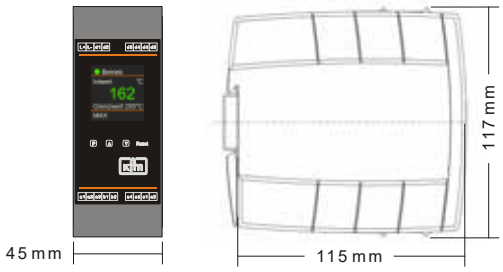
All temperature sensors demonstrably according to DIN EN 14597 resp. rule 2014/68/EU are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet. When protecting pressure equipment, care must be taken when selecting the sensor to ensure that it meets the requirements of the Pressure Equipment Directive 2014/68/EU.

Type	Operating medium	max. switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

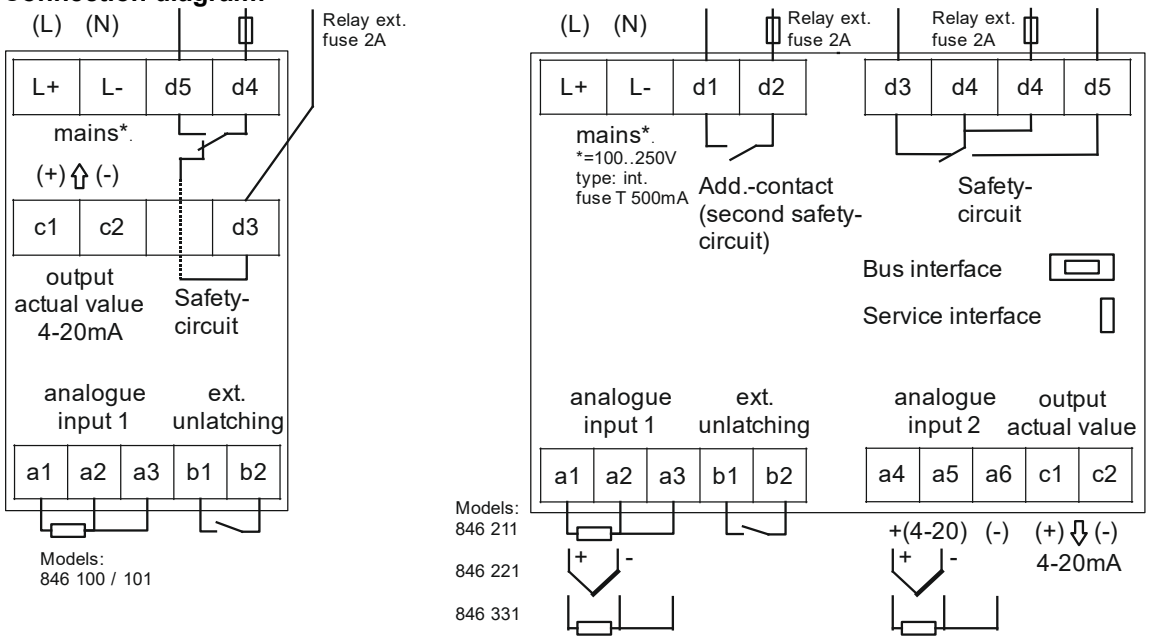
Installation dimensions: 846 1..:



846 2.. /3..

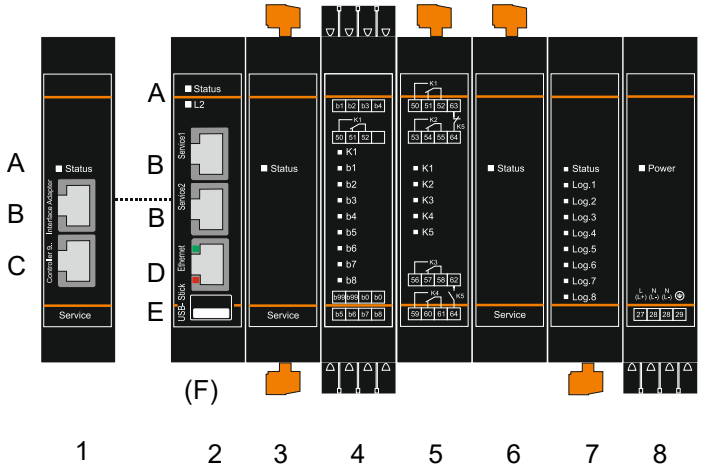


Connection diagram:



A Status LEDs (depending on the module)
B Service interfaces
C Interface to KFM controller 9..
D Ethernet interface
E Internal USB stick interface
(F) Internal USB-C interface and T1 control button

1 Hardware expansion adapter (852610) or alternatively
2 CPU module (852622(E))
3 Analogue input module (8522..)
4 Binary input module with relays (8523..)
5 Relay output module (8527..)
6 Analogue output module (8528..)
7 Logic output module (8528..L)
8 Power supply module (8525..)



General description:
The modular hardware expansion modules are used to expand the hardware built into KFM devices with additional inputs and outputs.
To connect to external KFM devices, e.g. the 903K series controllers, the 852610 hardware expansion adapter is required on the module side; this establishes the connection to all other modules. Optionally, a fieldbus adapter can be connected to the hardware expansion adapter (the 'Interface Adapter' (B) port). Alternatively, expansion modules can be connected directly to stand-alone function modules, e.g. to module 852620 (data acquisition only), data processing modules 852621 and 852622(E), data loggers 834.. or fault indicators 826..

Module overview:

CPU modules:

852610	Hardware expansion adapter for KFM controllers
852620	Standalone data acquisition module
852621	Freely configurable data processing module *(old version)*
852622(E)	Freely configurable CPU module with USB interface for memory sticks (With Ethernet interface for e.g. Profinet or Modbus TCP/IP, 2x service interfaces)

Power supply modules:

852500	Power supply module 100–230 V AC
852508	Power supply module 24 V AC or DC

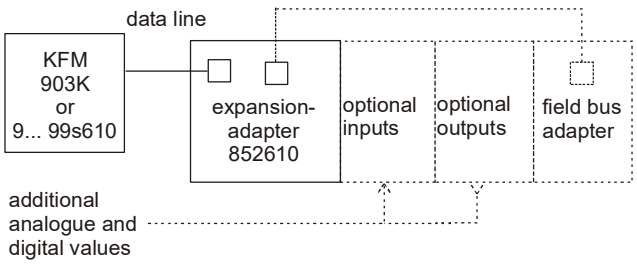
Additional analogue modules (+ logic outputs):

852220	Module with 2 analogue inputs for Pt100 / standard signal, range 0–400 / adjustable
85222w	Module with 2 analogue inp. for potentiom. 0...100/1000Ω / stand. signal, range adjustable
852280	Same as 852220, but range -200..+800 / adjustable
852820 (852850)	Module with 2 (5) analogue outputs 0/4...20 mA
852880L	Module with 8 logic outputs 0 / 24 V DC

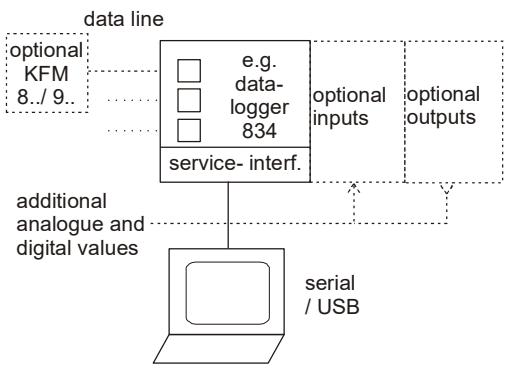
Additional digital modules:

8523801	Module with 8 binary inputs 230 V AC, 1 relay output (potential-free changeover contact)
8523881	Module with 8 binary inputs 24 V DC, 1 relay output (potential-free changeover contact)
852750	Module with 5 relay outputs (changeover contacts, max. 250V 2A)

Application: with hardware expansion adapter



with a standalone function module



Interfaces:
1 x KFM-device 903K or 9.. 99s610 (only hardware expansion adapter 852610), connection via the supplied cable, 1x interface adapter

Only 8522../ 8528..: 1 x TTL, protocol KFM 2.0, only for KFM- service

Only 852622..: 1 x Service interface for configuration, alternative for interface adapters;
1 x USB stick, 1 x USB-C (internal), depending on version Ethernet interface

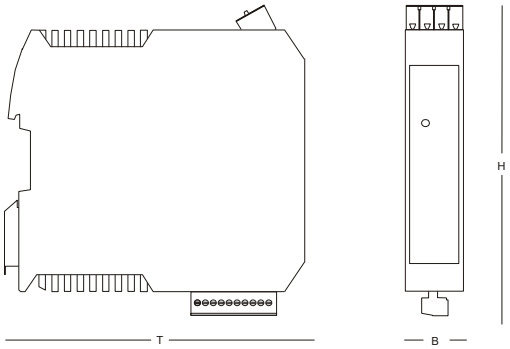
Technical data:

Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
optional: bin. inputs:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
optional: anal. inputs:	• Pt100/ standard signal, range 0..400 resp. -200..+800°C / adj. • Potentiometer 0…100/1000Ω / standard signal, range adjustable
optional: relay output:	230 V / max. 2 A
optional: anal. output:	0/4..20mA (load<=500Ω) as control or signal output

Other operating data:

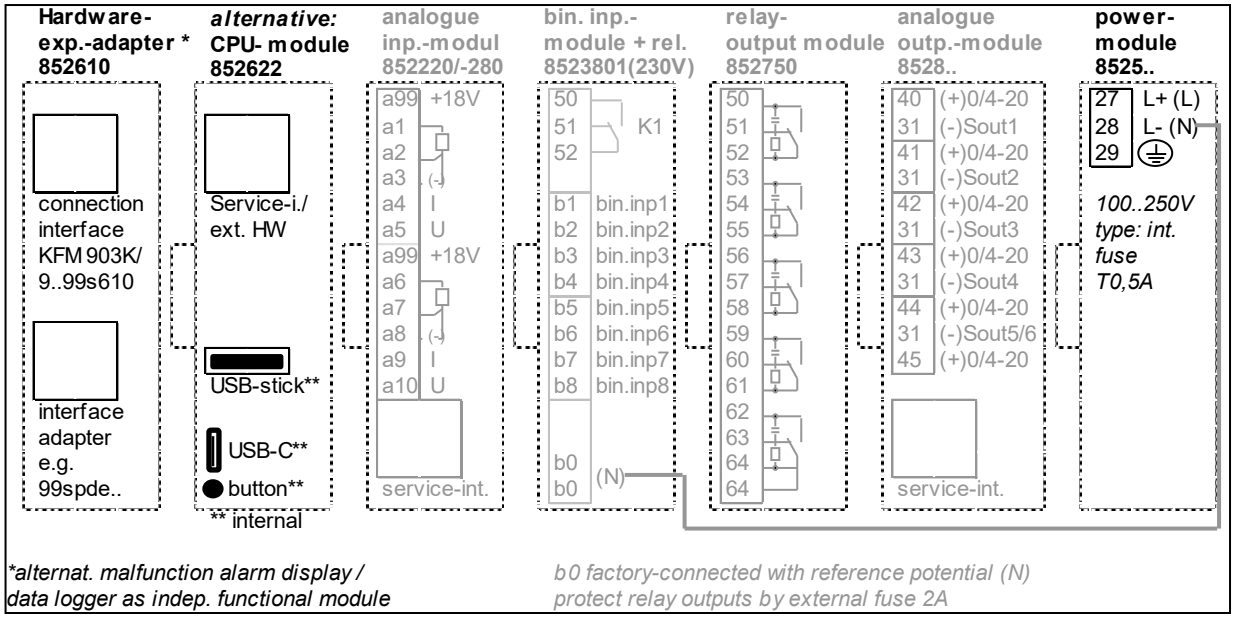
Housing: for fastening to 35mm mounting rail
Installation orientation: vertical, unlocking tab downwards
Type of protection: IP20
Perm. ambient temperature: 0...60°C,
Nominal temperature: 20°C
Climatic category :Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Installation dimensions (each module)



H= 124mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered device is the wiring diagram on its casing only.)



1 Display of relay functions
2 Digital display of value with unit and label text
3 Digital display of setpoint with unit and label text
4 Display of binary input function
5 Digital display of value with fixed unit and label text
6 Buttons for device operation
7 RJ-45 KFM 2.0 bus interface
8 Setup interface: USB-C KFM 2.0



General:

The **Type 8521** compact controller is a modular industrial controller designed for **DIN rail mounting**. It features a **1.44-inch TFT display** and a compact **45-mm housing**, suitable for installation in distributed or centralised automation systems.

The controller **provides four relay outputs**, **three** of which are **pre-wired internally for specific applications**. Depending on the version, a **binary input** is used to switch an external setpoint, alternatively a secondary setpoint, or to control the start/stop of the control process. In addition, a **4–20 mA output** is available, which, depending on the configuration, can be used as a control output or as a pure signal output.

The control function can be flexibly selected as follows:

- **Two-stage** with **two** auxiliary contacts
- **Three-point step operation**, with **two** auxiliary contacts
- **Continuous** with **four** auxiliary contacts.

Various options are available for the measurement input: **PT100**, **4–20 mA standard signal** or **thermocouple**. This allows the 8521 to be adapted to different process variables and transmitters.

A **communication interface** enables connection to higher-level **control systems**. Furthermore, the controller can be operated as a standalone functional unit within the **852.. series of** modular **hardware extensions**.

The Type 8521 is therefore suitable for compact, modular and customisable control solutions in industrial applications.

Versions:

852 127 852 1278	Basic version, 1x Pt100 input (Ai1) / 4–20 mA (Ai2), mains 100–250 V AC as above, but 24 V DC mains supply
852 127x 852 1278x	2x Pt100 inputs, mains supply 100–250 V AC as above, but 24 V DC mains supply
852 127t 852 1278t	1x input: Type J/K thermocouple (Ai1) / 4–20 mA (Ai2), mains 100–250 V AC as above, but 24 V DC mains supply

Technical data (continued)

Input / measurement range:

Pt100 -200 to +600 °C,
standard signal 0/4–20 mA / 0/2–10 V, range adjustable, NiCr-Ni (K) thermocouple 0–1200 °C, Fe-CuNi (J) thermocouple 0–900 °C

Output:

1 potential-free relay, max. 250 V, 2 A;
3 potential-connected relays, max. 250 V, 2 A;
1 continuous output 4...20 mA (load <= 500 Ω)

Binary input:

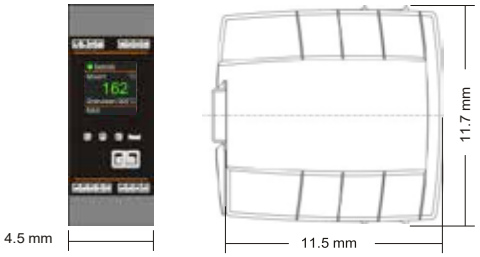
for potential-free contact

Interfaces:

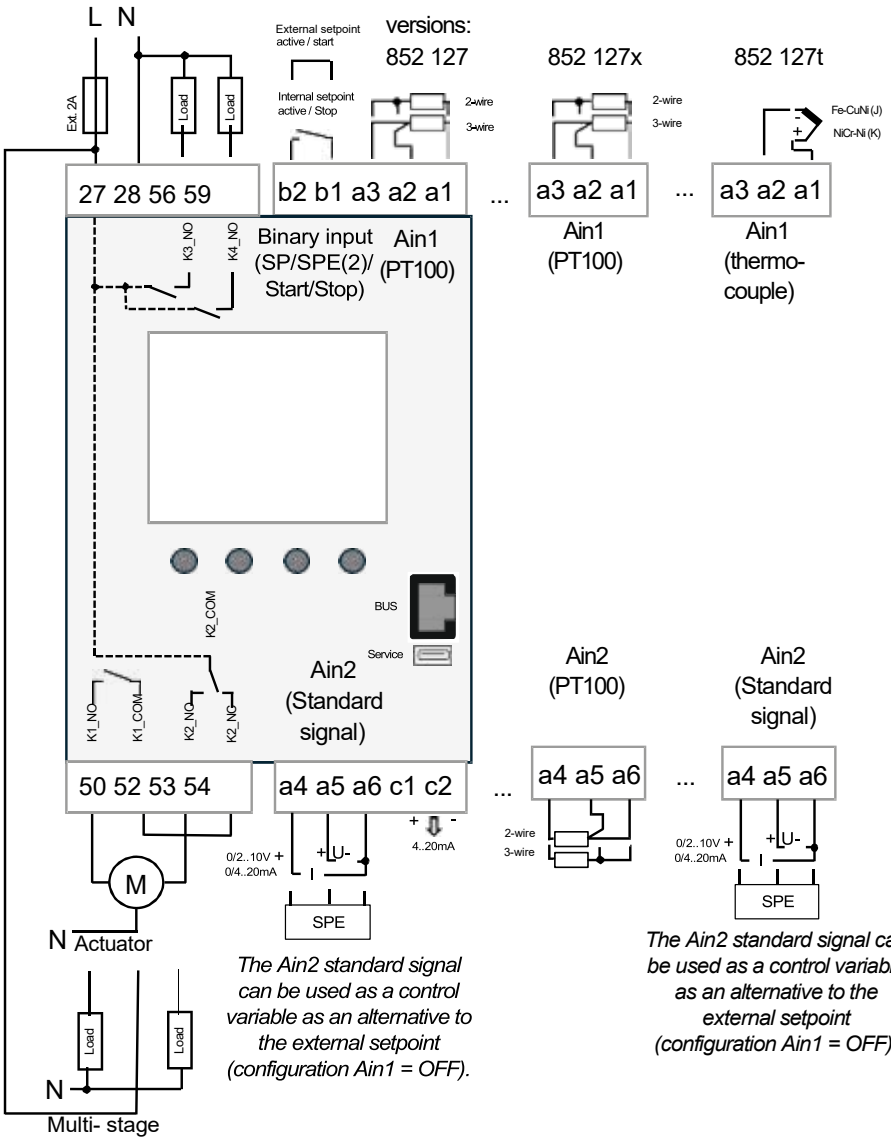
Service interface KFM 2.0 RJ-45 (female),

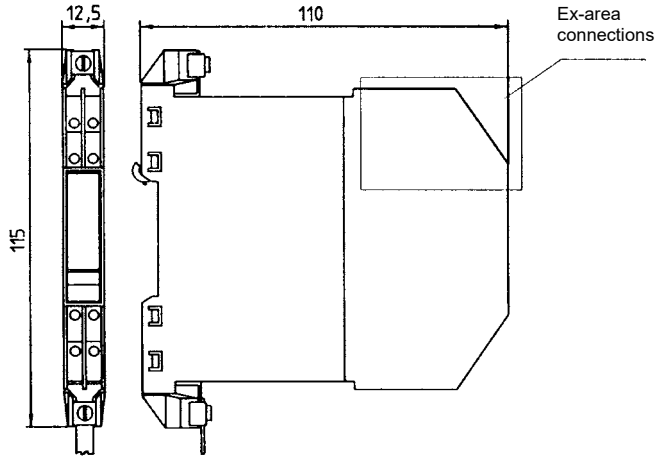
Setup interface KFM 2.0 USB-C (female)

Installation dimensions:



Wiring diagram:





Function:

Safety barriers are used to connect intrinsically safe and non-intrinsically safe circuits. They limit the energy that can be transferred from non-hazardous to hazardous areas, especially in the event of faults.

Technical specifications:

design:	modular terminal box made of Makrolon
type of ignition protection:	[EEx ia] II C,
assembly:	on 35 mm standard rail
field of application:	in the Federal Republic of Germany: Zones 1 + 2
Permissible ambient temp.:	-20 . . +60°C
certificates:	II (1) G D [EEx ia]IIC BAS01ATEX7005
	II 3 G EEx n A II T4 TÜV99ATEX1484x
protection class:	IP 20
dimensions:	12,5 x 115 x 110 mm
Weight:	about 0,15 kg

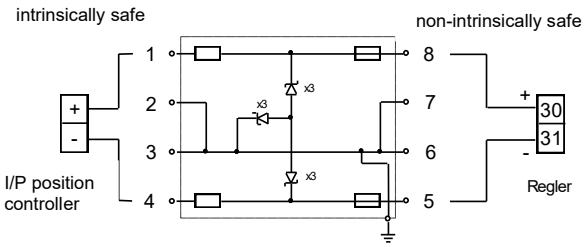
types:

Ex safety barrier for signal transmissions 0(4)...20mA, 2-channel (alternating polarity)
Max. operating voltage 15V, max. current 50mA, max. longitudinal resistance 115 ohms
List-no. 889507a

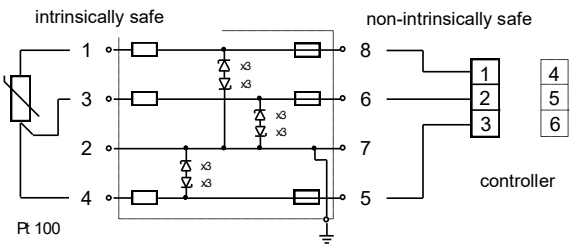
Ex safety barrier for 3-wire connection of resistance thermometers, 3 channels (alternating polarity), max. operating voltage 4.5V, max. current 50mA, max. longitudinal resistance 27.27 ohms
List-No. 889508

Connection:

List-no. 889507a
(z.B. I/P positioner connection):



List-no. 889508
(Pt100 with 3-wire connection):





Transparent cover door

List-no.:889 912

For series 822.., 92.., 93.. and 90..



Verschließbare Klarsicht Abdecktür

List-no.:889 915

Special design, only on request

General:

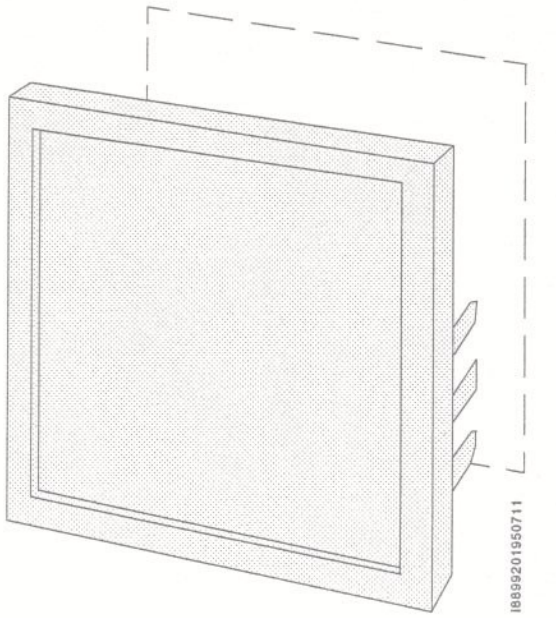
Transparent cover door for KFM devices in 96 x 96 grid dimensions to protect against dust, splashing water or unauthorised operation.

Technical data:

ductility:	until -150°C
Heat and shape resistance:	until 145°C
flame retardant:	UL 94 V – 2

versions:

List-no.: 889 912	Transparent cover door with snap lock, shape 96 x 96 (can also be locked, e.g. with a screw and nut) for series 822.., 92.., 93.. and 90.. (Protection class according to DIN EN 60 529: IP40)
List-no.: 889 915	Lockable transparent cover door with key, shape 96 x 96 Special design, only on request (Protection class according to DIN EN 60 529: IP54)



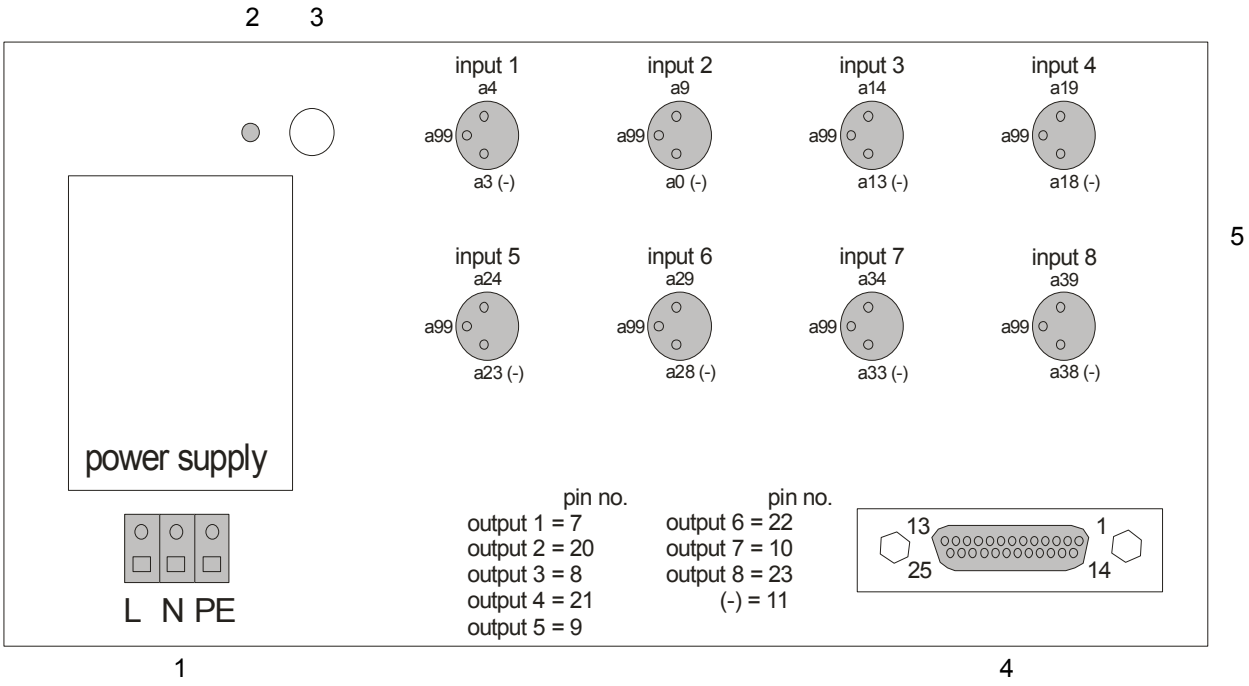
Blanking covers are used to cover unused switchboard openings.

The supplied clamping springs are pressed onto the cover's fitting bolts.
The blanking cover can then be inserted into the switchboard opening from the front.

nominal size	panel cut-out*	Li.no:
96 x 96 mm	92 (+0,8) x 92 (+0,8)	889 924

Other dimensions available on request.

*acc. DIN IEC 61554



1 power supply terminals
2 power LED
3 fuse (T 0,2 A)
4 outputs D-Sub 25 socket (0..5V)
5 inputs 8 x M8 sockets (4..20mA)

General

The electronic measuring transducer 899.. converts incoming signals linear from 4..20 mA to 0..5 V output signals. A maximum of 8 channels is available. The signal can be connected active or passive (supply by circuit board) depending on the wiring. Signal lines must be laid with shielded cables. To avoid cross interference, do not lay close to live components or lines. Lay the shield to ground potential on one end.

The connection of the 4-20mA input signals is made by eight M8 sockets, the 0..5 V output signals are available on a D-Sub 25 socket.

The operational readiness is displayed by a green led if the power supply is connected.

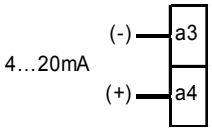
The device is working without any user intervention, it is intended for mounting on standard rails.

Tecnical data:

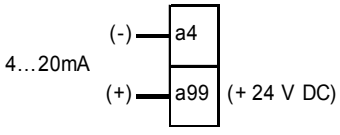
Input:	8 x 4...20mA, active or passive signal alternatively
Output:	8 x 0...5V, load > 500 Ohm (filter 100Ω/10nF)
Power supply:	100..250 VAC, about 15VA
Permissible ambient temperature:	0...60°C, nominal temperature 20°C

Connections, examples apply to input 1:

A) external supply



B) supply by circuit board



Overview Group 9
Digital controllers

Industrial controller with descriptive text display (format 96x96)

Colour TFT Display..... 903
Colour TFT Display, graphical programming..... 903K
Setpoint generator / actual value remote display..... 903A20
Remote controller unit for KFM 903 / 93..... 903A50
Compact form, colour TFT display 903.G

Industrial controller with LED display (segment display)

Format 96x96, others on request..... 92

Custom specific industrial controller

Function extensions (integrated)

Difference controller..... 991d
Limitation controller..... 991g
Cascade controller..... 991k
Program controller..... 991p
Ramp set point value..... 991r
Status and malfunction units..... 991s
Stage control output..... 991t
Position controller..... 991u

Step controller, compact device with TFT display..... 991td
Modular step controller..... 991tz8
Modular step controller for semiconductor switches..... 991tz88

Additional equipments and digital communication – see Page 2 –

Operating instructions – see group 0 -

Overview Group 9

Digital controllers

Additional equipments

Additional analog inputs.....99ax
Outside temperature dependent control.....99axa
Maximum/Minimum selection from 2 measurement inputs.....99axm
Position feedback input.....99axr
Input signal alteration rate limitation.....99azd
External control function influences..... 99b1s8
Digital inputs for status messages..... 99b.s
Terminals for external keyboard 99b3t
External set point value input (see 99e as an accessory device).....99bwa
Additional set point value permitting switch-over.....99bwz
External control function influences..... 99bx
Digital input for control functions.....99byb
Speed limitation of corrective action.....99byd
Selection of the actuating signal in continuous controllers.....99bym
Volume / flow display – capture of impulse counter- signals.....99cb
External setpoint and analogue signal outputs as an accessory device.....99e
Additional switching contacts.....99f
Switchable common output for 2 control channels.....99f1u.
Signal output (see 99e as an accessory device)..... 99o..
Signal output of step controller.....99ogy1
Parameter switch over.....99p2

Software

KFM Process-control-software PCS.....99pcs
KFM TFT display- configuration program.....99pkd
KFM Configuration program for industrial controller type 903K.....99pkm
KFM parameterization software PKS.....99pks

Digital communication

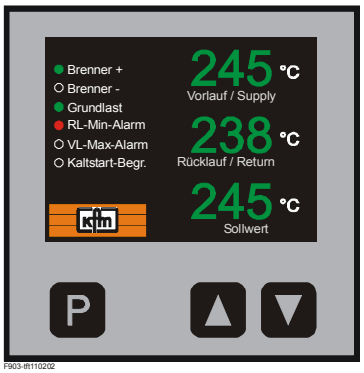
Serial interface.....99s
ETHERNET Interface 99se
EtherCAT Interface.....99sec
MODBUS® RTU Interface.....99sm
MODBUS® TCP Interface.....99smt
PROFIBUS®-DP- Interface.....99spde
PROFINET®-IO- Interface..... 99spne
USB- host Interface (memory stick).....99susb

Touch operation

Controller display with additional touch- function (touch sensitive screen).....99t

Industry Controller, Function extensions – see Page 1 –

1 2 3 4



5 6

1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Depending on the version, external RC combinations are enclosed or internal RC combinations for optional connection led on terminals (bridged to NO contacts at the factory). The scope of delivery includes plugable terminal blocks.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

Stage- and three-point step controllers with auxiliary contact (e.g. burner contr.) are fitted as standard with a 2nd measuring input. Additional contacts can be switched time dependent using the integrated real time clock.

Types *(depending on configuration):*	*Type*
Text-indicator	903000
Indicator	90301.
Single-stage controller	9031..
Two-stage controller	9032..
Three-point controller	9033..
Positioner / follow-up controller	9034..
Two-point PID controller	9035..
Three-point PID controller	9036..
Three-point step controller	9037..
Continuous controller	9038..
Continuous controller with 2 outputs	9039..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 additional contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
ext. module f.Profibus,Modbus,Ethernet..	(99) s..

Measuring inputs: (max. 8, depending on version)	*Type suffix*
Pt100/standard signal, -200...+800°C/adj.	without (or 0)
Thermal element NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint: Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts with time stamp, custom display masks also with real-time graphical representation, up to 9 displays for relay functions incl. freely adjustable description texts.

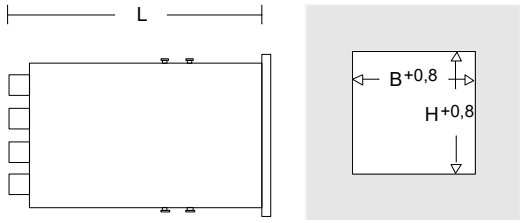
Outputs:
Up to 9 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA

*See also data sheets 99.. !

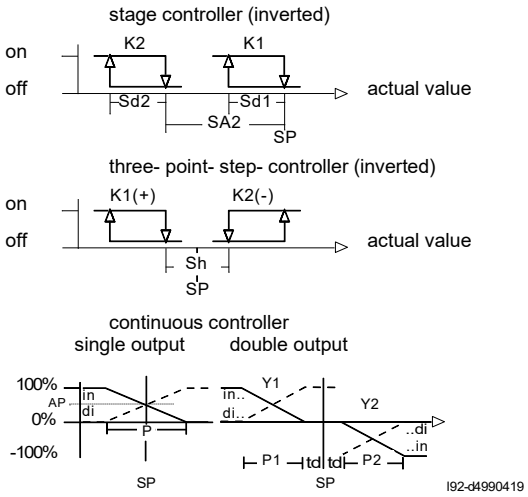
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent, switching function adjustable

Installation dimensions:

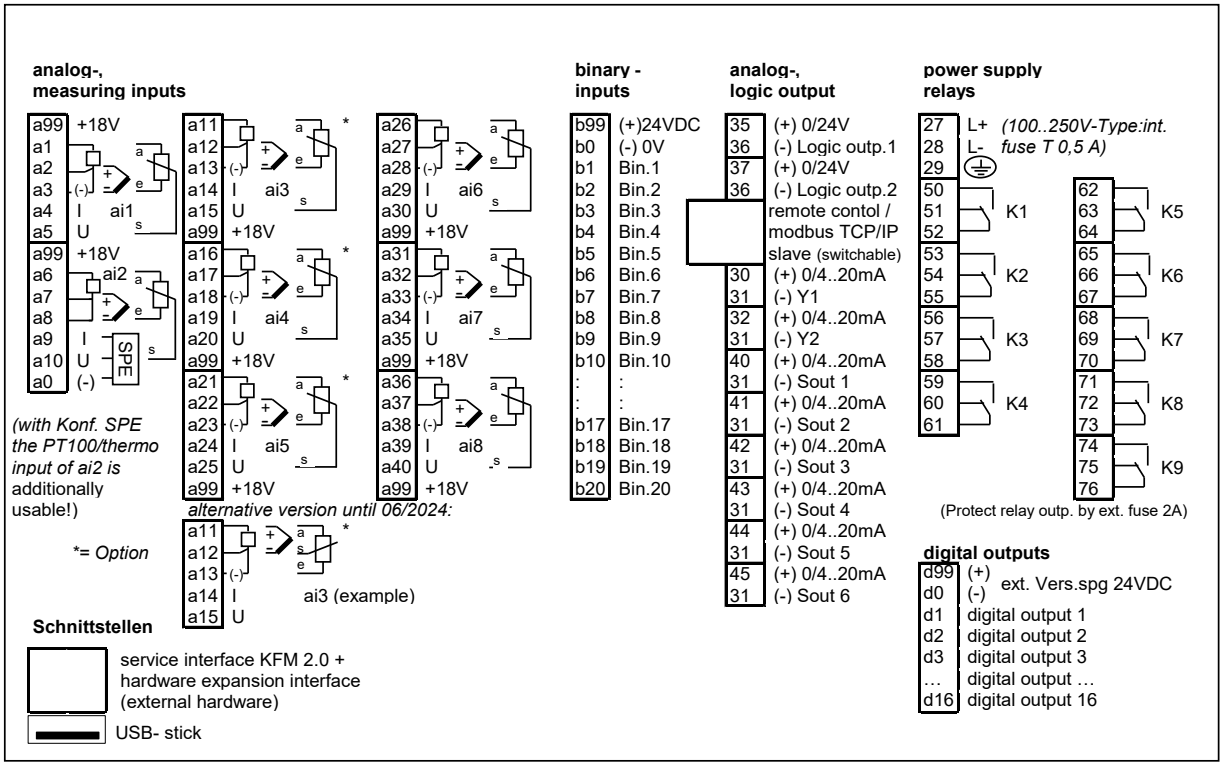


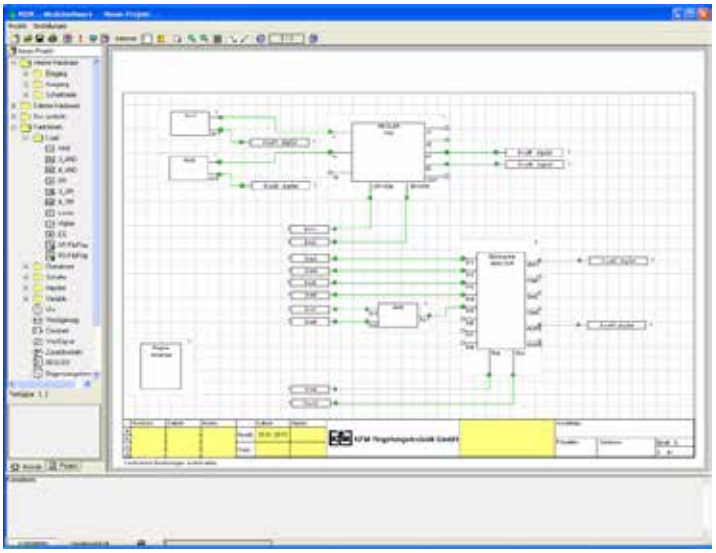
Form 96x96: L=150mm, B=92mm, H=92mm



Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60 °C
Nominal temperature: 20 °C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)





General:

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

The belonging module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules can be added to it by using an optional interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

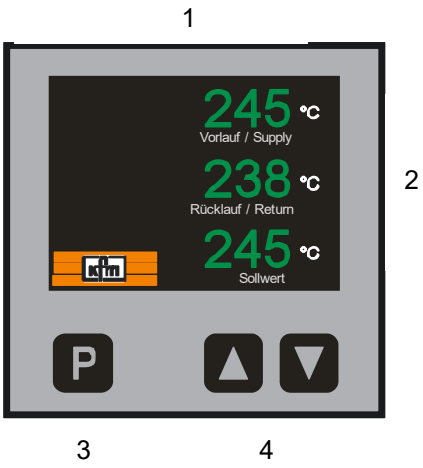
Depending on version, RC elements for external mounting are enclosed , only in exceptional cases internal RC elements are wired on terminals for the selective connection.

Hardware- types (*unprogrammed*)**:**

Type	Measuring inputs	Binary inputs	Analogue outputs	Relays
903K2223	2	2	2	3
903K2C46	2	12	4	6
903K5828	5	8	2	8
903K5K28	5	20	2	8
903K5K64L	5	20	6	4 (+2 Logik outputs)
903K8264L	8	2	6	4 (+2 Logik outputs)

Hardware- expansion modules: see sheet 852..

Special versions depending from quantities possible.



1 Colour display
2 Displays for setpoint value and actual value (option)
3 Key for setpoint- and parameter mode
4 Setpoint adjustment

General:
The units in 96 x 96 panel mounting format are based on the KFM 903 industrial control unit series and allow external setting of one to four setpoints or continuous control outputs and up to 4 three-level signals. Upper and lower limits can be assigned to the setting ranges.

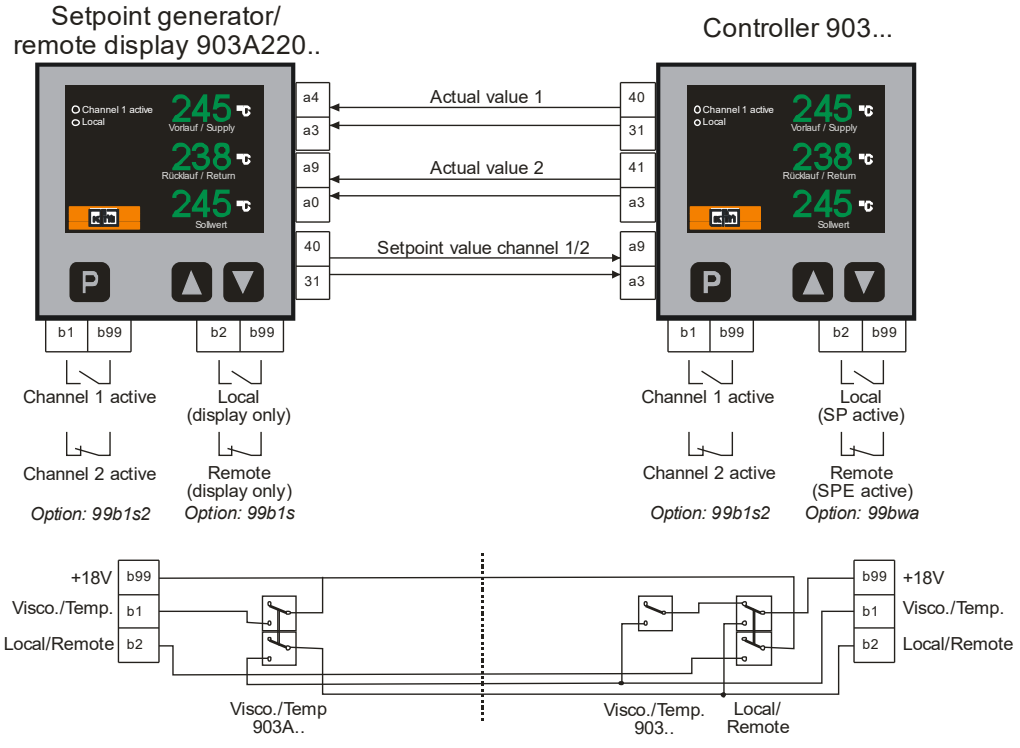
The adjusted setpoint– or control value is shown on the graphical display in the operating status. Depending on the equipment, further displays can be present, for example for actual value remote display.

Accessories from the KFM 903 product range are available as an option.

Types:	*Type*
Setpoint generator	903A200
Setpoint generator double	903A220
Option: 1 x actual value – remote display incl. measuring input Pt100 / stand. signal	99axq
ditto, but double	99axqq
binary input for alternating activation of 2 channels	99b1s2

See data sheet 903 for device variants and accessories

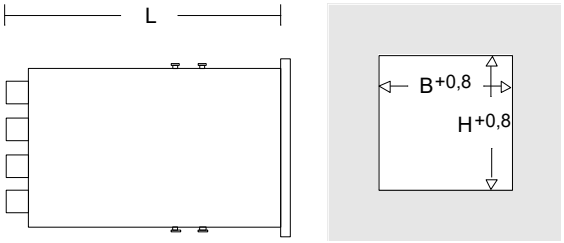
Wiring:
Example, connections between **generator** 903A220-99axqq-b1s2-b1s and **controller** 903..-99bwa-og2-..



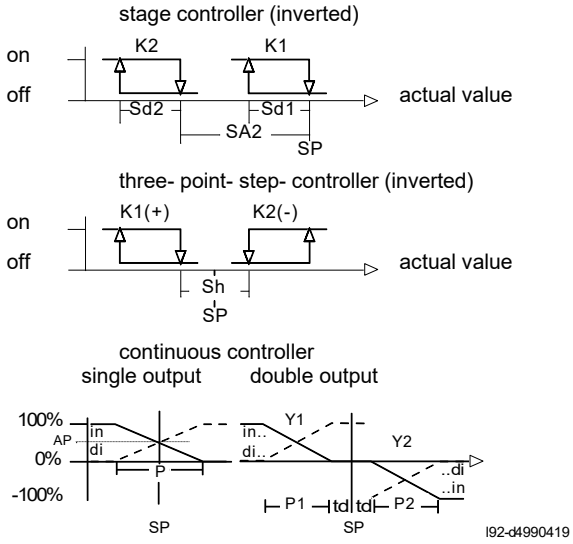
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent, switching function adjustable

Installation dimensions:

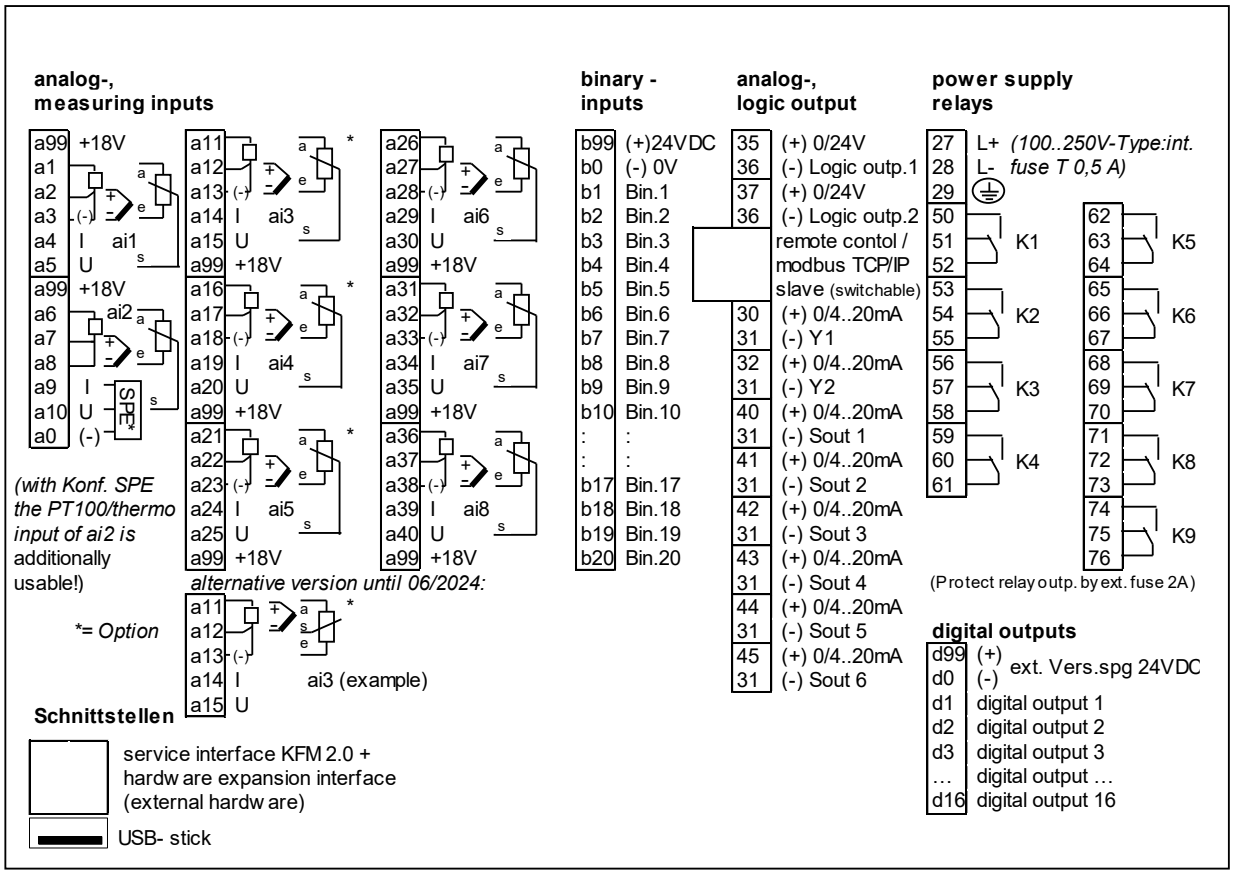


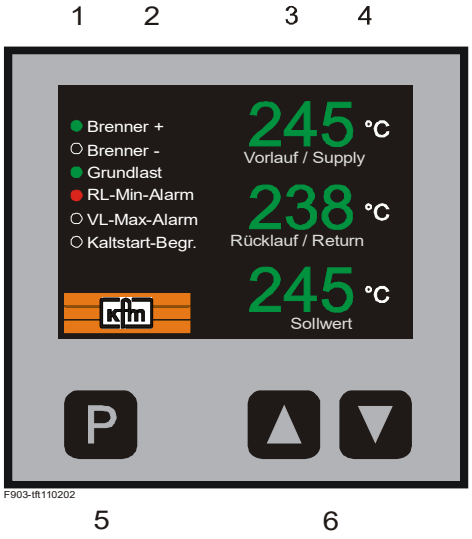
Form 96x96: L=150mm, B=92mm, H=92mm



Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60 °C
Nominal temperature: 20 °C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)





1 Display for relay function
2 Descriptive text for relay function
3 Digital values and descriptive text displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

General:

With remote devices 903A50 controller types 903 / 93 with option 99sre can be remotely operated, i.e. all operations can take place at the controller as well as at the remote control device resp. all indications are visible on both.

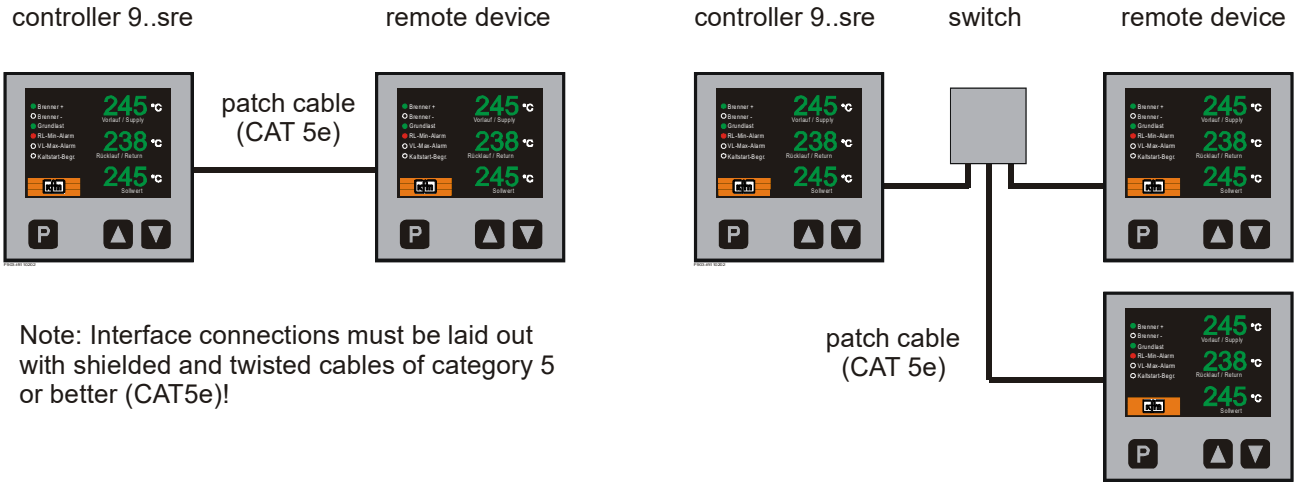
In the attempt of simultaneous operation the device which was operated first has priority. At this device the operation can be continued normally, at the other device the operation is blocked. But at any time on the displays of both devices identical contents are indicated. After the used menu level of the prior device has been left, operation is possible at both devices.

Depending on type, keys can be integrated in the remote device or routed to the terminals for connecting external keys.

The connection to the controller with option 99sre is realised by a patch cable. The remote device can be connected in a maximum distance up to 100 m.

Types	**Li.No.**
Remote device standard version, power supply 100...250V AC	**903A500**
Remote device standard version, power supply 24V DC	**903A508**

Flow chart: *(Examples, single remote device / two remote devices connected via a switch.)*



Note: Interface connections must be laid out with shielded and twisted cables of category 5 or better (CAT5e)!

Hints for setup-level: The setup-level is entirely for the *configuration of the remote device* and is only used exceptionally for adjustment of contrast and brightness of the background illumination, resp. for the configuration of different bus addresses when using two remote devices. The control of the connected controller in the operating mode is possible automatically after leaving the setup-level.



Press and hold the P - button, switch on power supply

A frame with the description „SETUP“ shows the activated setup-level.
Release P - button,

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ button

Settings in detail:
(existence depends on version and type):

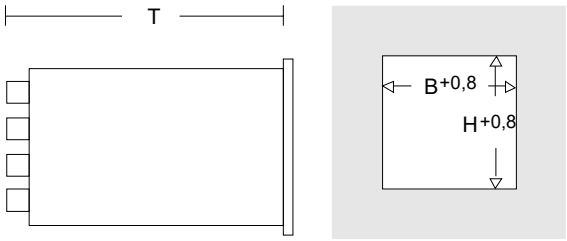
		Factory setting:	Notes
Adr	bus address (0...10)	5	___
BRIG	Brightness adjustment for display remote device (0 ... 100)	50	___

***return** to operating mode:*
briefly press the P- button

Error messages:

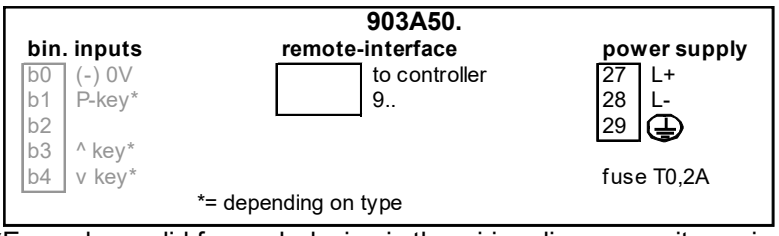
OFFLINE	Fault on remote interfaces, data link interrupted. Check the patch cable and the controller 9.. power supply.

Technical data / Installation dimensions 903A50.:
Housing: for panel mounting, 96x96mm
Power supply:24 VDC,alt. 100..250VAC,app. 2 VA
Protect. system (DIN EN 60529):
IP 54 (terminals IP 20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 61326
Interface: Ethernet 10Base-T or 100Base-TX (autom. baudrate detect.), max. length 100 m



H=92mm, B=92mm, T=150mm alternative 70mm

Wiring diagrams:



(Examples, valid for each device is the wiring diagram on its casing only

Input/output unit 852619



Operating unit and TFT display 903.G



General

The 903.G version consists of two modules: The industrial controller series 903 in compact housing dimensions as operating unit and TFT display 903.G in panel mounting format 96x96 with 8 cm installation depth, for use even in confined spaces, and the input/output unit 852619 for standard rail mounting.

The connection between the 903.G control unit and the input/output units is made via standard patch cables, thus enabling simple wiring of all signals on the standard rail.

The input/output unit 852619 contains a universal measuring input PT100 / standard signal (can also be used separately), a binary input, an analog signal output and two relay outputs.

If required, the modular hardware expansion units 852... and the intelligent additional devices for external setpoint and signal outputs 99e.... are used to add further inputs and outputs.

The TFT display can be used to show operating displays and action pictures, as well as fault and operating message lists, history (fault indicators), graphic display (line recorder/data logger - up to 8 freely selectable measured values/parameters) and service pages.

In addition to the integrated service interface, access can be made via USB stick.

Versions

Operating unit and TFT display:

903.G — Basic version 903.G, operating unit and TFT display, mains supply 230V

⇨ **Configuration:** According to list sheet series 903, e.g. 903700G-99bwa-og
(Three-point step controller with external setpoint incl. changeover and signal output)

903KG — Version 903KG in freely programmable version, mains supply 230V

⇨ **Configuration:** According to list sheet series 903K, unprogrammed or factory-programmed against separate charge

Input / output unit:

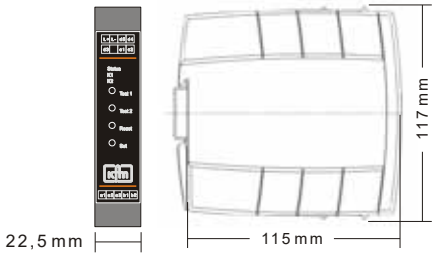
852619 — Basic version, mains supply 230V
Input Pt100/ (0)4...20mA or (0)2...10V, -100...+400°C/adj. (can be used separately),
Binary input for potential free contact, continuous output (0)4...20mA, (0)2...10V,
2 relays, potential free change-over contact (K1) resp. make contact (K2), switching capacity: 250V 2A

8526190L — As 852619, but one logic output 0/24V max. 40 mA,
1 relay with potential-free changeover contact, switching capacity: 250V 2A

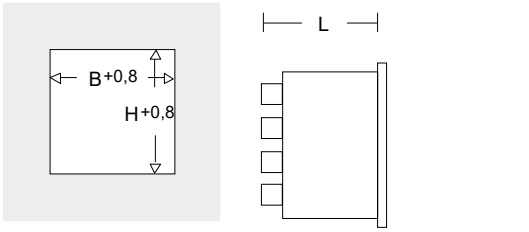
⇨ *See list sheet 852... for modular hardware expansion units, or list sheet 99e.... for intelligent add-on units for external setpoint and signal outputs.*

Installation dimensions

852619:



903.G:

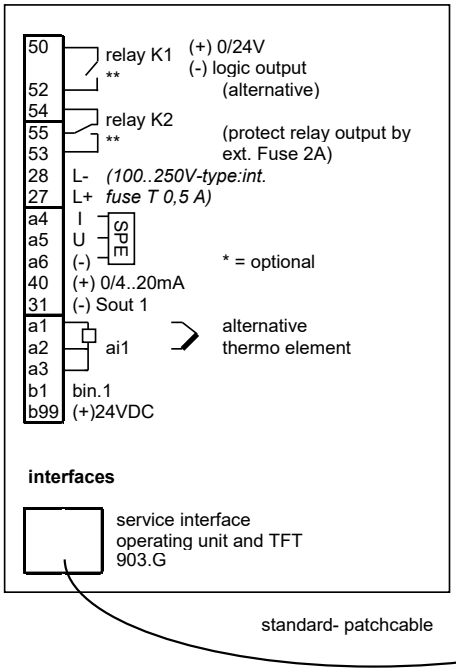


Form 96x96: B=92mm, H=92mm, L=80mm

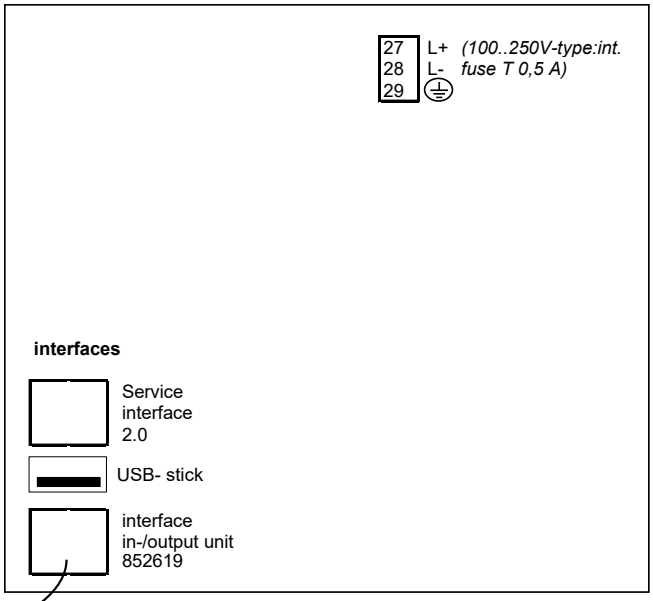
Connection diagram:

Example variant, the connection diagram on the device is decisive for the respective version.

852619

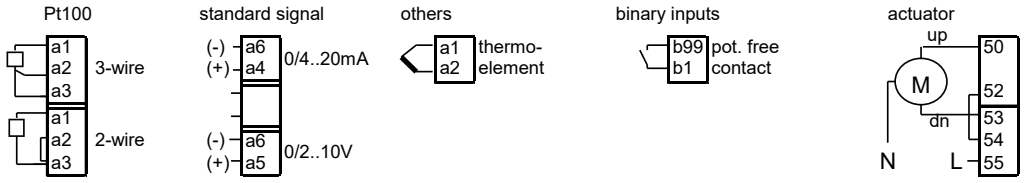


903.G



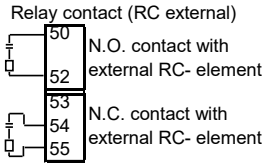
standard- patchcable

Wiring, examples for input 1 and output 1 respectively:



**** RC- Kombination**:

The RC- element is a component to protect the relay contact in case of higher loads. The RC- elements must not be used with small loads, for example auxiliary relays (depending on capacity) or electronic burner managers (note the manufacturer´s instructions). Depending on version, RC elements for external mounting are enclosed.



1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



Certifications: DIN, BV, DNV, GL

Brief description:

KFM 92 is a microprocessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices. All relay contacts are implemented as potential-free changeover contacts. Depending on the version, external RC combinations are included, internal RC combinations for optional connection to terminals (N.O. contact factory- connected) or the N.O. contacts of all relays are permanently wired internally with RC combinations.The scope of delivery includes plugable terminal blocks.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logic output	..L

function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
interface Profibus, Interbus S, other	(99) sp/si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.
combined input Pt100 / standard signal	q.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

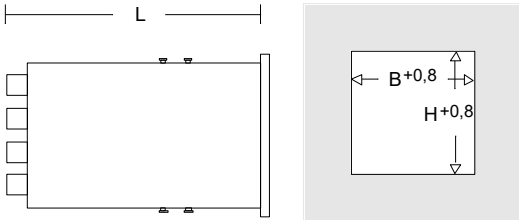
Outputs:

up to 8 relays with potential free change over switch, as control outputs or as additional contacts, capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

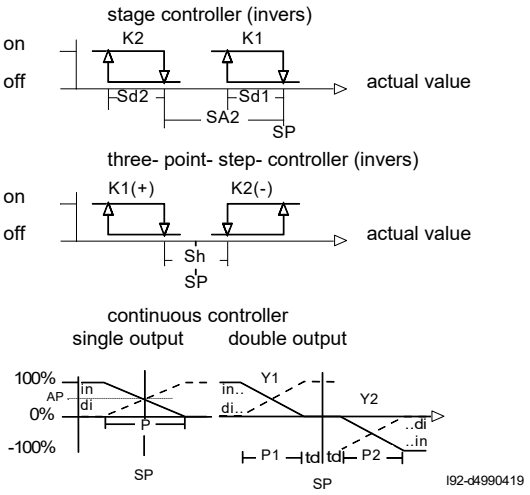
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

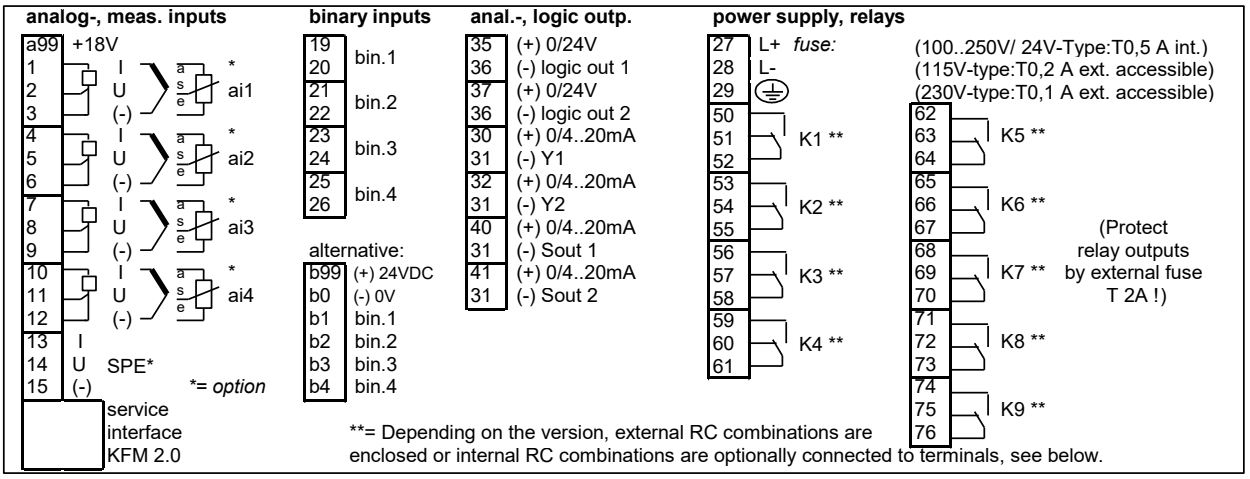


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

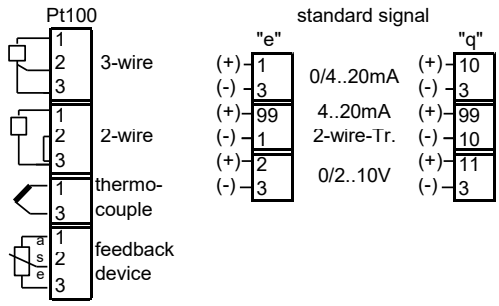


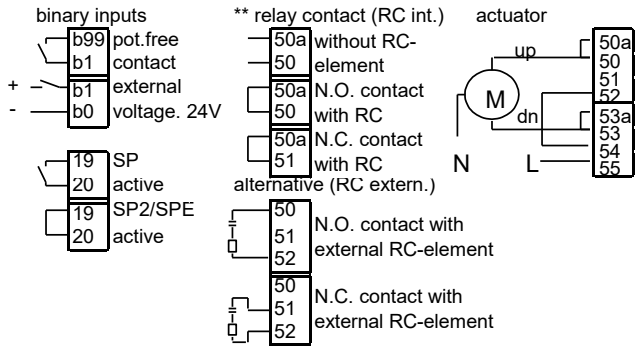
Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA)
Protective system DIN EN60529: IP54 resp. IP65 (flat seal + 4 mounting elements), terminals IP20
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:





1 Digital display actual value (depending on type)
2 Digital display setpoint
3 Key for setpoint and parameter mode
4 Setpoint adjustment
5 Parameter mode lock switch (back face)



General:

The units in 96 x 96 panel mounting format are based on the KFM 92 industrial control unit series and allow external setting of one to three setpoints or continuous control outputs and up to 4 three-level signals. Upper and lower limits can be assigned to the setting ranges.

The unit has a dual display. In operating mode, the target value or control output is displayed in the lower row. The upper row can optionally be used for the remote display of the actual value.

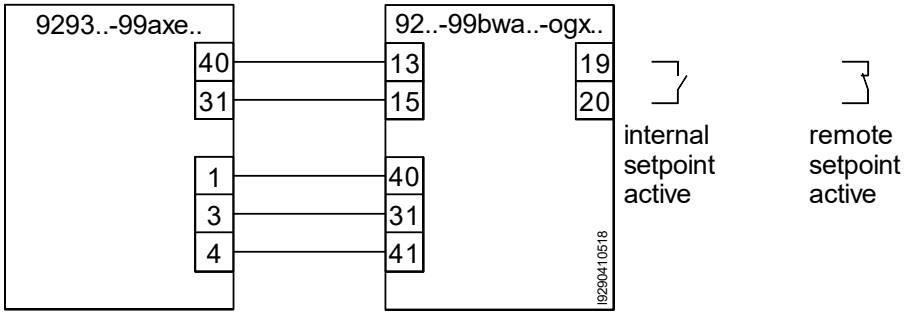
Accessories from the KFM 92 product range are available as an option.

Types:	*Type*
Setpoint generator	9293.
Setpoint generator with actual value remote display (Pt100 / standardised signal)	9293.0 / e
Actuator (three-point step)	9297.
Actuator (continuous)	9298.
Actuator (continuous, 2 outputs)	9299.

See data sheet 9200 for device variants and accessories

Wiring:

Example:Connections between **remote control unit** 92930e-99axe.. and **controller** 92..-99bwa-ogx-..

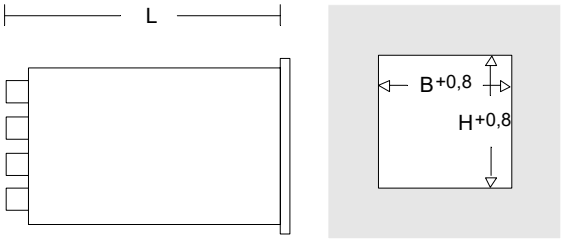


Industry controller type 929
Technical data

B 929 E

Characteristics:
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
(parameters depending on sub type:)
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Installation dimensions:

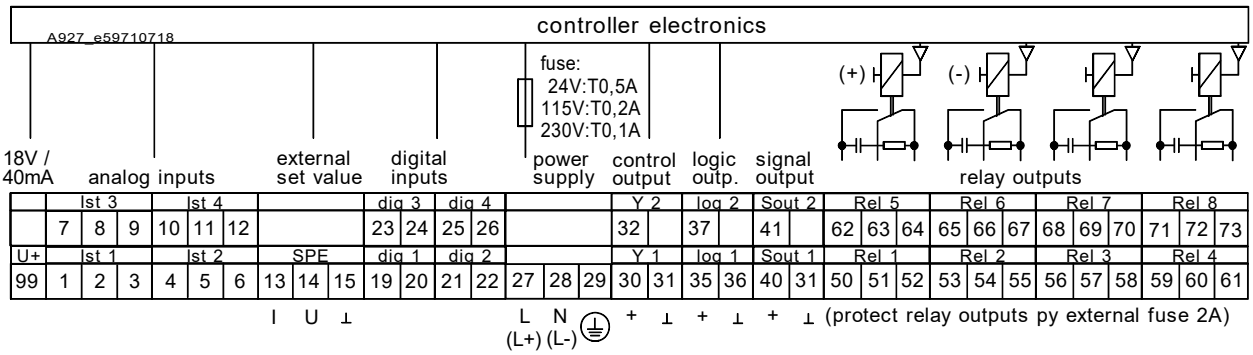


Form 96x96: L=150mm, W=92mm, H=92mm
Form 72x144: L=170mm, W=168mm, H=139mm

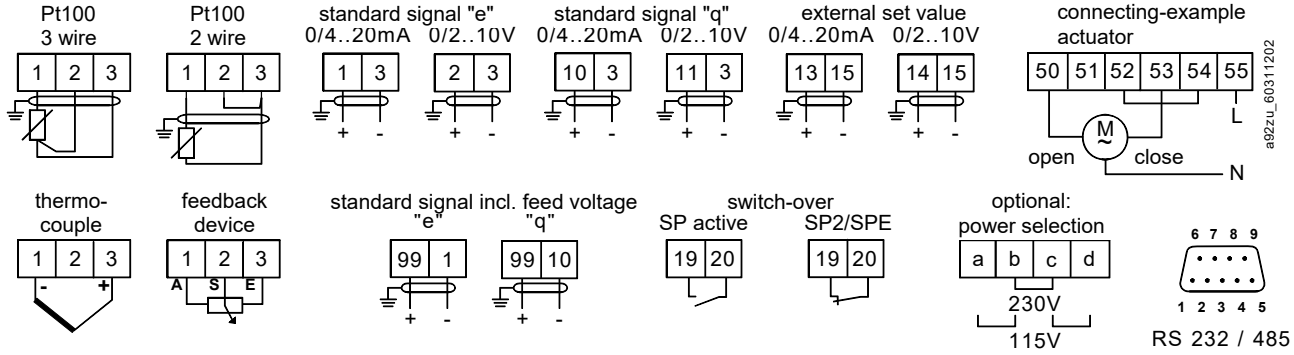
Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 230VAC +/- 10 %, 48...62Hz
alternative 115 VAC, 48 VAC, 24 VAC, 24 VDC
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KUF to DIN 40050
Relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 50081-2 and EN 50082-2

Wiring diagram: (Example, depending on sub type some details can be missed valid for each delivered controller is the wiring diagram on its casing only)

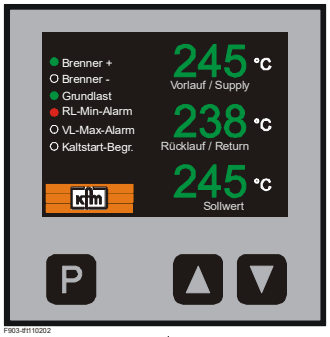


wiring examples (for input 1 each)

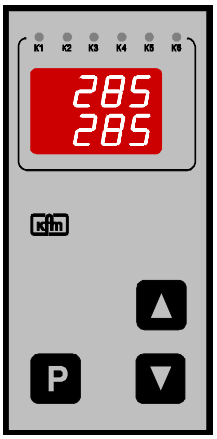


General:
A consistently modular hardware- und software design philosophy enables ready to use, preadjusted to customer specification functional sets and modular expandable assemblies with graphical user interface for every application; also several control functions at the same time and/or alternate switchable.
The entire range of services offered by series *8../9..* in accordance to the respective data sheets is for functioning available.

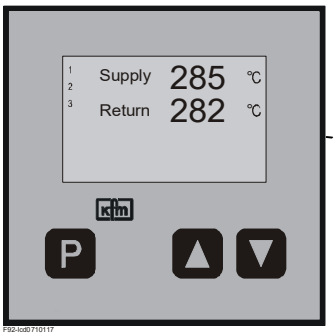
Series 903..
TFT-display



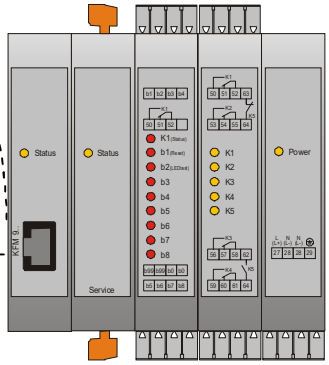
Series *94..*
(72x144mm)

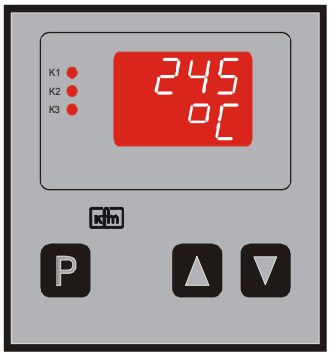


Series *902..*LCD-display

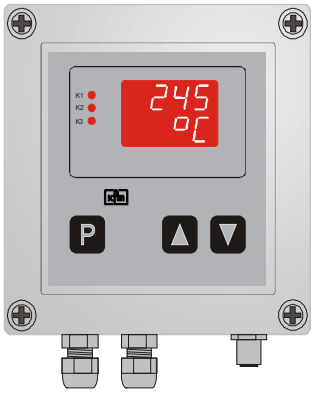


Series *852..*
functional modules

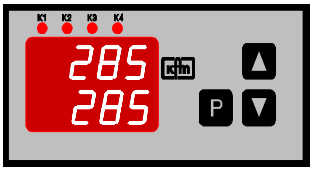




Series *92..*
7-segment
display



Series *96..*
for valve
attachment or
wall mounting
(130x130mm)
alternative TFT
or LCD display

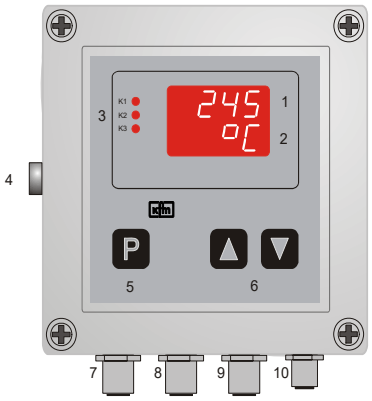


Series *91..*
(48x96mm)

Options:
Additional switching contacts and measuring inputs, modular expansion units, set value lowering at night or external set value incl. switching, gradient, cascade, program function, step controller, digital interfaces, remote control, malfunction alarm- and operating devices with time stamp (real time clock), wall mounting

Let us know what we can do for you – our suggested solution is free-of-charge and without any obligation!

1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Fuse relays (T 2A)
5 Key for setpoint and parameter mode
6 Setpoint adjustment
7 Terminals power supply
8 Terminals relay outputs
9 Service interface
10 Terminals measuring input



General:
KFM 96 is an industry controller series in valve attachment- resp. wall mounting- format 130 x 130 with a performance range of up to 4 relay outputs, various signal inputs and outputs as well as numerous possible optional extras.

Depending on the model the relays are carried out as potential-free changeover contacts or minus- priority circuit. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements.

Optionally the connection of the service interface and the communication with the master system is realised with a M12 plug- and screw connector, the USB connection is made with the adapter cable 99szksm.

The display is available with LED (7- segment), transflective LCD with white backlight lighting and transmissive coloured TFT.

Types (*depending on configuration):*	*type*
one stage controller	96..1..
two stage controller	96..2..
heating / cooling controller	96..3..
positioner / follow-up controller	96..4..
two- point- PID controller	96..5..
three- point- PID controller	96..6..
three- point- step controller	96..7..
continuous controller	96..8..
continuous controller, 2 outputs	96..9..

Display:	*3.- 4. suffix*
LED	..01.
LCD	..02.
TFT	..03.

Sub types:	*6.-7. suffix*
basic function	00.
basic function + 1..4 additional contacts	01..04.
2 x basic function	20.

Function extensions:	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction module	991s
Stage controller	991t

Additional devices:(see also data sheet 99..!)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
Interface by external module for Profibus, Modbus, Ethernet, ..	(99) s..

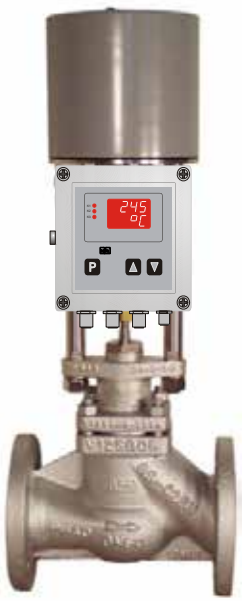
Measuring inputs(*max. 2,dep. on vers.*)**:**	*Type suffix*
Pt100/standard signal, 0..400°C/adj.	without or 0
Pt100/ standard signal, -200..+800°C/ adj.	99mb14b
Remote resistor transmitter 0...100/1000Ω	qw

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

Displays:
Max. 2 / 4* four-digit value displays with selectable decimal point, (each including adjustable descriptive text and unit of display, optional add. message texts) *
also custom display masks,
up to 4 displays for relay functions
** LCD and TFT only*

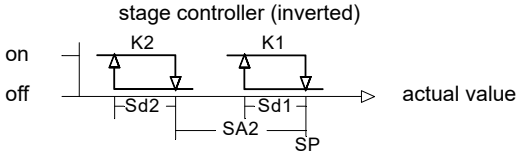
Outputs:
Up to 4 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
alt. up to 2 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output

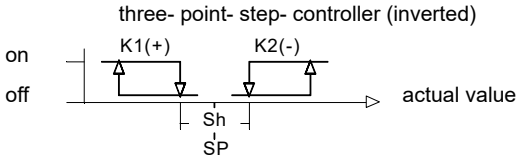
Example valve attachment:

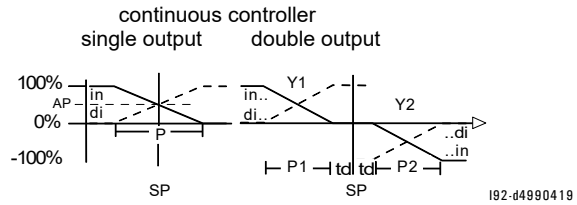


Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

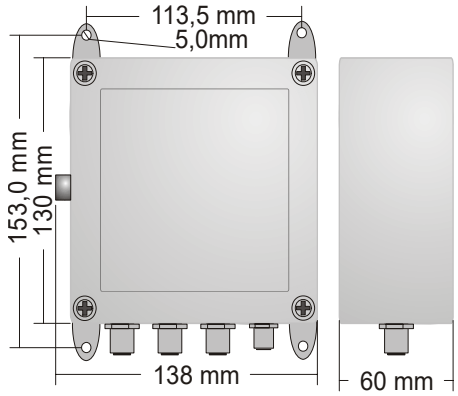
Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable





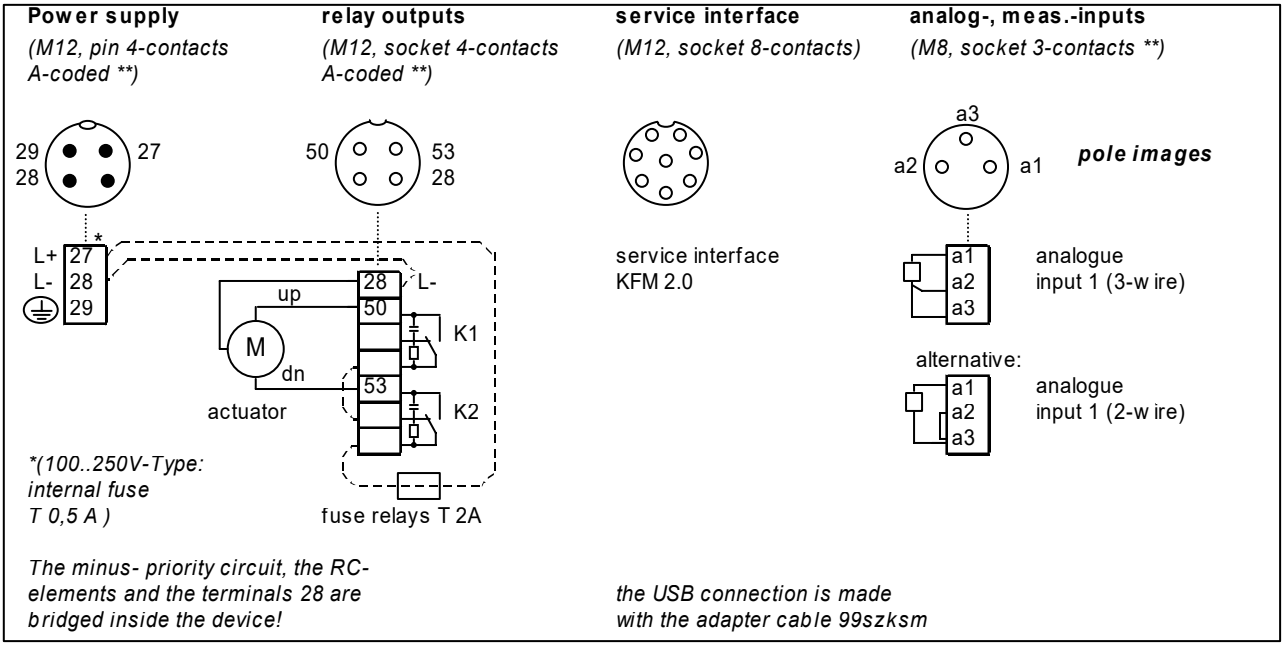


Installation dimensions:



Other data:
Housing for panel mounting, 96 x 96 mm
mounting direction: optional
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP65
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



** Corresponding connection cable can be supplied on request.

Function extension for calculating the *difference* between two actual values.
(Differential value = actual value 1.. – actual value 2..).
The calculated difference is displayed and made available both as a controlled variable and a reference for additional contacts or signal outputs (CH 0 / Ist0).

Depending on version, KFM- controllers can be operated with this additional function as a differential value controller. An additional measuring input is included with this function extension.

Versions:	**Li.-No.**
	991d*

Order text: Function extension: Difference controller
incl. add. measuring input Pt100/standard signal
range depending on type 0..400°C,
-200..+800°C resp. adjustable
calculation of the difference X1-X2
for display and further measured value processing

(*possible measuring inputs and list end no. refer to sheet 9..)

Operation (special features)**:**

Operating status:

Besides the indication of the difference value the display lines are also configurable to the actual values 1 and 2

Settings:

The differential value is displayed in the parameter levels, in as much as it is relevant for settings and displays, additionally as channel (CH) 0:

Parameter level 2:

0bLo/0bHi Start / end of range for calculated difference

(if the difference goes under / exceeds the range limits: Error message Err0)

0nSt In as much as this function is provided: Setting the number of places after the decimal point of the differential value display

Supplement to error messages:

Err 0 Differential calculation error.
Causes: Error at measuring input 1 or 2, or the difference has gone under or exceeded the range limits (0bLo / 0bHi).

Optional equipment: Auxiliary control circuit with limiting function

991g E

The limiting function for the type series 902 / 93 consists of an additional control circuit with its own measuring input and its own settings (CH2), intervening in the output of the main control circuit. The function mode (min. or max. limitation, effective direction) can be set per menu.

Function:

In the case of 3-point step controllers the relay of one control direction (depending on the presetting) is locked and the relay of the other control direction is activated in increments as soon as the set limit value is exceeded or undergone. This causes the current position of the actuator to be maintained or adjusted so that the limit value is maintained.

In the case of continuous action controllers the higher or lower current control signal, depending on the presetting, is selected from the two control circuits and switched to the output. In this way the control signal of the auxiliary control circuit is given priority as soon as the set limit value is no longer maintained.

Versions:	**List No.:**
auxiliary control circuit with limiting function incl. additional universal input Pt100 or standard signal range depending on type 0..400°C or –200..+800°C resp. adjustable	991g*
version with limitation function only for the second output	991g2*

* alternatively other measuring inputs (type accessories such as main type Pg. 902)

Operation (supplement):

Actual value display:

Short-term display in the bottom display by actuating the ▲-key,
continuous display can be configured in the parameter level 2

Setpoint value setting:

Actuate the P-key until "**2SP**" appears,
set the desired value using the arrow keys.

Parameter level1 :

After calling up the parameter level select **CH 2**.
Call up and set the parameters in succession as for CH1.
*Attention: Do not change the setting of parameter **CH 1** for the main control circuit!*

Configuration level:		*Factory setting*
2out	effective auxiliary control circuit direction direct / inverse (di / in)	in
out	min. / max. limiting function (Lo / Hi)	Lo

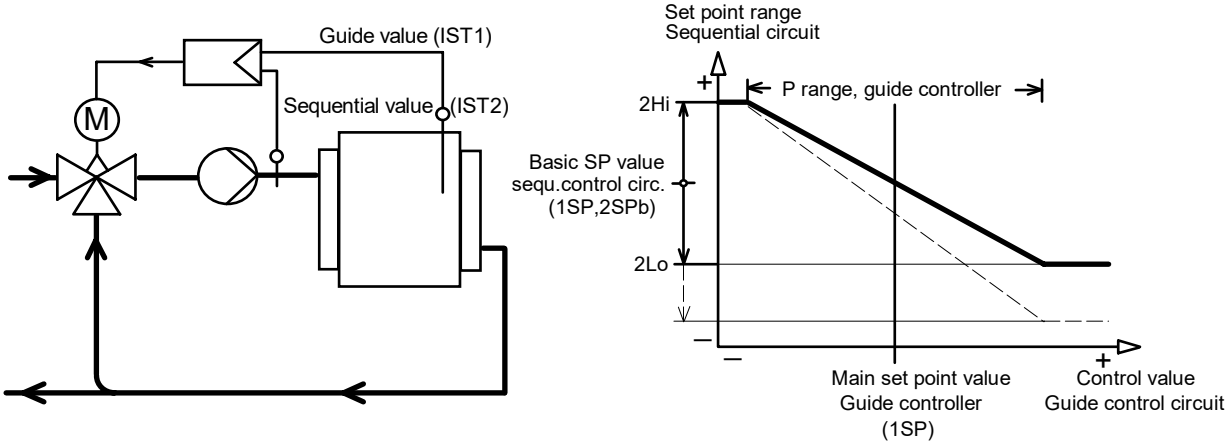
All rights for technical modifications withheld

Function:

For cascade controllers, the basic unit of the standard version serves as a sequential controller, acting on the control output. The function extension consists of an additional guide control circuit with its own measuring input, the output of which acts on the set point value of the sequential controller. A deviation between set point and actual value of the guide control circuit (e.g. product temperature) increases or decreases the basic set point value of the sequential control circuit (e.g. supply temperature or combustion chamber temperature) within an adjustable range.

In the basic version 991k, only the set point value for the guide control circuit is set. It also serves as basic set point value for the sequential circuit. In version 991kb the possible change of the set point value is limited by the adjusted minimum and maximum absolute values. In version 991ku the guide controller set point value and sequential controller basic set point value are set independently from each other.

Version 991kdt provides a so called dt-control, to monitor the difference between the guide- and sequential actual value. Upon exceeding the adjusted difference value will influence the cascade to reduce the difference below the adjusted value.



Control behaviour, equipment:

Sequential controller:	as desired, depending on the selected basic version
Guide controller:	PI (PID), with especially modified integral action

Versions:	**List No.:**
Standard version	991k..
the same, with limitable sequential setpoint value range	991kb.
Standard version, with dt-control	991k..dt
the same, difference value heating / cooling separately adjustable	991k..dt2
separate set point values	991ku..
Guide control circuit can be switched off permanently by menu (sequential controller measuring input actual value 3)	991k..(3)m

Addition for measuring input of guide controller, if different from sequential controller:

Pt100 DIN, 0...400°C	..0 or without
Pt100 DIN, 0...100°C	..1
Thermal element NiCr-Ni (Typ K)0...1200°C	..n
Thermal element Fe-CuNi (Typ J)0... 900°C	..f
Thermal element PtRh-Pt (Typ S)0...1700°C	..p
Rheostatic teletransmitter 0...100/1000Ω	..w
Standard signal 0(4)...20mA, 0(2)...10V	..e
Combined input PT100 DIN, -200..800°C or standard signal	..q
Actual value transferred by digital interface in place of measuring input	..x

Characteristic features of cascade controller

Guide value = Input IST1 (Terminal 1-3 / a1-a5)*
alternative: by digital interface
Sequential value = Input IST2 (Terminal 4-6 / a6-a8)*
alternative: Input IST3 (Terminal 7-9 / a11-a15)*

Set point value setting:

		Factory setting:	*Notes:*
1SP	Guide controller set point value, also basic set point value for sequential controller (except for type 991ku)		
2SP	Display: current sequential controller set point value = total of basic set point value and guide controller influence		
2SPb	Basic set point value for sequential controller (only for type 99ku)	0	___

Parameter level 1 (supplement):

CH	Channel selection of guide controller / sequential controller = CH1 / CH2		
FUE	Only CH2: temporarily switch off guide controller influence (only for optimization) or permanently (An = on, Aus = off)	An	___

Parameter level 2 (supplement):

2Lo / 2Hl	admissible maximum difference of the sequential controller set point value	-50/50	___
2FLo / 2FHl	minimum / maximum limit of sequential controller set point value	#/#	___
dt	Difference value between guide - and sequential actual value (0 ... #) Adjustment 0 will cause the deactivation of the function (type 991kdt only) (#= controller range)	0	___
dt1/2	the same, difference value for heating / cooling separately adjustable	0/0	___

Configuration level (supplement):

1 ib	Integration range of the guide controller: 0...100% of the proportional band	*100*	___

Commissioning

Prior to optimizing the control behaviour, correct the factory set set point value range limitations of the sequential circuit, if necessary. The admissible range of the sequential circuit set point value is dependent upon various factors (e.g. maximum heating surface temperature, design of the heating surfaces, etc.) and should be individually set for each machine system. The values "2Lo" for the bottom and "2Hi" for the upper limit are set in parameter level 2 as a *difference* to the basic set point (also refer to the function diagram). The factory setting for thermostats is -50K / +50 K, for controllers with signal input 0.0. In version 991kb is to adjust additional an upper and lower absolute limit value.

Once the sequential control circuit limit values are set, optimize the sequential control circuit *without* influence on the guide control circuit. For this purpose, switch off the guide controller function (parameter level 2: CH2, FUE AUS). Now undertake the standard optimization of the control parameters.

Subsequently, switch on the guide controller function again and optimize the parameter for the guide control circuit, taking into consideration that the guide control circuit often reacts more sluggish than the sequential circuit. Therefore, it can usually be operated as proportional action controller *without* integral action (value for I at 0.0) or with a relatively long integral action time (several minutes). As an option, the integration range may be limited with parameter ib.

Deviating reaction to error messages:

At Err 1 the guide controller element does not function,
the sequential controller element continues to operate as standard controller with the set set point value.

At Err 2* the configurated safety circuit reacts (Factory setting: relay off or control signal on 0)

* depending on version

Function extension, program controller 991p

Function:

Enter a series of set point values and allocated times in the parameter level, which are invoked in succession after a program start has been triggered. The controller operates in standard operation on the basis of the set basic set point value prior to a start and following a program sequence.

The program function is activated in the parameter level, by entering the desired program steps into ”Pr-S”. The program function is shut off with adjustment Pr-S = 0, also the respective menu positions are suppressed. The adjusted number of steps applies uniformly for all existent programs. If fewer steps are required in the individual program than preset under Pr-S, they can be suppressed by setting a set point value as precedent and a time of ”0”.

Enter the programs as steps with consecutive numbers, always consisting of a target set point value SP.. and the attendant time t.. If a direct switch-over (*jump*) to the next set point value is desired, t.. is set to ”0”. If a value of >0 is set for t.., the change to the attendant target set point value takes place within this time in form of a *Ramp.* If a set point value is to be kept unchanged for a specific amount of time, set the subsequent SP.. to the same value, the attendant time t.. serves as *holding time* .

Shall the program run several times, enter the desired number of program cycles into ”P-CY”. Factory setting is 1. A continuous reapeating program cycle is selected by adjustment P-CY = 0.

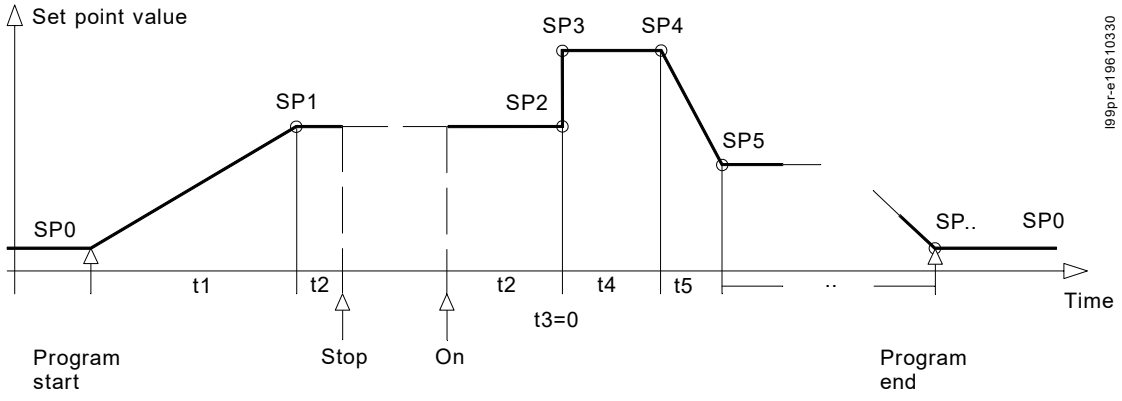
integrated set point monitoring:

Constant monitoring takes place during the program sequence, to check whether the actual value follows the current set point value. The program sequence is stopped as soon and as long as the difference set as admissible is exceeded:

With a *ramp*, the further increase or decrease of the set point value is stopped. With *holding times* the specified time increases accordingly. With a *jump* the next time segment does not start till afterwards.

special feature for switching contacts
The available switching contacts of the controller can switch optionally in relation to the program status (SP0) or individual program steps (SP1…SP20).

Program sequence (example)



Versions:	**List No.:**
1 program, max. 20 steps, 1 control input	991p1
4 programs, max. 20 steps, 1 control input	991p4
8 programs, max. 10 steps, 1 control input	991p8
optional:	
as mentioned above, but with 3 additional control inputs for the start of each program P-nr.1…4	991p4b3

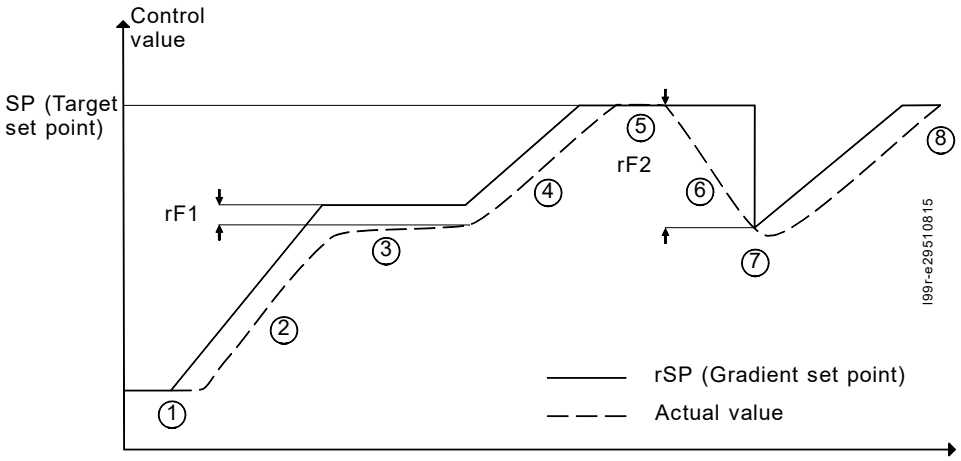
Function:

The set point value “SP” set at the controller serves as the target set point value. Once the controller has been switched on, the starting point of the ramp set point value “rSP” is set to the available actual value. Subsequently, the default set point value increases or decreases by the set gradient.

A synchronously running monitoring function causes the ramp set point value to be stopped as soon and as long as the actual value does not follow the default set point value at the set max. distance ("rF1").

The additional function "ramp set point value" switches off as soon as the target set point value is reached, however, it remains in readiness and starts again each time the set point value setting is changed or when the actual value is changed by more than the admissible difference ("rF2").

Operating phases of the ramp function (example)



1. Ramp set point value is set to actual value
2. Set point value increases at set gradient
3. Set point value does not continue to increase as the actual value does not follow
4. Set point value increases again, as actual value has dropped below the max. difference "rF1"
5. Actual value has reached the target set point value, ramp function is switched off
6. Possible malfunction: actual value drops by more than the admissible "rF2"
7. Ramp function is activated, ramp set point value is set to momentary actual value
8. Target set point value is reached again, ramp function is switched off.

Versions:	**List No.:**
Standard version	991r.
Alternative versions	
Separate adjustment for increasing and decreasing gradients	991rhk
ditto, ramp function can be activated via menu, sep. for rising and falling ramp	991rhkbm
bin. input to control the ramp set point value (ramp active, if input bridged)	991rb1
Possible additional functions	
Additional contact, related to the gradient-status	99fr
binary input for extern stop of ramp function	99b1s14

Function extension: Status and error messages

Controllers from the 902 / 93 series with LCD and 903 / 93 series can receive status and error messages by means of supplementary internal or external binary inputs and display them in plain text in the lower two display lines. The texts associated with the currently activated binary inputs are displayed chronologically in a message list. Additionally, a history can be displayed depending on the version. The messages can also be optionally assigned to relays as collective or new value messages.

Function:

By means of the corresponding activation of a binary input, the associated message text is shown on the display. Depending on the message logic that has been set, a flashing circle symbol appears before the text line (new value). The message can be confirmed by means of binary input 1 (reset). This is indicated by the permanent display of the symbol before the message. Following deactivation of the binary input, the associated text and, if applicable, the additional symbol are removed from the display.

Through various terminal connections it is possible to activate the binary inputs by means of external voltages or also by means of floating contacts.

The functions of the binary inputs can be set (direct or inverted) and they can each be provided with a separate time delay. In addition each input can be assigned to a collective relay. The requisite contact output is provided by means of the configuration of the additionally existing supplementary contact. Depending on type a further configurable supplementary contact is available for announcing new values, e.g. by means of a buzzer or a new value pulse. This contact is always activated (single 3 sec. pulse or permanent) when a new message appears. After confirming with reset, the contact is reset.

The display texts can be edited simply using the KFM PKS PC software.

Note: Special features of controllers 902 / 93 with status and error messages see manual 991s_BE.

Versions:	**List no.:**
16 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s16
20 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s20
24 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s24
Possibility of indication of status and error messages from external binary input and relay modules in clear text, connection at the service interface (only for 902 series, standard for 903 series)	991sw

Function extension: Status and error messages

Special features of controllers 903 / 93 with status and error messages:

When an appropriate signal is registered at a binary input the corresponding text is shown on the display. Additionally, messages are marked with a green (operating), yellow (pre alarm), red (alarm) respectively flashing circle symbol with time and date depending on the configured logic (new value). The message can be confirmed by using binary input 1 (reset). This is signalized by the permanent display of the symbol in front of the message. The corresponing text and possibly the additionally symbol are blanked out after deactivation of the binary input. Binary input 2 (LED-Test) is used for functional testing of the LEDs. The history of malfunction- and operating indications can be recorded optionally.

Depending on different wire connention to the terminals, the use of external voltage alternatively to potential-free change-over switches is possible.

The characteristic (direct or inverse) and a seperate time delay is adjustable for each of the binary inputs. Furthermore each input can be configurated as alarm, pre- alarm or operating indication. The neccesary contact output is provided by configuration of each additionally existing I/O module contact.
More freely configurable contacts can be used for new value messages e.g. by means of an audible alarm or for new value pulse. If another message in addition to an existing one occurs, this contact is activated always (operates one-time for 3 sec. or permanent). Once the reset is actuated, the contact is set back.

For information on displaying and calling binary input messages, message list and history, see page 6, operating Instructions 903.._BD.

Configuration level (parameters available depending on version):		**factory setting**
[#] **Di* Dir**	Characteristic binary input * direct / inverse / disable (di/in/dis)	di
[#] **Di* Func**	Function binary input * (Alrm (alarm) / AloR (alarm without reset) / AloS (alarm without collective message) / PrAl (pre alarm)/ PAoR (pre alarm without reset) / PAoS (pre alarm without collective message) / STAT (without))	Alrm
[#] **Di* Tdel**	Switch-on delay binary input * (0...300 sec)	0
[#] **Di* Hist**	Save in history binary input * (on/off)	on
Accept Fct	Accept function for malfunction indications (on/off)	off
Blink Fct	Flash function for malfunction indications (1Val/NewV/off) (1Val = In the event of a further fault occurring in addition to an existing, not yet acknowledged fault, the LED of the new fault message will have steady light, whilst the LED of the first fault message will continue to flash. NewV = In the event of further faults occurring in addition to an existing fault, the LED of the new fault message will flash.	NewV
REL*	Switching function for relay contact * *Additional function selection options for supplementary contacts:* **SR A** Collective message function, relay is de-energised if there is a message. **SR E** Collective message function, relay is energised if there is a message. **NW A** New value message, relay is de-energised if a new message appears that has not yet been confirmed with reset. **NW E** New value message, relay is energised if a new message appears that has not yet been confirmed with reset. **IP A** New value pulse, relay is de-energised for 3 sec if a new message appears. **IP E** New value pulse, relay is energised for 3 sec if a new message appears. **SRIA** Collective message function with new value pulse, relay is de-energised if there is a message. If a further (new) message appears, the relay is energised for 3 sec. **SRIE** Collective message function with new value pulse, relay is energised if there is a message. If a further (new) message appears, the relay is de-energised for 3 sec. **BUS** Bus function, relay is de- / energized depending on control via service-interface, for example with Profibus- adapter 99spde..	SR A
REL*	reference value * (alarm (Alrm) / pre alarm (PrAl))	Alrm
StmTxt*	Texts applied to the active binary input *, max. 40 character *Hint:Binary input 1 and 2 are used for reset and LED test !*	Fault*

*= Number of the binary input or relay #= Number of the module

Function:

Completion of a continuous PID controller with subsequently arranged switching steps, optionally installed in the controller or in external accessory units. In principle, the operation, handling and optimization of the continuous controller remain unchanged, However, the continuous control signal is not led to the outside but immediately converted internally to an appropriate number of switched on relay switching steps, based on the actuating variable 0...100%.

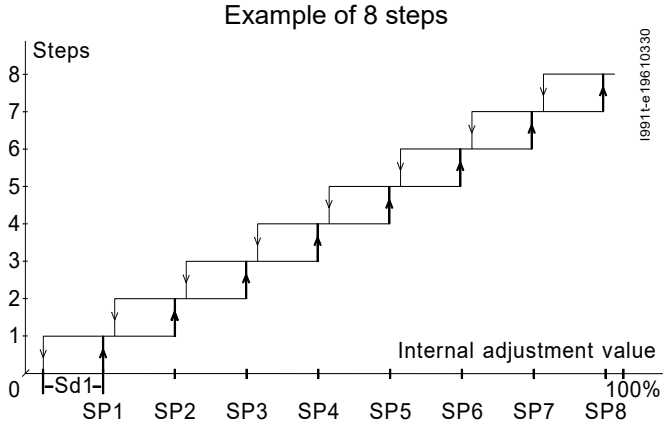
In the factory setting, the switching points of the steps are evenly distributed throughout the entire adjustment range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

All relays are potential free change over contacts, a spark quenching unit is installed for the normally open contacts. Relays which are not needed may be switched off through switch point >100%. The first step may be configured as switching output if desired. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Version for automatic change-over of the steps
Every change in the output steps causes an automatic change-over of the active steps by activating the next higher output step for power increase and deactivating the lowest output step for power decrease. This forces an approximately even use of all steps including the connected load.

Version for different output powers:
In order to achieve an approximately uniform power change per step even with different output powers, one or more outputs are switched for each step depending on the calculated power in versions without continuous output. The other settings of the step parameters remain unchanged by this.
In versions with continuous output the percentage of the output power relating to the common output power can be adjusted for each step. The other settings of the step parameters are calculated automatically resp. are presetted by factory. A changing of these values is admissible in special exceptional cases only.

Example of 8 steps



Versions:	**List No.:**
Internal controller switching	991t..
Division of the contin. control signal into max. 20 actuating values (for example 4,8,5,6..20mA)	991ty
Recommended supplement for heater controls:	
accessory equipment to display the return flow temperature	99ax.
Option:	
First step cycling, relay / logical output	..t / ..tL
First step as a continuous output 0/4..20mA	..y
ditto, but with adjustable power allocation of the steps	..p
version with different output powers of the steps	..c
automatic change-over of the steps	....z

Switching stages in external devices see list sheet 991tz8

Special features of step controllers

Configuration level (supplement):

		Factory setting
tE	Switch-on delay per step 1...60sec	5sec
SP..	Switch-on points for step 1...8, based on output 0...100% (or deactivation with setting 101%)	see table
Sd..	Switching differences %	see table

optional:

rel	Switching behaviour of first step: St (normal step) / CY" (cycling)	St
cy"	Cycle for cycle behaviour (2...120 sec)	20 sec

type 991t..0z only

st	function of the steps static ("stat") or automatic change-over of the steps ("auto")	auto

Settings SP.., Sd..
in %, based on internal control signal 0...100%

	SP1	**SP2**	**SP3**	**SP4**	**SP5**	**SP6**	**SP7**	**SP8**	**Sd..**
for switching behaviour St= normal									
3 Steps	34	66	97						31
4 Steps	27	50	74	97					24
5 Steps	21	40	59	78	97				18
6 Steps	17	33	49	65	81	97			14
7 Steps	16	30	43	57	70	84	97		11
8 Steps	13	25	37	49	61	73	85	97	10
for switching behaviour CY= step1 cycling									
3 Steps		34	66						0.1
4 Steps		27	50	74					0.1
5 Steps		21	40	59	78				0.1
6 Steps		17	33	49	65	81			0.1
7 Steps		16	30	43	57	70	84		0.1
8 Steps		13	25	37	49	61	73	85	0.1

type 991t...v only:
Example: Relay arrangement with 3 different output powers (relationship ideal 1:2:4)

	step 1	step 2	step 3	step 4	step 5	step 6	step 7
relay 1	x		x		x		x
relay 2		x	x			x	x
relay 3				x	x	x	x

Method of operation:

The functional extension for continuous PID controllers consists of a following electrical output for the operation of motors, control valves or other electrical actuators. The operation, control and optimisation of the continuous controller remain, in principle, unchanged.

The continuous control signal is converted via the relay outputs K1 (open) and K2 (closed) directly into a corresponding setting of the connected actuator (see the controller data sheet for the circuit diagram). At the same time, the usual continuous output is omitted (with the exception of Type 991uy).

In addition to the two additional relays, the necessary supplementary item, 99axr, the input for the position feed back, is also supplied. A feedback potentiometer for indication of the position must be present on the actuator that is being driven.

The expansion to version 2 consists of an additional input and an output for a second actuator, whose position is compared with the first and made to follow it.

The functional extension for a three-step controller allows a second actuator to be operated in parallel. The position is continuously compared with that of the first actuator, and made to follow it. In addition to the two additional relays, the two necessary items of supplementary equipment, 99axr, inputs for the position feed back, are also supplied. Feedback potentiometers for indication of the position must be present at both the actuators that are being driven.

Models:	**List no.:**
Position controller instead of continuous output	991u
Position controller in addition to continuous output	991uy
Double position controllers instead of continuous output	991u2
Position controller for continuous heating/cooling controller (9281.):	
- instead of 1st output (heating output)	991uh
- instead of 2nd output (cooling output)	991uk
Second (relay) position output for switching controllers	991uww

Operation (extension):

Parameter level:		Factory setting
SA..	Dead band relay no. to guidance signal (as a % of the regulating distance)	0.0
Sd..	Switching difference relay no. (as a % of the regulating distance)	0.5

Configuration level:

FG. A..E Remote comparison, see data sheet 99axr or reverse side

Used in conjunction with controllers with three-point step output, the option 99axr allows position indication of the accessed actuator equipped with a feedback potentiometer.

A program for convenient automatic adaptation of the display 0...100% to the electrical values of the respectively available feedback potentiometer in the configuration level, is included in option 99axr:

Operation:
After checking or correcting the actuating time "Y" actuate the P-key, possible several times,
until **"FG A"** appears in the display.

Start compensation by *pressing the P-key for a prolonged time (longer than 5 sec.),*
until a flashing **"0"** appears in the bottom display.
(*Press the P-key briefly to skip compensation.)*
Relay 2 ("-") switches ON, actuator moves to starting/closed position,
Relay 2 switches OFF, **"0"** changes to steady display

After checking the mechanically correct position, acknowledge the default value 0% with the P-key,
"**FG E**" appearing in the top display for final value compensation,
a flashing **"100"** appears in the bottom display
Relay 1 ("+") switches ON, actuator moves to end/open position,
Relay 1 switches OFF, "**100**" changes to steady display

After checking the mechanically correct position, confirm the default value 100% with the P-key
(subsequently, the system switches to the next configuration)

The program also checks whether the output has really caused an alteration of the position of the actuator and the potentiometer:
If identical values are measured at the start and the end, the error message "Err 300" appears.

Measuring input:	**List No.:**	**Measuring/display range**
Teletransmitter 0...100 to 0...1000 Ω	99axr	0...100.0 %
Standard signal 0(4)...20mA, 0(2)...10V	99axe	0...100,0 %

Wiring: See the wiring diagram in the general operating instructions for the 90.. and 92... controller series. The wiring diagram printed on the respective unit takes precedence.



1 TFT display
2 Buttons for device operation
(Reset without function, only internal)
3 Bus interface for KFM- field bus adapter
4 USB service interface

General:

The 991td.. step controller can be used to add downstream switching stages to continuous controllers of the 9 series. They are controlled via the control signal.

In the factory setting, the switching points of the stages are distributed evenly over the entire setting range depending on the number of relay modules, but can be changed as required. A built-in switch-on delay prevents the simultaneous switching on of all stages and thus load jumps in the supply network. It is set for all stages together.
Relays are designed as potential-free changeover contacts.

Stages that are not required can be switched off by setting the switching point >100%. Optionally the first stage can be switched clocked. In parallel, depending on the version, a standard signal 0/4-20mA is available for controlling a semiconductor switch. This causes an equalization of the power jumps between two stages and thus an almost stepless behavior.

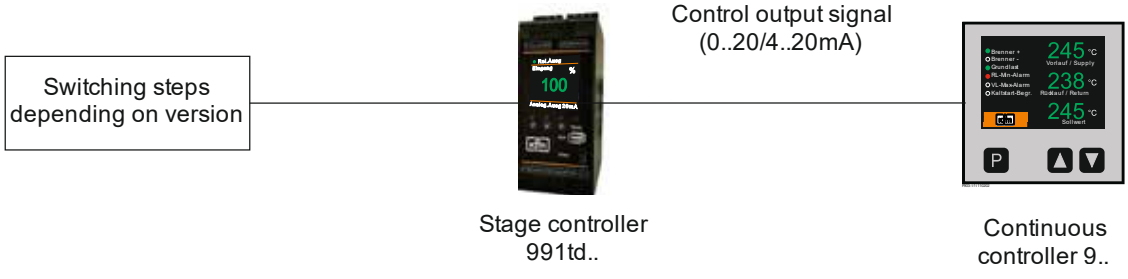
The bus interface ix industrial allows the connection of KFM adapter modules, e.g. 99spne (Profinet), whereby actual value, switching distance and status of the device can be read out.

The service interface is used to parameterize the stage controller.

Versions:

991td2	2 stages, 1st stage continuous 0/4-20mA (signal between the stage), 2nd stage relay, potential-free changeover contact
Type suffix	without: 100-250 V AC, 8 = 24V DC

Wiring example:



Characteristic values:
Input / measuring range:
Standard signal, 0..+100

Output: 1 relay, max 250 V 2 A,
output 4...20mA (load<=500Ω) for 1st stage

Interfaces:
Service interface. 2.0 Micro USB 2.0 Type B
Bus interface 2.0 ix Industry Type A

Mains connection: (without protective earth connection)24VDC, about 3 VA

Protection class according to EN 60529:IP 20, for installation in housing min. IP 40

Permissible ambient temperature: 0..60 °C,

Storage/transport temperature: -20..+80 °C
Nominal temperature: 20 °C,transport in cardboard box

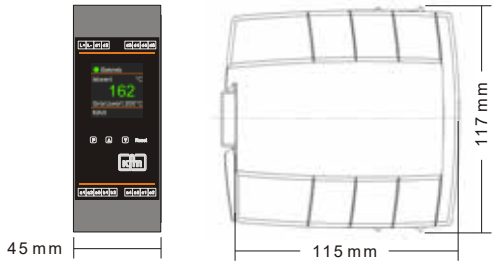
Climatic resistance: Rel. humidity <= 75 % annual mean without condensation

Electromagnetic compatibility:
According to EN 61326, industry requirement

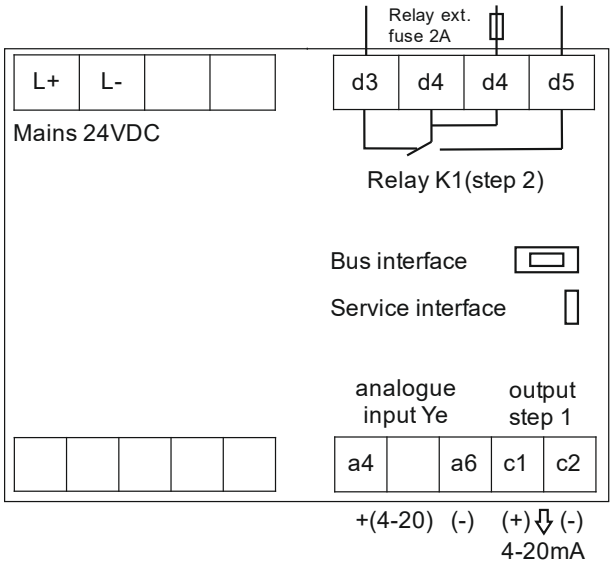
Installation position: any

Housing: Mounting on 35 mm standard rail

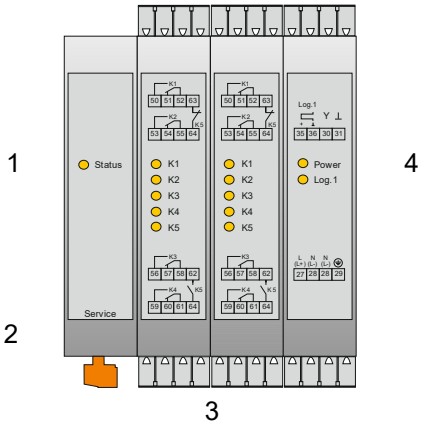
installation dimensions:



Connection diagram:



1 Status-LED (CPU-module)
2 Service interface for configuration (PC)
3 Relay modules
4 Power-LED (power supply module)



Brief description:
Continuous controllers from the series 9 can be complemented with subsequently arranged switching steps by the modular step controller 991tz86e. Actuation is performed using the continuous control signal. The configuration of all parameters (setpoint distance, hysteresis, switch-on delay etc.) is done in the CPU-module of the modular step controller by the KFM-PC- software PKS. The modular step controller consists of one CPU- and power supply module each as well as one ore more relay modules with 5 relays each, depending on the number of required switching steps. The step controller can be complemented with 4 relay modules to a maximum of 20 relays. All relays are potential free change over contacts.

In the factory setting, depending on the number of relay modules, the switching points of the steps are evenly distributed throughout the entire control range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

Relays which are not needed may be switched off by setting the switch point >100%. The first step may be configured as a modulating output if desired. In parallel, depending on the version, there is a cyclic switching output 0/24V and a continuous control output 0(4)…20mA available for driving a semi conductor switch. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Version for automatic change-over of the steps
Every change in the output steps causes an automatic change-over of the active steps by activating the next higher output step for power increase and deactivating the lowest output step for power decrease. This forces an approximately even use of all steps including the connected load.

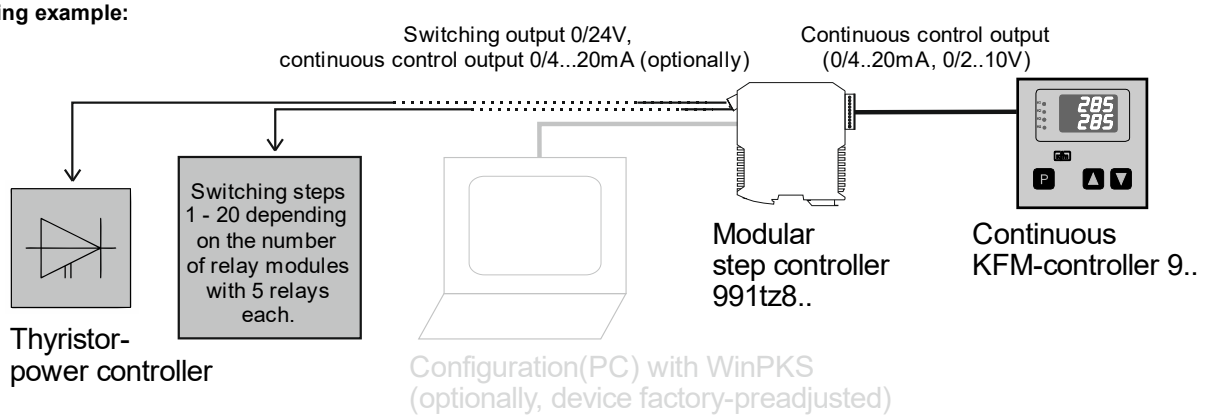
Type summary:

991tz86e.	CPU- module (with standard signal 0(4)...20mA, 0(2)...10V measuring input)
991tz870	Relay module with 5 relays
991tz850	Power supply module 100-250 VAC
991tz858	Power supply module 24 V AC/ DC

Device versions:

..Ly	Switching output 0/24V max. 40 mA and cont. control output 0(4)…20 mA load <=500Ω
...z	Automatic change-over of the steps

Wiring example:



Error messages: The status LED of the resp. module signalises the operating state:

CPU- module:

green permanent*: Normal operation

green flashing*: *Only with configuration 4..20mA/ 2..10V:*
Measurement line error analogue input

red permanent: The detected module is unsuitable
-> Check the type name of the module, (see type summary)

red flashing: Communication error between one or more other modules
-> Check proper position of the connections beetwen the individual modules

Relay module:

green permanent*: Relay actuated, switched on or switched off depending on the configuration

red flashing: Communication error to the CPU
-> Check proper position of the connections beetwen the individual modules

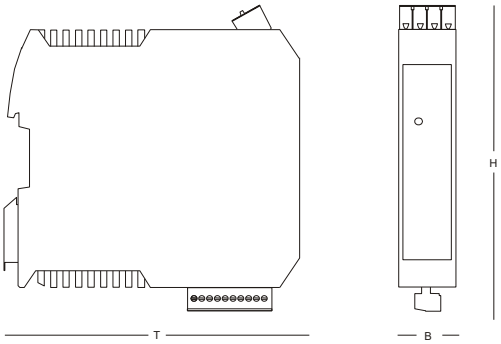
Power supply module:

green permanent*: Supply voltage on, normal operation

red flashing: Communication error to the CPU
-> Check proper position of the connections beetwen the individual modules

** alternative yellow, depending on version*

Installation dimensions (each module):

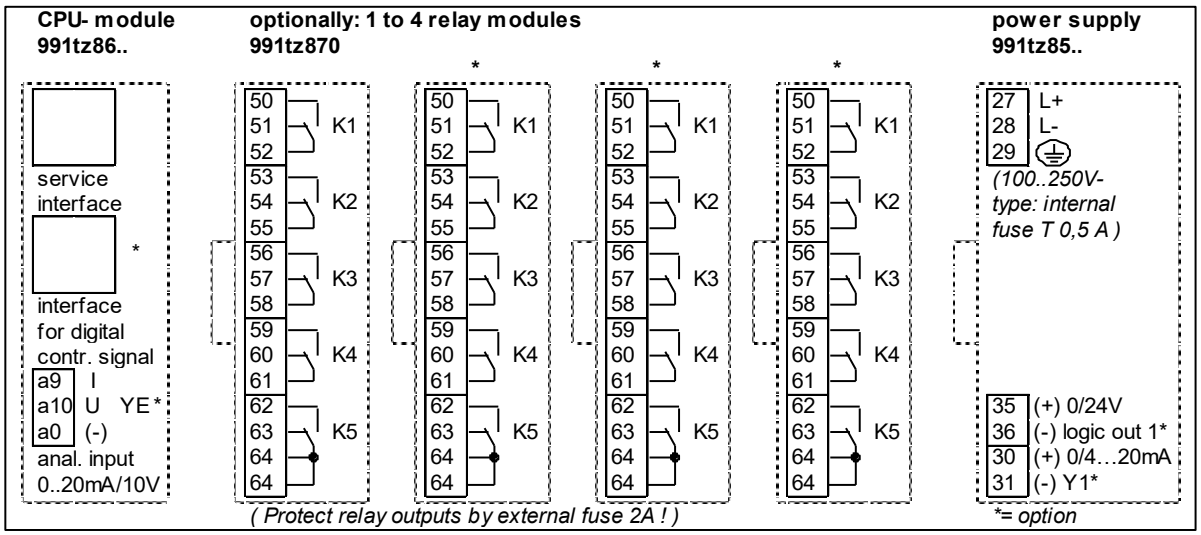


H= 124mm, B = 22,5mm, T = 116mm

Technical data:

Power supply: 100..250VAC, about 12VA,
alternative 24V DC/ AC, about 12VA
Relay output: 230 V / max. 2 A
Logic output: 0/24V max. 40 mA
continuous output 0/4…20mA: load <= 500Ω
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temp.: 0..60°C, nom. temp 20°C
Relative humidity <= 75 % yearly average,
(KWF to EN 60529) no condensation
EMC: referring to EN 61326

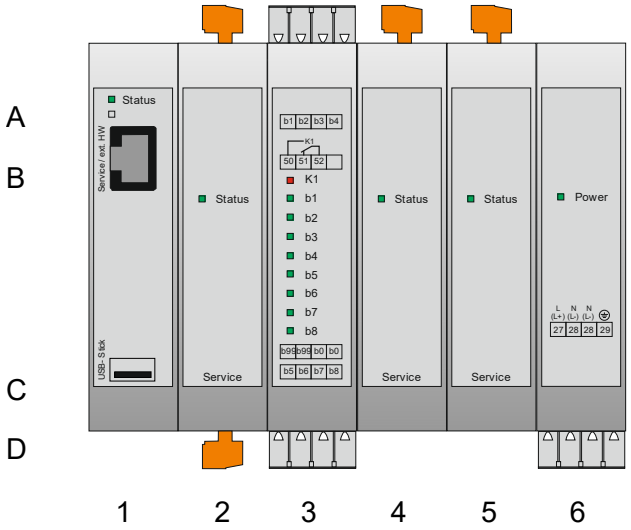
Connection diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



Example for 6 steps:

A Status LED (depending on module)
B Connection interface for configuration alternative interface adapter
C USB stick, KFM service only
D Interfaces and CPU button (internal)

1 CPU-Module (991tz88e)
2 Analogue input module (991tz8220)
3 Binary input module with relay (991tz83..)
4 Ana. output module steps 1-5 (991tz880)
5 Analogue output module step 6 (991tz880)
6 Power supply module (991tz85..)



General description:

With the 991tz88 modular step control, continuous controllers from the 9 series can be supplemented with downstream signal outputs 0/4..20mA for semiconductors. Actuation takes place via the control signal. The settings for all parameters (number of signal outputs, switch-on delay, etc.) are made in the CPU module of the modular step controller using the KFM PC software PKS.
The modular step control consists of one CPU and one power supply module and, depending on the number of signal outputs required, one or more analogue output modules with 5 analogue outputs each and one or more binary input modules with 8 binary inputs and 1 relay. The stage control can be extended to a maximum of 20 analogue outputs.

A built-in switch-on delay prevents all signal outputs from being switched on at the same time and thus load jumps in the supply network. It is set for all outputs together.

Each time the power is changed, the next highest signal output (power increase) or the lowest signal output (power reduction) is automatically activated. This ensures that the individual signal outputs, including the connected load, are utilised almost equally. With active limitation (YHi), the automatic step change is deactivated.

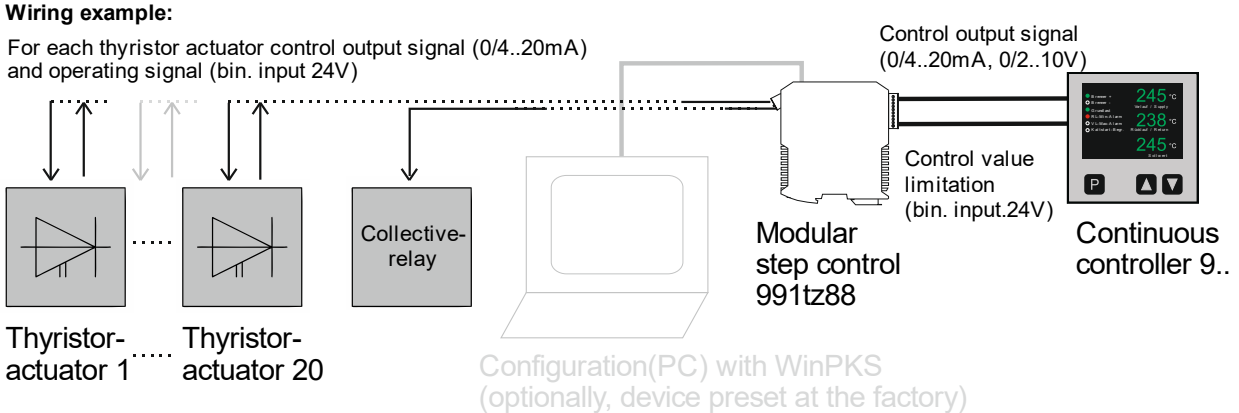
Integrated operating logic records and analyses the operating status of the signal outputs. Outputs with faults are deactivated (binary input fail-safe). Faults are signalled by means of a collective relay.

The output of each heating level can be limited to a maximum value (YHi) via a binary input.

Types:

991tz88e	CPU module for mod. step controller for max. 20 semiconductor outputs
991tz8220	Module with 2 analogue inputs for Pt100 / standard signal, range 0..400 / adjustable
991tz83881	Module with 8 binary inputs 24VDC, 1 relay output (potential-free changeover contact)
991tz880	Module with 5 analogue outputs 0/4...20mA
991tz8508	Power supply module 24 V AC/ DC

Wiring example:



Interfaces:
Only 991tz88e: 1 x Service interface for configuration, alternatively for interface adapters,
1 x USB stick, 1 x USB-C (internal)

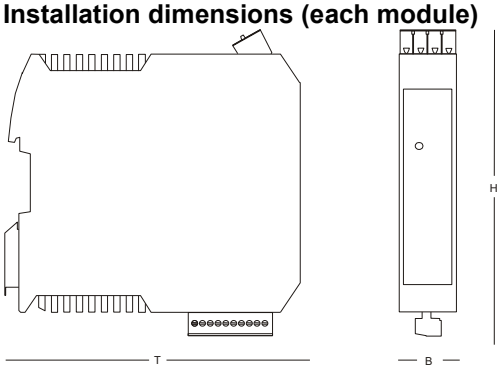
Technical data:

Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
optional: binary inputs:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
optional: analogue inputs:	Pt100/ standard signal, range 0..400 resp. -200..+800°C / adj.
optional: relay output:	230 V / max. 2 A
optional: analogue output:	0/4..20mA (load<=500Ω) as control or signal output

Other operating data:

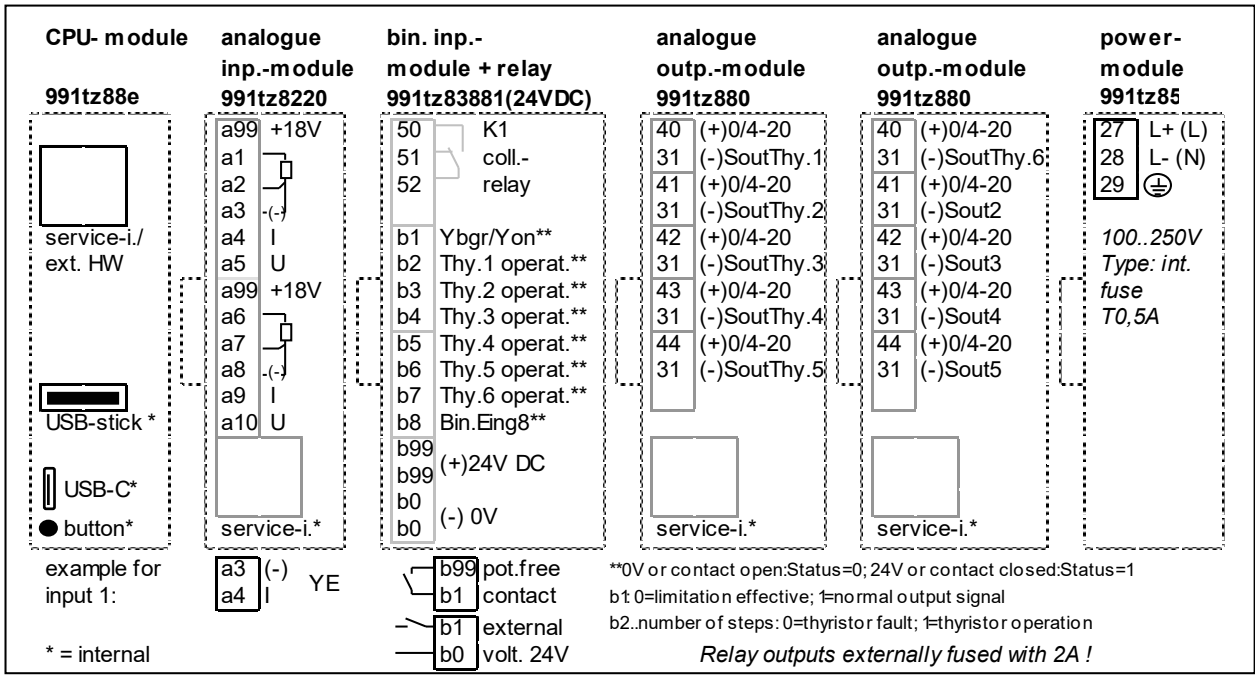
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)



H= 124mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered device is the wiring diagram on its casing only.)



Controllers of series 92/93 (903/93) may be equipped with up to 4 (8) analog inputs per unit in addition to the measuring inputs available as standard. They may be used to display additional measuring values or as reference value for installed additional contacts.

Series 92/93 only:
The display is continuously switched over to additional inputs by actuating the ▲ key. In addition, the bottom display shows the brief designation of the attendant measuring input. The display automatically switches back to the standard operating condition 30 seconds after the last key was pressed. Furthermore, input 2 may be configured as a second display in addition to the controller actual value.

For series 903/93 only:
Factory adjusted, the values of input 1 to 8 are shown with plain text indication.

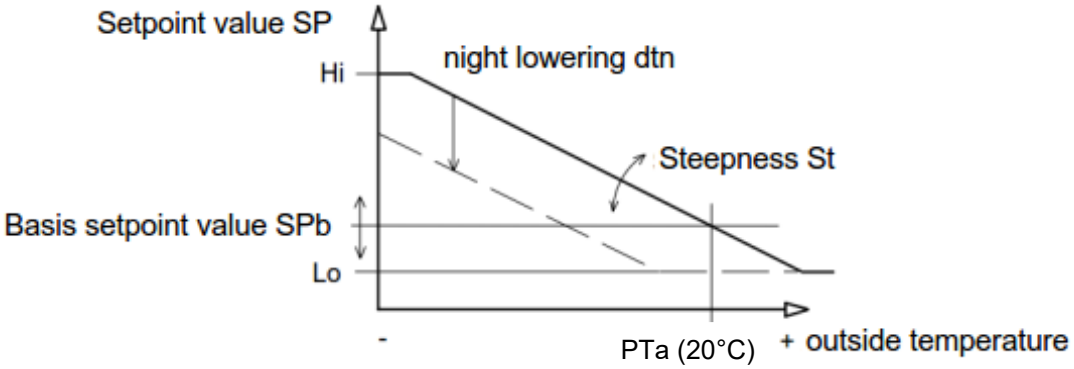
For temperature sensor inputs, °C or °F may be selected as display unit, for standard signal inputs, a scaling between -999 and +4000 (series 92/93) respectively -999 and +9999 (series 903/93) may be infinitely set.

Measuring input:	**List-No.:**	**Measuring/display range**
Series 92/93 only:		
Resistance thermometer:		
Pt100 DIN	99ax	0...400 °C
Thermal elements:		
NiCrNi (Typ K)	99axn	0...1200 °C
FeCuNi (Typ J)	99axf	0...900 °C
PtRhPt (Typ S)	99axp	0..1700 °C
Standard signal:		
0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axe	adjustable
Rheostatic teletransmitter:		
0...100 to 0...1000 Ω	99axr	adjustable
For series 903/93 only:		
Resistance thermometer / Standard signal:		
Pt100 DIN (PT1000 DIN) switchable 0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axq(c)	-200...800 °C / adjustable
Thermal elements / Standard signal:		
Thermal element switchable 0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axqt	NiCrNi (Typ K) 0...1200 °C / FeCuNi (Typ J) 0...900 °C / PtRhPt (Typ S) 0..1700 °C / adjustable

Additional terminals:

Series 92/93: see sheet 9200 wiring diagram, analogue inputs ai1 to ai4
Series 903/93: see sheet 903 wiring diagram, analogue inputs ai1 to ai8
Terminal numbers according to number of existing, or required analogue inputs

This accessory equipment measures the outside temperature und calculates each corresponding setpoint value “SP”, for example for the supply temperature of a heating circuit in consideration of the adjusted basis setpoint value “SPb” (related to e.g. +20°C outside temperature) and the adjusted steepness “St”, in accordance to the below diagram.
Optionally, lowering the temperature at night “dtn” is activated by closing a binary input (for example external switch clock).



Type summary: **List.-no.:**

For outside temperature measurement with Pt 100 DIN, range preadjusted -30...+70°C: 99axa(q)
Type as above, but with option for lowering the temperature at night: 99axa(q)n

Operation (in addition):

Operating status:

For series 92/93 only:
Display line 1 shows the actual value of the supply temperature (measuring input 1)
Display line 2 shows the actual value of the outside temperature (measuring input 2)
The actual calculated setpoint value is displayed by brief pressing the P-button.
(Depending on type, further displays or switch over to further values)

For series 903/93 only:
Factory adjusted the values of input 1 (supply) and 2 (outside temperature) as well as the actual setpoint value are displayed with plain text indication.

Parameter level 1:		factory adjustment:	notes:
SPb	Basis setpoint value with outside temp. +20°C, range 0...400°C	20	_____
St	Steepness, range 0,1...100,0 K/K	1,0	_____
PTa	Reference point outdoor temperature	1,0	_____
dtn	Lowering the temperature at night, range 0...400 K	0	_____

Parameter level 2:

Lo/Hi	Limitation of the calculated setpoint value, Upper- / lower limit	relating to meas. range	_____

Corresponding terminals (example):

Terminal- no.:		**Connection of:**
For series 92/93 only:		
1 / 2 / 3	analogue input 1 (PT100)	regulating variable, for example supply
4 / 5 / 6	analogue input 2 (PT100)	outside temperature
19 / 20	binary input 1	for example external switch clock
For series 903/93 only:		
a1 / a2 / a3	analogue input 1 (PT100)	influenceable regulating variable
a6 / a7 / a8	analogue input 2 (PT100)	changeable reference variable
b99 / b1	binary input 1	for example external switch clock

On devices with an additional measurement input (input 2), this supplementary equipment permits a maximum or minimum selection from the inputs 1 or 2. The values indicated by the two inputs are continuously compared, and only that input with the larger (or smaller) value is used as the regulating magnitude.

Ordering text: Supplementary equipment:
Minimum-maximum selection between 2 measurement inputs
Li. – no. 99ax1ma

Additional information for the operating instructions:

In the normal operating mode, the *upper* display indicates the **active** actual value.
The *lower* display remains empty, or, according to the version and the setting, indicates the (active) set value or the manipulated variable.

If the ▲ - button is pressed the *upper* display shows the value for input 1 and
the *lower* display shows the value for input 2.

Different reactions to error messages:

An error in one of the two measurement inputs is indicated by an "Err" in the display.
By pressing the ▲ - button it is possible to determine whether the error occurred at input 1, input 2, or at both inputs.

Used in conjunction with controllers with three-point step output, the option 99axr allows position indication of the accessed actuator equipped with a feedback potentiometer.

A program for convenient automatic adaptation of the display 0...100% to the electrical values of the respectively available feedback potentiometer in the configuration level, is included in option 99axr:

Operation:
After checking or correcting the actuating time "Y" actuate the P-key, possible several times,
until **"FG A"** appears in the display.

Start compensation by *pressing the P-key for a prolonged time (longer than 5 sec.),*
until a flashing **"0"** appears in the bottom display.
(*Press the P-key briefly to skip compensation.)*
Relay 2 ("-") switches ON, actuator moves to starting/closed position,
Relay 2 switches OFF, **"0"** changes to steady display

After checking the mechanically correct position, acknowledge the default value 0% with the P-key,
"**FG E**" appearing in the top display for final value compensation,
a flashing **"100"** appears in the bottom display
Relay 1 ("+") switches ON, actuator moves to end/open position,
Relay 1 switches OFF, "**100**" changes to steady display

After checking the mechanically correct position, confirm the default value 100% with the P-key
(subsequently, the system switches to the next configuration)

The program also checks whether the output has really caused an alteration of the position of the actuator and the potentiometer:
If identical values are measured at the start and the end, the error message "Err 300" appears.

Measuring input:	**List No.:**	**Measuring/display range**
Teletransmitter 0...100 to 0...1000 Ω	99axr	0...100.0 %
Standard signal 0(4)...20mA, 0(2)...10V	99axe	0...100,0 %

Wiring: See the wiring diagram in the general operating instructions for the 90.. and 92... controller series. The wiring diagram printed on the respective unit takes precedence.

All rights for technical modifications withheld

additional device for standard signal input: alteration rate limitation

The adjustment *d* helps to avoid overshoots due to violent corrective actions,
f.e.in steam contol circuits.

The additional adjustment *db* allows to restrict this influence to a part of the
input range.

Example:
The signal input range is 0 to 20 bar, with a setpoint value of 10 bar the damping shall be limited to the range from 5 to 15 bar.

The adjustement for the parameter *db (%) is derived as follows:
The damping shall be effiective within 5 to 15 bar.
This means a damping range of 10 bar, referring to the measuring range of 20 bar it is 50 %.

Order text: Additional device:
input signal alteration rate limitation
List No. 99azd*

Adjustment:
(in supplement to configuration level):

***d"** permissible speed of corrective action, % per second
(no function: adjust 0.0)
factory setting: 0.0

***db** influenced part (%) of input range
(no range restriction: adjust 100)
factory setting: 100

* = no. of measuring input

Option to cascade function 991.. activation by digital input

99b1s8 E

This option allows to activate the cascade function 991k by digital inputs (f.e. terminal 19 / 20 = digital input 1).

Contact closed: the cascade function is active. All influences to the setpoint value (f.e.external setpoint value, second setpoint value) refer to the guide controller.

Contact open: the cascade function is off. Only the sequential controller is active. All influences to the setpoint value (f.e.external setpoint value, second setpoint value) refer to the sequential controller.

Type summary:	**List No.:**
switchable with separate sequential controller setpoint	99b1s8
as stated above, but with takeover of the guide controller setpoint	99b1s8fsp

Type 991b1s8fsp: The sequential controller part continues to operate with the guide controller setpoint in case of Err 1 or disabled guide controller.

Attention:
To avoid cross interference all low voltage measuring lines and pilot wires must be encased in a shielded cable (the shielding must be earthed one-sided) and avoid the neighbourhood of heavy current lines.

All rights for technical modifications withheld

Controller series 9.. can acquire status messages by using internal binary inputs and provide them via service interface for further processing, for example with interface adapter 99spde.. for Profibus.

The binary inputs can be accessed with parameter code "1002". *For the structure of the parameter see page 6 of the manual 99s_BE.*

With series 903... messages can be additionally displayed as LED symbol and in plain text on the TFT display, the LEDs and message texts can be easily edited by the KFM-PC Software PKS.

With series 92.. and 902.. messages are displayed in the setpoint level by parameter "bin" resp. "BIN.EING.“.

Depending on the sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible.

Types:

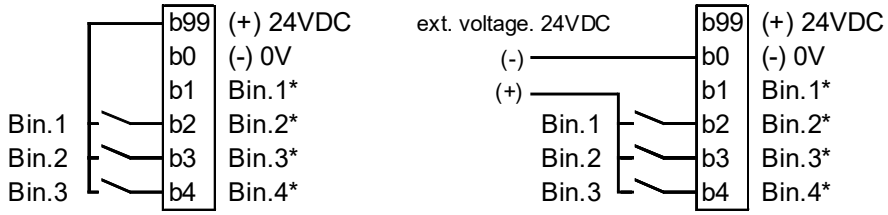
99b2s: 2 binary inputs incl. software for acquiring and processing of status messages

99b3s: 3 binary inputs incl. software for acquiring and processing of status messages

99b4s: 4 binary inputs incl. software for acquiring and processing of status messages

Additional connection terminals:

Example for type 99b3s, valid for each delivered controller is the wiring diagram on its casing only.



Remarks: *To avoid cross interference use shielded cable only for the low voltage signal leads, the shielding must be earthed one-sided.*

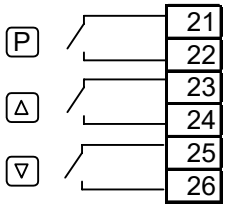
Avoid to cross with load wires.

** Appropriated digital inputs depend on additional functions, respectively on already used binary inputs.*

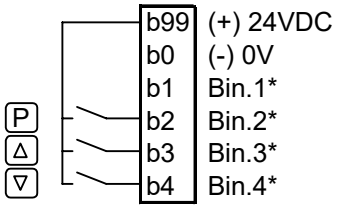
Controllers of the series 9.. can be equipped with terminals for external keyboards.
Depending on sub type, the use of external voltage 0 / 24V alternatively to potential-free change-over switches is possible.

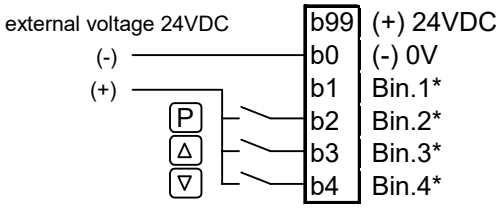
Wiring diagram:

(Examples, depending on sub type, some details can be missed. Valid for each delivered controller is the wiring diagram on its casing only)



alternative:





Remarks: *To avoid cross interference use shielded cable only for the low voltage signal leads, the shielding must be earthed one-sided.*

Avoid to cross with load wires.

** Appropriated digital inputs depend on additional functions, respectively on already used binary inputs.*

This function expansion makes it possible to switch over control units of series 9.. from the internal equipment set point value to an externally specified setpoint value, as desired.

The analog input for processing the external setpoint value signal is identified on the connection terminals with the designation SPE, as well as the optional connection type of voltage (U) or direct current (I).

The voltage or current range may be configured to 0 or 2...10 V or 0 or 4...20 mA. Furthermore, the setpoint range allocated to the signal range is freely adjustable. The function of the value is selectable by menu as absolute (abs) adding (add) or subtracting (sub).

Depending on type, switch-over from the internal to the external setpoint value takes place through a binary control input (potential free contact, alternative: external voltage 24 VDC) or is to select, additionally with the type extension "..mb", by menu adjustment in the setpoint level (SP-F: choice SP = internal or SPE = external setpoint). Only for type extension "..mb" : The configuration of the external setpoint for series 902/903.. takes place in the configuration level using SPEF (resp. SP-F for type 9..) by selecting BIN = activation by bin. input or MENU (resp. SP-L for type 9..) = activation by menu adjustment in the setpoint level.

In the standard version, the incoming external setpoint signal is displayed in the setpoint level under the designation ‘SPE’ when the P key is pressed again after the setpoint ‘SP’. It is also possible to see whether this signal is currently active, depending on the switch position: the currently active value, SP or SPE, appears in the normal display, whilst the inactive value merely flashes. Alternatively, several external setpoint signals can be listed on a separate display page; to that, press the ▲ - key *briefly*.

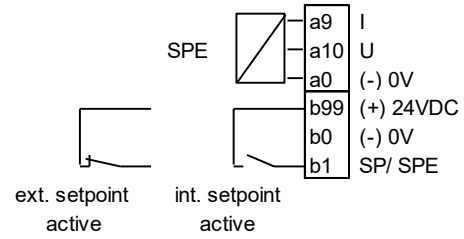
Provided that the setpoint is also shown in the lower display of the operating display, this display automatically switches to the external setpoint as soon as it is activated; it therefore always shows the currently active setpoint.

Types	**List No.**
- Activation with control input for potential free contact* *Series 903 – alternatively menu; plus secondary setpoint*	99bwa
- ditto, plus analogue inputs with downstream maximum selection for active external setpoint	99bwa..1max
- Switch-over with menu function or potential free contact* *(for series 92.., 902.. only)*	99bwamb

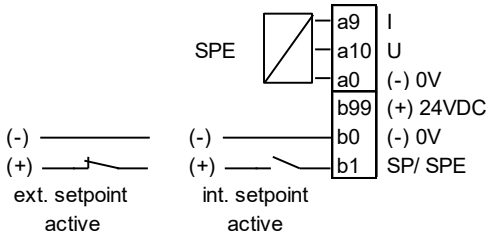
*Depending on sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible.

Additional connection terminals: Examples, valid for each delivered controller is the wiring diagram on its casing only.

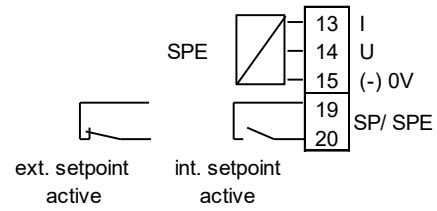
potential free contact



external voltage 24 VDC



alternative:



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Accessory equipment 9..
additional set point value permitting switch-over

This function expansion for control units of series 9.. makes it possible to enter one or several additional set point values in the operating level as an optional alternative to the main set point value SP.

Switch-over from the main set point value to a different set point value takes place through the allocated binary control input (potential free contact, alternative: external voltage 24 VDC). Only one contact may be switched at a time.

Providing the set point value in the operating level is displayed in the bottom display, this display automatically switches over to the external set point value, i.e. as soon as it has been activated it displays the current effective set point value.

In the operating level, the additional set point value is displayed and set under the designation “SP2” / ”SP3” for example, after the main set point value “SP”, once the P key is actuated again. In addition, it can be recognized which set point value is currently effective: The respective active value SP or SP_ appears in the normal display, the inactive value only flashing.

Types:	**Li.-No.**
- Switch over to other set point values by potential free binary control input[#]	99bwz*

[#] = Depending on sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible. (series 92..: sub type “u“)

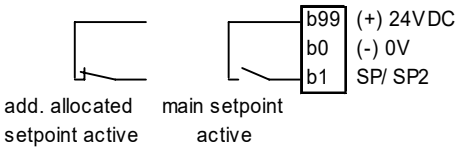
Order text:

Accessory equipment:
Function expansion for switching over
to additional set point values incl.
attendant binary control inputs
Li.-No. 99bwz*: Control input for potential free contact

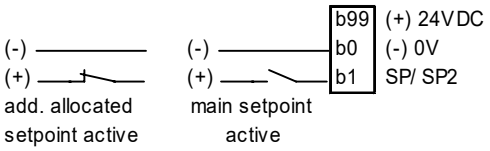
* = Number of additional set point values

Wiring diagram: Example, each for 99bwz1, valid for each delivered controller is the wiring diagram on its casing only.

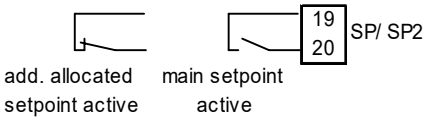
potential free contact



external voltage 24 VDC



alternative:



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Optional extras:
External control of controller functions

A controller function can be influenced via an external contact using a digital input (Type 99bx) or a control bit from parameter code 6210 (Type 99bs). Depending on the type, the manual mode can be called up.
Control contact *closed* / control bit = 1*: influence active*
with control contact *open* / control bit = 0: normal operation

	List No.
Control STOP, (switching output: relay *off*, continuous output: control signal at *last* value), Unit is switched to *manual mode*	99bxh
for 3-point step controllers:	
Control STOP, all relays *off*	99bx70
Control STOP mode, relay *K2(-) energised (on)*	99bx72
For continuous controllers:	
Control STOP, control signal *0%*	99bx80
For continuous controllers with 2 control outputs:	
Control STOP, output 1 = *0%*, output 2 is not affected	99bx81
Control STOP, output 1 is not affected, output 2 = *0%*	99bx82
Control STOP, output 1 = 100% (20 mA), output 2 is not affected	99bx83
Control STOP (90.. series), output 1 and output 2 = *0%*	99bx90y
Output 1 = *0%*, output 2 is not affected	99bx91
Output 2 = *0%,* output 1 is not affected	99bx92
Same as above, but with control bit, parameter code 6210	99bs92
Same as above, but with 2 binary inputs (separate for each output): both binary inputs open: outputs 1 and 2 = 0%, plus STOP control	99bx93
Also available: reverse function	..u
After reactivation via a binary input, the output signal rises one time up to the calculated setpoint with an adustable gradient.	..s
for controllers with a setpoint ramp: additional setpoint ramp reset	..r
Ramp function optionally enabled (when control contact *is open*: ramp function OFF, controller operates with target setpoint)	99bxr
For additional contacts:	
Additional contacts 1–4 OFF (associated relays off)	99bxf1
Additional contacts 1–3 OFF (associated relays off)	99bxf13
Additional contacts 2–4 OFF (associated relays off)	99bxf2
Additional contacts 2–3 OFF (associated relays off)	99bxf23
When the input is closed, a single switch-on pulse is applied to additional contact K...	..i

Configuration level 1 (supplement), *if available*:		*Factory setting:*
99bx…s only:		
1/2tY	Permissible rate of change for the control output (1/2) per second (in 0…100% of the signal range) No limit: enter 0	1.7
only 99bx…i:		
DTi	Pulse duration for additional contact K... (-600..+600 seconds)	5

Connection:
see the wiring diagram in the general controller description, data sheet 90../92.., or the operating instructions 90../92..

Special function:
Limitation of a continuous action control output

Description:

The control output of continuous action controllers can be limited to a settable value by way of a binary input or a relay linkage.

open input: limitation effective,
closed input: normal output signal
(Description for list no. 99bybbu)

The desired maximum value of the control variable is set in the configuration level as parameter **Yhi** alternatively **LHi** (depending on version).

Adjustment:

Configuration level (in supplement)**:**

YHi / LHi	Maximum value of the manipulated variable "(-100) 0...100",	*factory setting: 10*

Versions:	**List No.**
Limitation by way of binary output	99bybb
Limitation by linking an auxiliary contact K1. The switching point is set as usual for K1; all standard function and allocation selection possibilities of the auxiliary contact are retained. By allocation of another measuring input it is also possible to trigger the limitation by conditions outside the control circuit (return temperature, other measuring value).	99bybf
Alternative in each case: reverse action	.....u

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additional device for continous controllers series 9..: speed limitation of corrective action

This alternation helps to avoid overshoots due to violent corrective actions, f.e.in steam control circuits.

Order text: Additional device:
speed limitation of corrective action
List No. 99byd.

Adjustment:
(in supplement to configuration level):

tY permissible speed of corrective action, % per second
(no function: adjust 0.0)

factory setting: 0.0 %/sec

Versions	**List- No.:**
Standard version	99byd
Special version:	
Speed limitation of the *decreasing* corrective action, *increasing* corrective action unaffected	99byd1

In the *double* continuous controllers of the 9… series, this additional equipment is used to select, according to the setting, either the largest (maximum selection) or the smallest (minimum selection) of the two internal actuating signals, and to make it available at only *one* output present in hardware as a 0/4…20 mA signal.

Ordering text:

Additional equipment for continuous controllers:
Selection function for maximum or minimum selection of the internal actuating signal of a double continuous controller and connection to the position output.
List no.: 99bym

Operation:

Configuration levels (extension):

		Factory setting:	*Notes:*
1out	Position output characteristic curve control loop 1 direct / inverse "di / in"	in	
2out	Position output characteristic curve control loop 2 direct / inverse "di / in"	in	
out	Position output signal "0-20 / 4-20" mA	4-20	-------
out	Operation of the "Lo / Hi" selection	Lo	-------

Controller from series 9.. can capture impulse counter- signals using internal binary inputs and provide for example the actual volume per hour or the added up total quantity for displaying and further processing. Depending on version the impulse counter- signals can be used for flow control, dosage or for pump-protection respectively control.

The total quantity of each impulse input is saved every 6 minutes independently of the power supply and can be reset or adjusted if required. It can be selected between division and multiplication depending on the size of the factor. The displayed value is a result of the quantity and an adjustable correction factor.

Furthermore, with *version 99cb2d* can be switched over from either impulse input 1 or the difference between impulse input 1 - 2 using an additional internal binary input.

The usage of external voltage 0 / 24 V DC is possible alternatively to a potential free contact. The maximum frequency of the impulse inputs is 3,2 kHz.

Versions:

99cb: 1 binary input incl. software for the capturing of impulse counter- signals and the calculation of actual volume per hour or the added up total quantity

99cb2d: 2 binary inputs incl. software for the capturing of impulse counter- signals and the calculation of actual volume per hour or the added up total quantity, either impulse input 1 or the difference between impulse input 1 - 2

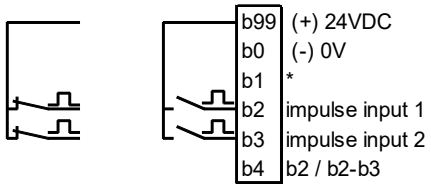
Settings in detail: *(existence depends on version and type):*

Setpoint value setting (supplement):		**Factory setting**	**Notes**
Faktor	correction factor	1,000	___
Parameter level 1 (supplement):			
***NKS_o1**	Number of decimal places output 1 " added up total quantity " (0...3)	0	___
***NKS_o2**	Number of decimal places output 2 " actual volume per hour " (0...3)	0	___
Configuration level (supplement):			
***fakt**	Factor (didi/ dimu/ mudi / mumu)*(**di**vision resp. **mu**ltiplication)*	mumu	___
***tf_o1**	Time factor output 1 " added up total quantity " (0,001...9999)	1,000	___
***tf_o2**	Time factor output 2 " actual volume per hour " (0,001...9999)	1,000	___
***SetC_sm**	Set Counter (0...99 999 999)*(max. 8 significant places)*	0	___

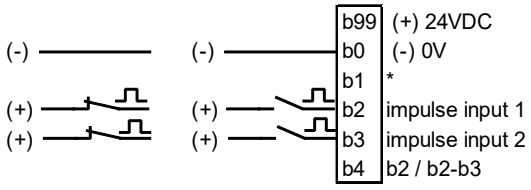
** Number of the impulse input*

Wiring diagram: Example ..cb2d, valid for each device is the the wiring diagram on its casing only .

potential free contact



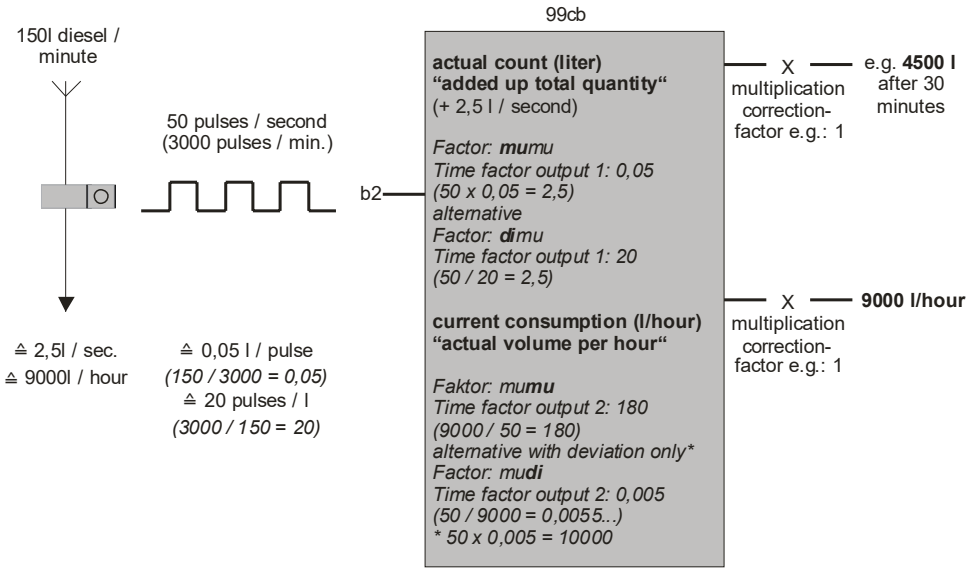
external voltage 24 VDC



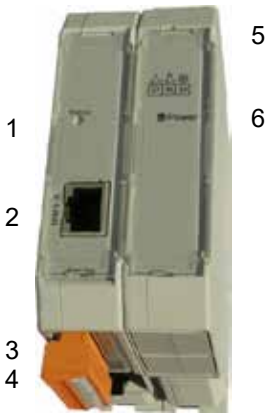
* = other

Example: version 99cb, counter module for diesel fuel

Counter module characteristics:
20 pulses / liter



1 Status-LED
2 RJ-45 connector KFM controller
3 Terminals signal outputs / binary- and analogue inputs
4 Service interface for configuration (PC)
5 Terminals supply voltage
6 Power-LED



Brief description:
With the intelligent accessory device 99e, for mounting on DIN rail, controllers of series 9.. can be equipped with an input for external setpoint and additional signal outputs later on. The external setpoint is activated by a binary input. The requested transmission data e.g. actual value, setpoint or regulating variable as well as the range and type of the in- / outputs are configurable. So the accessory device 99e can be used additionally or alternatively to the use of bus- systems, e.g. PROFIBUS.

The communication between the accessory device and the service interface of the KFM controller takes place by a patch cable (2m), which is delivered with each accessory device. Connection faults are recorded in the fault memory for diagnostic purposes. The devices are modular in structure, consisting of functional- and power supply module, alternatively type version ..i can directly be used with the power supply of already existing KFM-assemblies, e.g. series 8…

Type summary:
Functional module for connecting power supply modules:
99ebwogg Accessory device for external setpoint and 2 signal outputs

power supply module:
99e500 Power supply module 100-250V AC
99e508 Power supply module 24V AC or DC

Functional module for connecting power supply of already existing KFM-assemblies:
99ebwoggi Accessory device for external setpoint and 2 signal outputs 0/4...20mA

Adjustments: (existence depends on version and type)
The accessory device 99e is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the PKS PC software (from version 1.9L) via the service interface

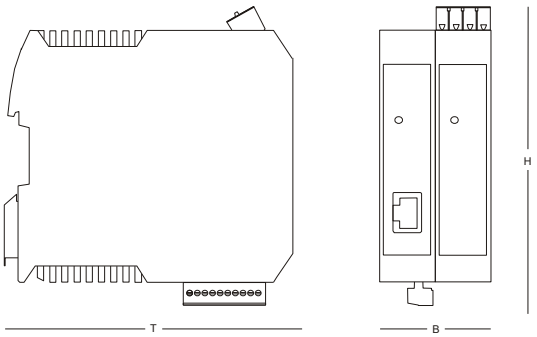
		factory setting	*notes*
write: (to the KFM controller)			
Data word 1	Bus- setpoint 1(1060 ref. to protocol KFM 2.0)	1060	___
Only if a KFM controller series 92 is connected:			
Data word 1	(Internal)- setpoint 1(1100 ref. to protocol KFM 2.0) *Note: The internal setpoint of the controller will be overwritten if the binary input is activated.*	1100	___
read: (from the KFM controller)			
Data word 2	Actual value 1(1010 " " ")	1010	___
Data word 3	Actual value 2(1011 " " ")	1011	___
	for further parameter codes refer to manual 99s		
1ELO/1EHI	for external setpoint: start / end of setpoint range	0 / 400	___
1SLO/1SHI	for information signal output 1: start / end of range	0 / 400	___
2SLO/2SHI	for information signal output 2: start / end of range	0 / 400	___
AIN1	Input type for input no.1: “0..20/4..20(mA)/0..10/2..10(V)/ AUS=OFF" (note different terminals for I/U!)	4-20	___
Sou1	Type of information output signal 1:"0..20/4..20(mA*)0..10/2..10(V*)"	4-20 / 2-10	___
Sou2	Type of information output signal 2:"0..20/4..20(mA*)0..10/2..10(V*)"	4-20 / 2-10	___
Adr	bus address KFM controller 9.. * = depending on version	5	___

Commissioning:
Connect the patch cable (2m) with the service interface of the (9..) KFM-controller. The power-LED on the power supply module signalises the operating voltage, the status-LED on the functional module the operating status:

green permanent*:	Normal operation
green flashing*:	Communication error between KFM-controller and accessory device 99e.. Hint: All analogue outputs are set to the start of range, the fault memory will be increased by 1.
red flashing:	Measurement line error analogue inputs accessory device 99e.. Hint: All transmission values to the KFM-controller are set to the start of range.
red yellow flashing:	Communication error KFM- controller and measurement line error. Hint: All analogue outputs and transmission values are set to the start of range, the fault memory will be increased by 1.
red permanent:	Internal error *Switch off power supply for a short time. If, after this time, the LED still lights contact KFM or remit the device for repair.*

** alternative yellow, depending on version*

Installation dimensions:

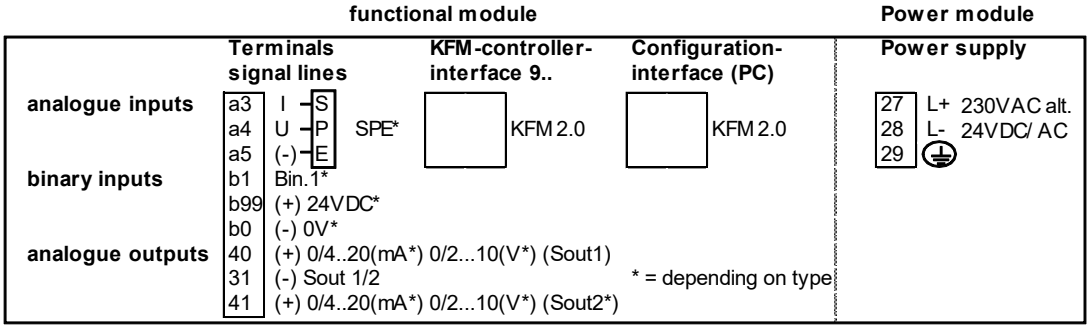


H= 124mm, B = 45mm, T = 116mm

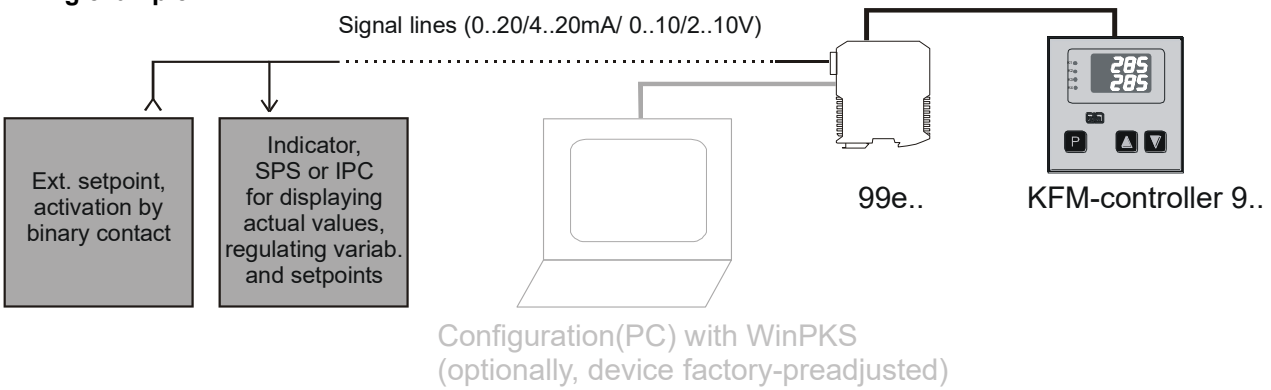
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 230V AC, about 12 VA
altern. 24V DC/ AC, about 12 VA
Outputs: 1(2) continuous outputs 0/4…20mA
alternative 0/2…10V (load >= 500 Ω)

Connection diagram:



Wiring example:



Additional switching contacts are avaiable type dependent, up to 8 relays per controller.

1. Adjustments on *parameter* level, seperately per each contact:

SP.. **S**witching **p**oint for independent additional contacts with own set value (type dependent).

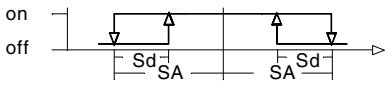
SA.. **S**witching interval for following additional contacts, given as range (**a**bsolute value) above or below the set value of the controller.
(SA or SP alternatively, depending on the selected control function)

Sd.. **S**witching **d**ifference (hysteresis), dead zone between activating and deactivating switching function. (To the deactivating switching point it is necessary to take an adequate deviation (concerning the adjusted switching point) into account)

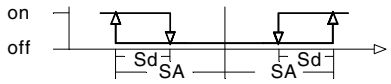
2. Selectable **switching functions** on *configuration* level, seperately per each contact:
(type dependent**)**

a) *following* contacts:

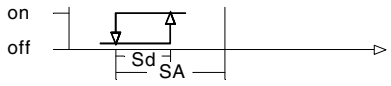
LC A Switching point on both sides of the set value (**L**imit **c**omparator). Relay drops out in case of rising deviation (**A**us)



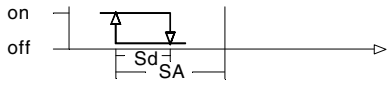
LC E Switching point on both sides of the set value (**L**imit **c**omparator). Relay cuts in in case of rising deviation (**E**in)



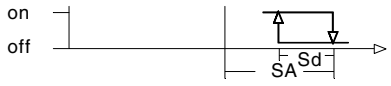
Su A Switching point below the set value. Relay drops out in case of decr. act. value (**A**us)



Su E Switching point below the set value. Relay cuts in in case of decr. actual value (**E**in)



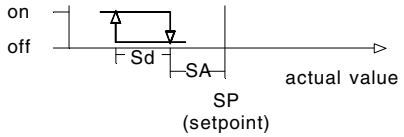
So A Switching point above the set value. Relay drops out in case of rising act. value (**A**us)



So E Switching point above the set value. Relay cuts in in case of rising actual value (**E**in)

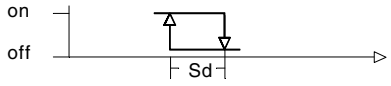


St A Heating stage below the set value. Relay drops out in case of rising act. value (**A**us)

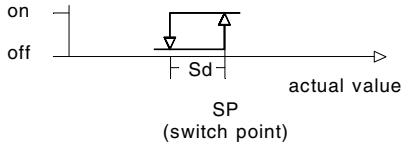


b) *independent* contacts :

US A Relay drops out in case of rising actual value (**A**us)



US E Relay cuts in in case of rising actual value(**E**in)



3. further adjustments on configuration level:

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH.. assigned measuring input/ actual value (**ch**annel) no. .. for independent contacts or assigned control loop for following contacts

SI E "Safety" shut down (in case of measuring line fault): Relay **on**

SI A "Safety" shut down (in case of measuring line fault): Relay **off**

Additional contact with special function: switchable common output for 2 control channels

99f1u. E

Additional device (only) for dual controller:
series 92.. type: 927030..(three-point-step) and 928030..(continuous) resp.
series 902../903.. type: 902(3)72..(three-point-step) and 902(3)82..(continuous)

In devaition to the normal device (1 output for each control loop) there is only one output (type three-point-step: relay K1 + K2 or continuous: control output Y1) for both control loops.

Depending on the switching state of the additional contact (type three-point-step: relay 3 or continuous: relay 1) the control channel 1 or the control channel 2 is connected to the output.

additional contact switched off: control channel 1 is connected to the output
additional contact switched on: control channel 2 is connected to the output

Besides the switching state of the additional contact the LED (type three-point-step: LED3 or continuous: LED1) gives the additional information of the active control channel.

The adjustments and the other functions of the additional contact are equal to the normal device.

Type:	**List - No.**
1 common output, switchable to control loop 1 or 2	99f1u
option: the setpoint of the 1st control channel(1 SP) can be adjusted at the configuration-level (for this setpoint the setpoint limitations 1 Lo/Hi are dropped)	99f1u2

This function expansion is designed to transmit actual values, set point values, additional correcting variables, etc. as standard signals from series 9.. control units to display units, PLC or IPC.

The current or voltage range can be configured at 0...20mA, 4...20 mA, 0 ...10V or 2...10 V.
The signal range can be set as minimum and maximum value.

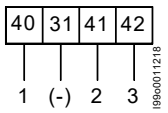
Designs:	**Type**
Output signal 0/4...20mA	99og
Output signal 0/2...10 V by external resistor 500 Ω	
Series 903 / 93 with selectable assignment (depending on version actual value, setpoint value, reference value).	
Supplements (for series 903 / 93 only):	
(number) Output signals 0/4...20mA	....(2..3)
Supplements (for series 92 / 93 only):	
Actual value	x
2 actual values	xx
Set point value	....w
Actual value + set point value	....xw
with galvanic isolation	.....t / tt

Operation:

Parameter level 2 (supplement):		*Factory setting*
(1)S Lo	Beginning of range setting (display value)	*(same as controller)*
(1)S Hi	End of range setting (display value)	*(same as controller)*

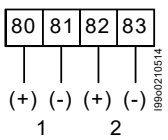
Configuration level (supplement):		
Sout **Sou1(2)**	Assignment of information signal (value): Ist1 = Act.1/ Ist2 = Act.2/ Setp. = SP/ control output =Y	*Ist 1*
Sout **Sou1(2)**	Selection of information signal (type): 0-20 / 4-20 mA or 0-10 / 2-10 V	*4-20*

Additional connecting terminals:



1 = Signal output 1
2 = Signal output 2
3 = Signal output 3
(-) = common reference potential

isolated design:



1 = Signal output 1
2 = Signal output 2

Hint: The signal outputs are also galvanic isolated from each other.

Additional Options
Signal Output of Step Controller

99ogy1 E

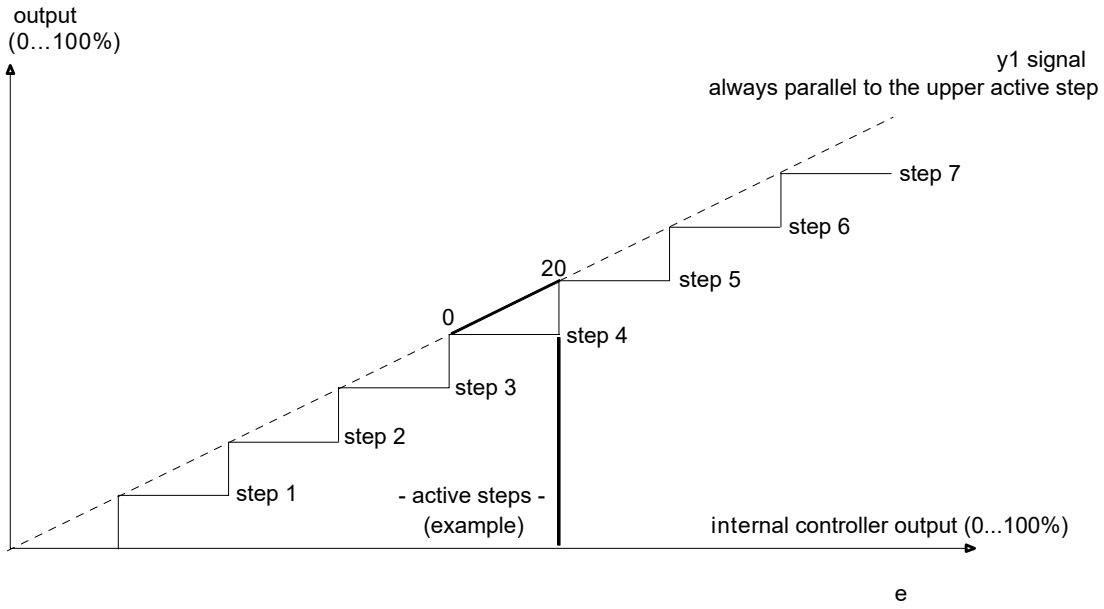
Function :

Additional analog signal output 0(4)...20 mA, or logic output for step controller Type 92D.. (or 92800-99st..) to compensate the power steps between the heating steps.

The signal range is always parallel to the upper active steps: it starts with the switch-on point of the step at 0% output signal and ends at 100% output signal immediately before the switch-on point of the next step.

In conjunction with a thyristor actuator that complements the normal step switch and takes effect on the remaining heating steps, a quasi continuous control of the total performance is guaranteed.

	Type
analog output	99ogy
logic output	99ogyL



Setting Possibilities:
(Configuration level; supplement):

tE	Switch-on delay time 1...60 sec. (for all steps)	- Standard setting: 5.0 sec.
tP	Time delay (switch interrupt) for the y1-output, when switching to the next step.	- Standard setting: 0.0 sec.
SP..	Switch-on points (e.g. 1...7 relays), relative to 0..100% of the controller output (or: deactivation of steps not needed: Value > 100%)	- Standard setting: - 12.5;25;37,5;50;62,5;75,87.5 - (4 relays: 20, 40, 60, 80)
Sd..	Switch difference of the steps (e.g. 1...7)	- Standard setting: 0.1

Controllers series 9.. with this accessory equipment can be switched over to another parameter set. The switch over takes place by the assigned binary control input (potential free contact, alternative external voltage 24 VDC).

Depending on type, both parameter sets include the control parameters and additionally one setpoint value as well as control- and configuration parameters for an additional contact.

Types	**List No.:**
switchable 2. parameter set control parameter	99p2
switchable 2. parameter set control parameter, add. setpoint value and function add. contact K3	99p2k3

Parameter level:

	1. parameter set		*2. parameter set*
P1	Proportional range	**P2'**	Proportional range
I1	Integral action time	**I2'**	Integral action time
d1	Rate time	**d2'**	Rate time
Sh1	Response sensitivity	**Sh2'**	Response sensitivity
SA1	Setpoint distance for trailing contact K1	**SA1'**	Setpoint distance for trailing contact K1
Sd2	Hysteresis for trailing contact K1	**Sd2'**	Hysteresis for trailing contact K1
SA2	Setpoint distance for trailing contact K2	**SA2'**	Setpoint distance for trailing contact K2
Sd2	Hysteresis for trailing contact K2	**Sd2'**	Hysteresis for trailing contact K2

Type 99p2k3 only, addition to normal version
Setpoint value level:

	1. parameter set		*2. parameter set*
SP 1	Setpoint value	**SP 2**	Setpoint value

Parameter level:

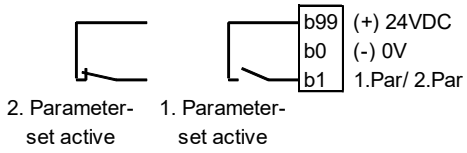
SA 3	Setpoint distance for trailing contact	**SA 4**	Setpoint distance for trailing contact
SP 3	Setpoint value independent contact	**SP 4**	Setpoint value independent contact
Sd 3	Hysteresis contact	**Sd 4**	Hysteresis contact

Configuration level:

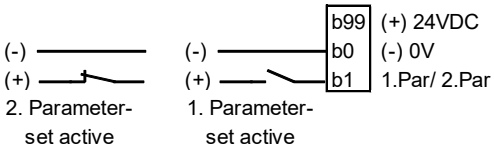
reL3	Function mode, assigned actual value and fail-safe position contact	**reL4**	Function mode, assigned actual value and fail-safe position contact

Wiring diagram: Example, in each case for 99p2.., valid for each delivered controller is the wiring diagram on its casing only.

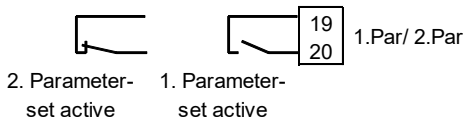
Potential free contact



external voltage 24 VDC



alternative:



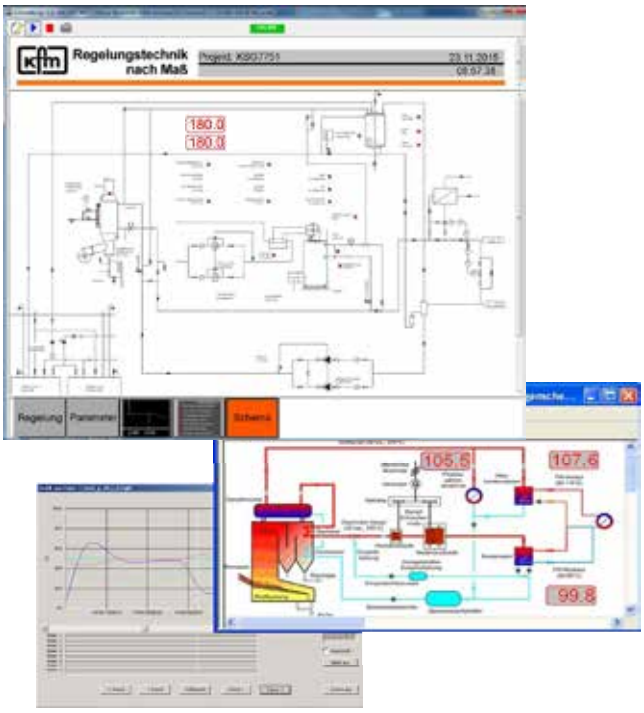
General:

The interface- software KFM- PCS offers process- visualization of custom specific system schemes and flow charts. The operation and visualization takes place by PC or industrial- PC. The creation of projects with graphical design tools and the operation are distinguished by simple handling. All devices equipped with service- interface KFM 2.0 can be integrated for data supply.

Operating and visualization for real- time operation (online):

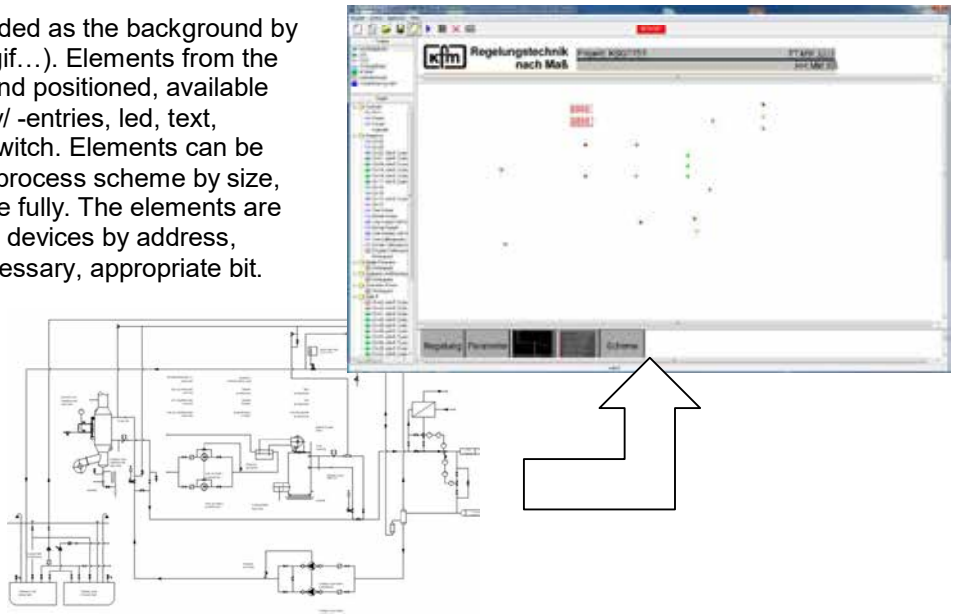
All inserted elements, e.g. value displays, value entries or leds, are communicating according to their configuration with the desired device. In addition to the dynamic display of system variables and –conditions the control of the process by the system operator takes place using the buttons push- button/ switch and value entries.

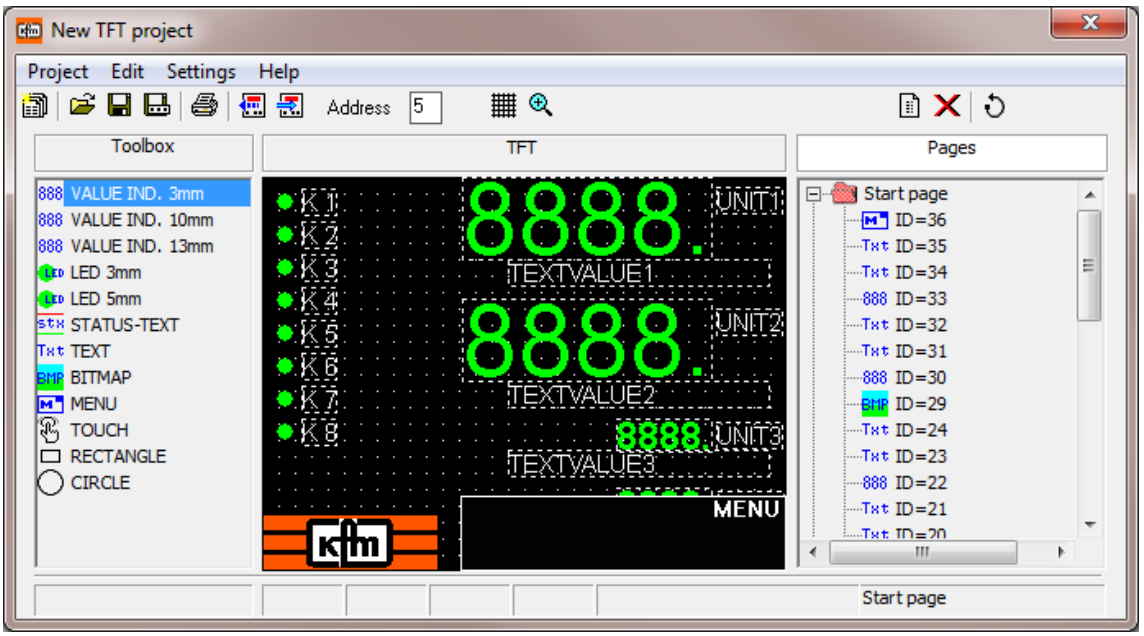
The data- transfer of complete parameter blocks, the graphical representation (line recorder) and data recording (data logger) as well as the display of operating- and malfunction history are possible.



Creation of projects (offline):

The system scheme is loaded as the background by a bitmap file (.bmp/ .jpg/ .gif…). Elements from the tool box are moved over and positioned, available elements are value display/ -entries, led, text, bitmap and push button/ switch. Elements can be adapted to the respective process scheme by size, color, transparency or state fully. The elements are assigned to the connected devices by address, parameter code and if necessary, appropriate bit.





TFT- displays from KFM- series 803 and 903 can be changed or completely new designed with this program.

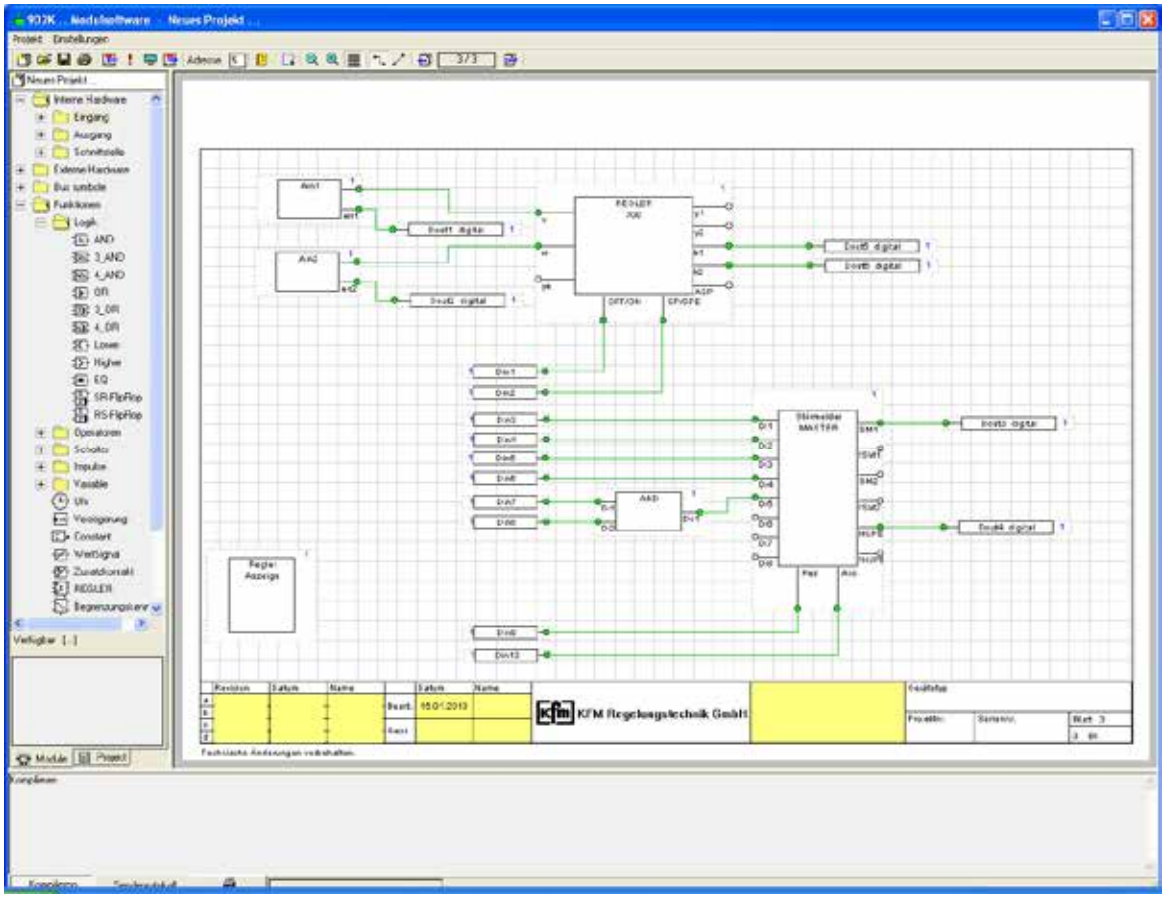
Every retrievable value in the device can be placed at any position and designed freely across the individual pages. In addition, there are texts and graphical symbols in various form and color. It is also possible to import whole bitmap-, JPEG-, PNG- or GIF-files, for example company logos or pictures.

Beside the start page and the existing logger- and binary message page another logger page and a maximum of 5 free pages can be set additionally, to which can be page turned at the device. Also, pages can be deleted again and changed in their order.

The configuration can be saved as a file, that is easily taken over to devices of the same kind later or serve as a basis for customization for different devices.

Hint:

Alternatively, individual configurations can be supplied ex work at extra cost.



General:

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

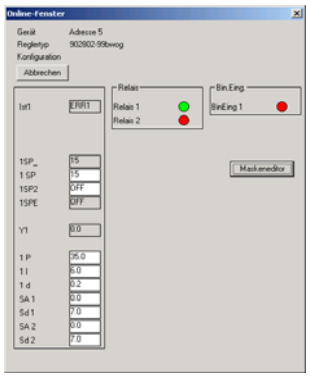
The module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules can be added to it by using an optional interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

The interface software KFM – PKS offers different function areas, which can be optionally and independently used. The software is distinguished by simple handling.

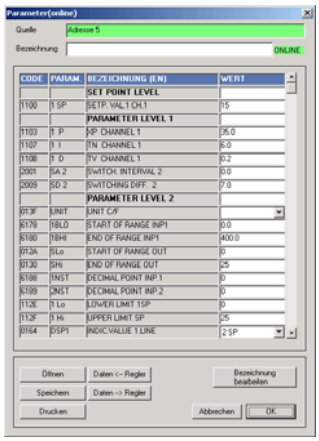
1. Online remote operation

On starting, the program automatically searches for any connected controllers. A window then appears, displaying the actual value, set value and parameters of the first controller found. Settings with a white background can be changed; changes have immediate effect in the controller. If more than one controller is connected (RS485 only), the required controller can be selected via a menu.



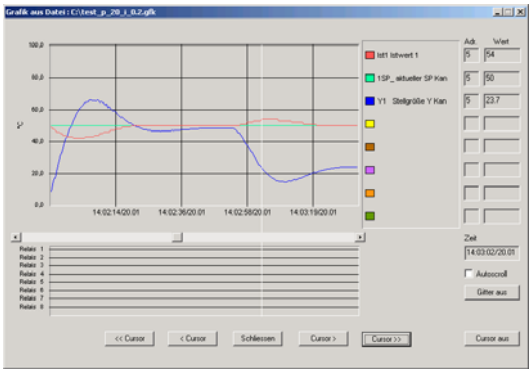
2. Data transfer

Optionally also the complete parameter block of the selected controller can be read out, edited, displayed as a table and printed out.
It is also possible to save the complete parameter setting as a file. Equally, parameter sets that have already been saved can be loaded into the controller.



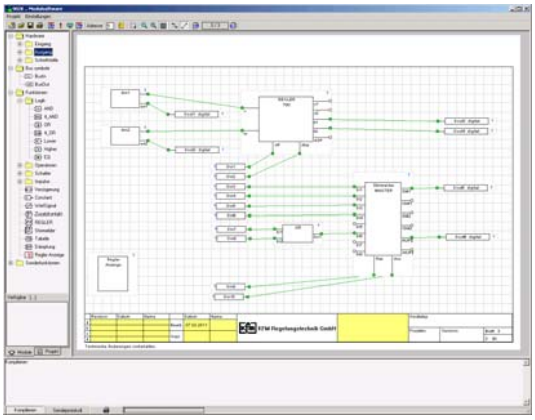
3. Graphical Display (Line Recorder)

The data arriving from the controller can be displayed as a continuous diagram. Recordings made previously can also be recalled and displayed.



4. Data Recording (Logger)

Up to eight types of data arriving from the controller can be stored continuously in a file. This file can later either be recalled and displayed as a graph, or can be used by other programs.



5. Module software (only from WinPKS ver.2.0 or later)

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the controller series 902K..

General information:

Serial interfaces enable digital communication with computers or higher ranking control systems.
An RS 232 (optional USB) interface permits connection of one controller per computer interface. The RS485 interfaces enables the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level). Further Interfaces upon request.

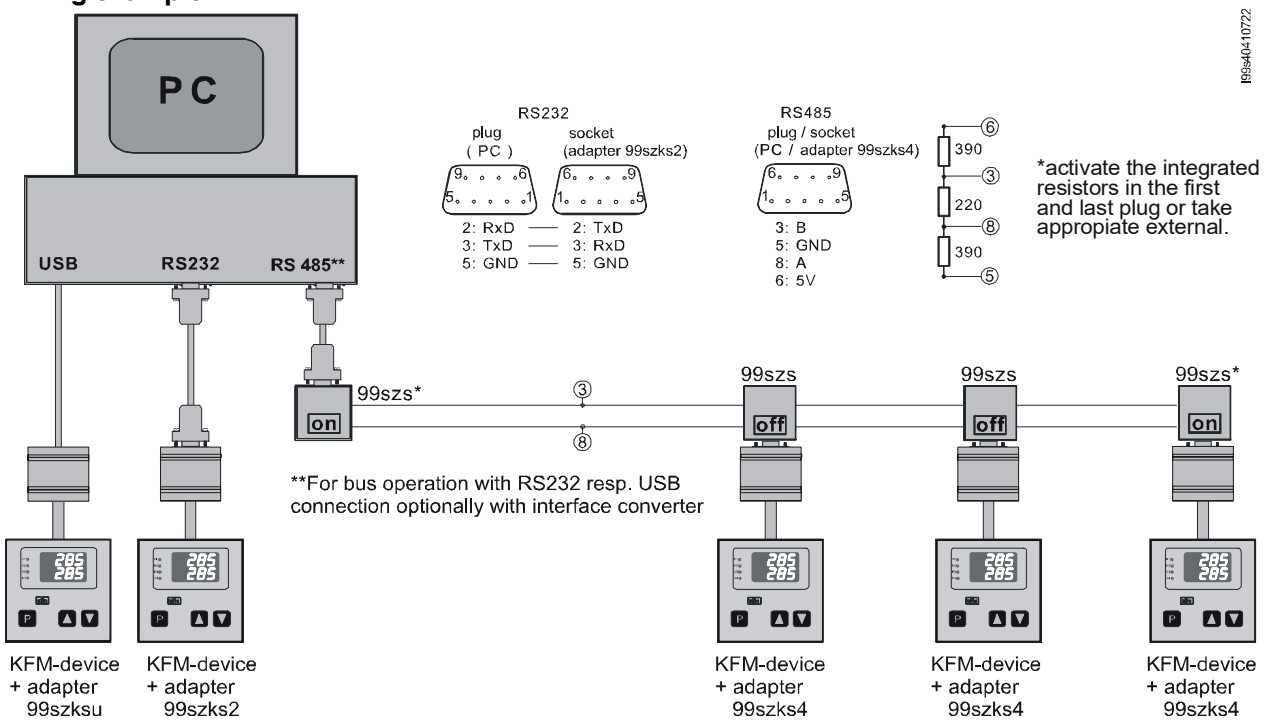
Technical data:

Interface:	direct connection - RS232, USB	bus connection - RS485
Connection:	serial, asynchronous 2 wire (+GND)	serial, asynchronous 2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Branch connection length:	15m	2m
Max. number of controllers:	1	31
Transmission direction:	-	data flow control
Transfer rate:	9600, 19200, 38400 Bit / s	9600, 19200, 38400 Bit / s

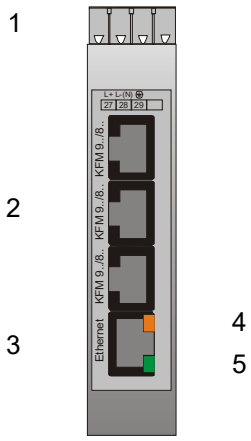
Connection lines:

Cable junction for KFM devices is done by adapters which are linked to the service interface.
By direct connection: 99szks2(RS232), alternatively 99szksu(USB)
By bus connection: 99szks4(RS485)
To establish the bus connection, providing that there is no interface RS485 on PC resp. at the PLC existing, an interface converter RS232 resp. USB to RS485 is necessary.
Use screened lines to connect the interfaces (e.g. KFM 99szl.).
Place the screening on the controller earthing terminal.
Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate external resistors.

Wiring example:



1 Power supply 24V DC
2 RJ-45 interface connector for KFM device 8.. / 9.. (number depending on type)
3 RJ-45 interface connector to the ethernet
4 Status-LED activity (*orange =half-duplex or green =full-duplex*)
5 Status-LED active connection (*orange =10Mbps or green =100Mbps*)



Serial interfaces enable digital communication with computers or higher ranking control systems. Communication takes place serially.

KFM-controllers are accessible, by using their service interface and this adapter, also for ethernet respectively internet.

In terms of PC facilities, the IP address of the adapter is assigned to the connection settings of the KFM software directly, for example PCS for process visualisation.

Types:

99se18.	Adapter for communication with one KFM device 8../ 9.., power supply 24V DC
99se38.	Adapter for communication with three KFM devices 8../ 9.., power supply 24V DC

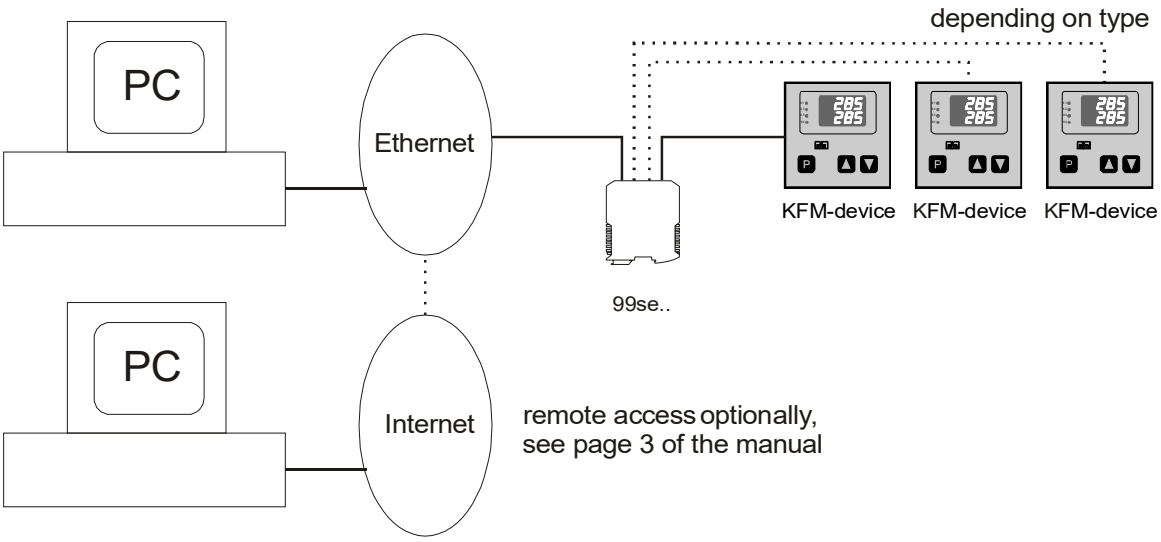
type additions optionally

..v	Encryption AES (Rijndael) 256 bit
.0	Functional module without power supply terminals for conn. power supply modules 99e500
.0i	Functional module for connecting power supply of already existing KFM-assemblies

power supply module

99e500	Power supply module 100-250V AC

Wiring example:



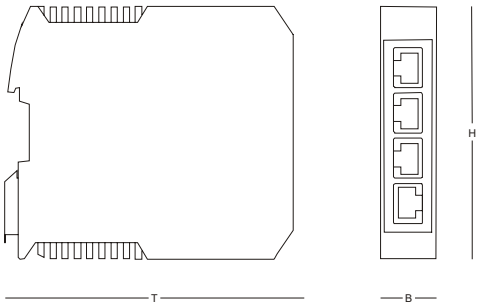
Technical Data:

Protocol:	TCP/IP, UDP/IP, ARP, ICMP, SNMP, TFTP, Telnet, DHCP, BOOTP, HTTP and AutoIP
Interface:	Ethernet 10base-t or 100base-tx (automatic baud rate detection)
Plug connections:	RJ45
Max. number of devices:	32
Administration:	SNMP, telnet, serial, internal web server and windows®-based software for configuration and administration
Baud rate:	9600 bit / s ,19200 bit / s and 38400 bit / s
Compatibility:	Ethernet: version 2.0/IEEE 802.3
Encryption:	Password blocking, optionally AES (Rijndael) 128-,192-,or 256- bit

Other operating data:

Power supply :	24V DC, about 100mA; alternative 100-250V AC, about 12 VA (with power supply module 99e500 only)
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

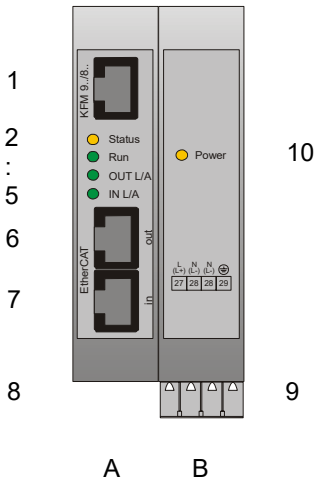
Installation dimensions (each module)



H= 99mm, B = 22,5mm, T = 116mm

1 RJ-45 connector KFM-device
2 Status LED KFM-device
3 Run LED
4 LED connection state output
5 LED connection state input
6 RJ-45 connector EtherCAT output
7 RJ-45 connector EtherCAT input
8 Configuration interface (service) for PC-connection
9 Terminals supply voltage
10 Power LED

A EtherCAT adapter (99sec..)
B Power supply module* (99e5..)
*Existing, depending on the equipment



General:
The connection of KFM-devices to the EtherCAT fieldbus is realized by the intelligent bus adapter 99sec.., wich is configured to the address of the connected device and the requested transmission data e.g. actual value, setpoint and status word. The EtherCAT- addresses are determined automatically by the master device during network initialization.

The EtherCAT interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The EtherCAT-connection is carried out as a standard-ethernet-interface (100base-TX or 100base-FX; baudrate: 100 MBit/s) in accordance with IEEE 802.3, the EtherCAT-adapter is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors.

The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. 255 devices could be installed. Data modules for floating point operation are available for the data transmission. Two error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

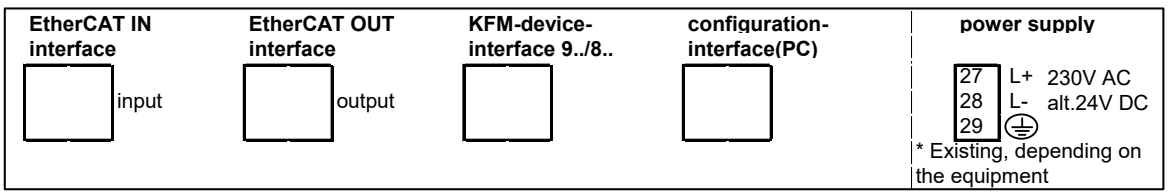
Types:
Functional module without mains supply for connection with power supply modules:
99sec120 Adapter for 12 EtherCAT values

Power supply module:
99e500 Power supply module 100-250V AC
99e508 Power supply module 24V AC or DC

Functional module for connection with power supply within already existing KFM-assemblies:
99sec120i Adapter for 12 EtherCAT values

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.15) using the configuration interface.

Connection diagram:



Commissioning:

Connect the supplied patch cable (1,5m) with the service- interface of the KFM device and the RJ-45 connector “KFM 9../8..“ of the EtherCAT-adapter and connect the RJ-45 connector “ECAT IN“ to the EtherCAT bus. Further optional EtherCAT-adapters can be connected using the RJ-45 connector “ECAT OUT“.

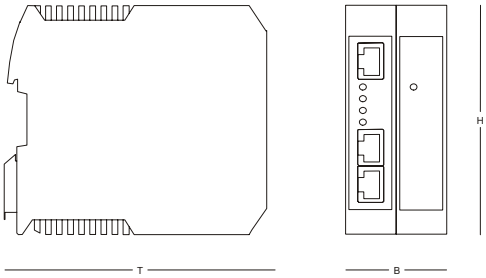
The LEDs on the front signalize the operating conditions :

LED	display	signification
EtherCAT-adapter, status KFM- device	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between KFM-device and EtherCAT-adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
	red flash./ perm.	*Fault* on loading the parameter, remit device for repair.
EtherCAT-adapter, Run-LED	off	*Initialization condition*, nor mailbox-communication neither process data-communication possible
	green fast flashing	*Pre-operational condition*, mailbox-communication but no process data-communication possible
	green slow flashing	*Safe-operational condition*, mailbox- and process data-communication possible, but outputs remain in a safe condition
	green permanent	*Operational condition*, mailbox- and process data-comunication possible
EtherCAT-adapter, Out L/A-LED	off	*No connection* to the subsequent EtherCAT-module
	green permanent	*Connection* to the subsequent EtherCAT-module
	green flashing	*Communication* with the subsequent EtherCAT-module
EtherCAT-adapter, IN L/A-LED	off	*No connection* to the foregoing EtherCAT-module / master Hint: all transmitted values of the respective device are set to “0“, the respective fault memory will be increased by 1.
	green permanent	*Connection* to the foregoing EtherCAT-module / Master
	green flashing	*Communication* with the foregoing EtherCAT-module / Master
Power supply module, Power LED	yellow permanent	*Voltage supply* connected to the power supply module

Technical data:

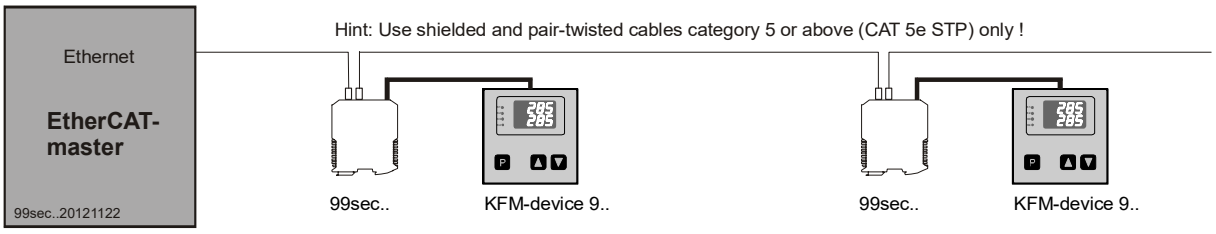
Housing: for fastening to 35mm mounting rail Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 230V AC, about 12 VA
altern. 24V DC, about 12 VA

Installation dimensions:



H= 99mm, B = 45mm, T = 116mm

Wiring example:



1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug Modbus- RTU
6 Configuration interface (service) for PC connection





Brief description:
The connection of KFM devices to the MODBUS- RTU is realised by the external bus adapter 99sm.. which is configured to the requested transmission data e.g. actual value and setpoint. The MODBUS interface is able to replace separate wiring of external analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).
The MODBUS interface is carried out as RS232-, RS485- or RS422- bus interface. The adapter has to be connected directly to the bus wiring using the 9-pole D-SUB plug.
Suitable resistors (e.g. in the connector plugs) must be present at the beginning and at the end of the bus line for communication via data bus. Shielded and twisted cables must be used. Lay the shield to ground potential. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. The bus adapter provides the MODBUS-functions 01/05 (read single bit), 03 / 04 (read input register) and 16 (write multiple register). Analogue values are transmitted as 2 x 16 bit floating point numbers, binary values as 1 bit or 2 byte-word (16 bit, if necessary a multiple of it). The function of the adapter can be supervised by a fault bit. Additionally connection faults are recorded in the fault memory for diagnostic purposes.

Types:

fifth and sixth position		*seventh position*	
99sm04.	Adapter for 4 MODBUS values, power supply 24V DC	99sm..2	for RS 232 interface
99sm12.	Adapter for 12 MODBUS values, power supply 24V DC	99sm..4	for RS 485 interface
99sm28.	Adapter for 28 MODBUS values, power supply 24V DC	99sm..6	for RS 422 interface

device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The MODBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the WinPKS PC software via the service interface.

	designation	*KFM parameter*	*MODBUS-register#*	*factory setting read / write*
Data word 1	Control word 1	1004	10 (“Dec“)	write
Data word 2	Bus setpoint 1	1060	20 (“Dec“)	write
Data word 3	Actual value 1	1010	30 (“Dec“)	read
Data word 4	Actual value 2*	1011	40 (“Dec“)	read

** = depending on type* *# =memory area in the modbus master*
for further parameter codes according to protocol *KFM 2.0 refer to manual 99sm.*

Bus monitor	Monitor check time (0..100 sec), period within which a bus request shall take place, otherwise LED signals a failure. *Hint: Bus monitor is deactivated by setting 0*	5
Delay time	Delay time (0..250ms) for a modbus-adapter reply	0
Baudrate	Modbus baudrate (9600/19200/38400)	9600
Parity, Stopbits	Modbus parity (None/Even/Odd), number of stopbits (1, 2)	none, 2 stop
Bus address	0..99, **Coding switch**, available after removing the covering	5

Hint: In case of multiple bus participants different addresses are to be adjusted !

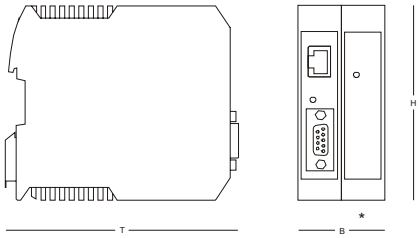
Commissioning:

Set the desired modbus-address by use of the coding switch. Connect Modbus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.
Use of the supply voltage on the Modbus interface only for terminating resistors.

The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and MODBUS adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error MODBUS, MODBUS not active, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error MODBUS and KFM device, each fault memory will be increased by 1.

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

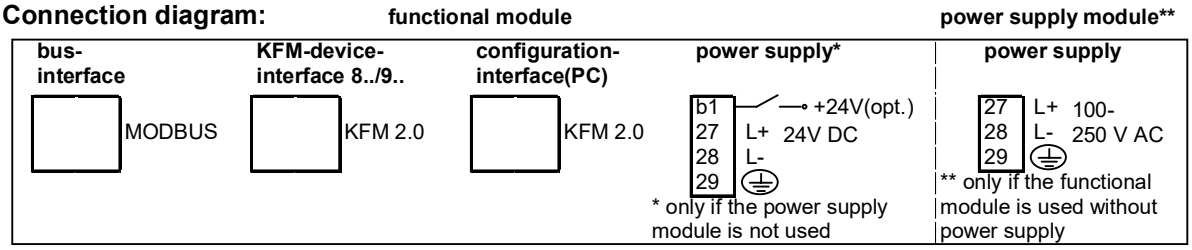
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA

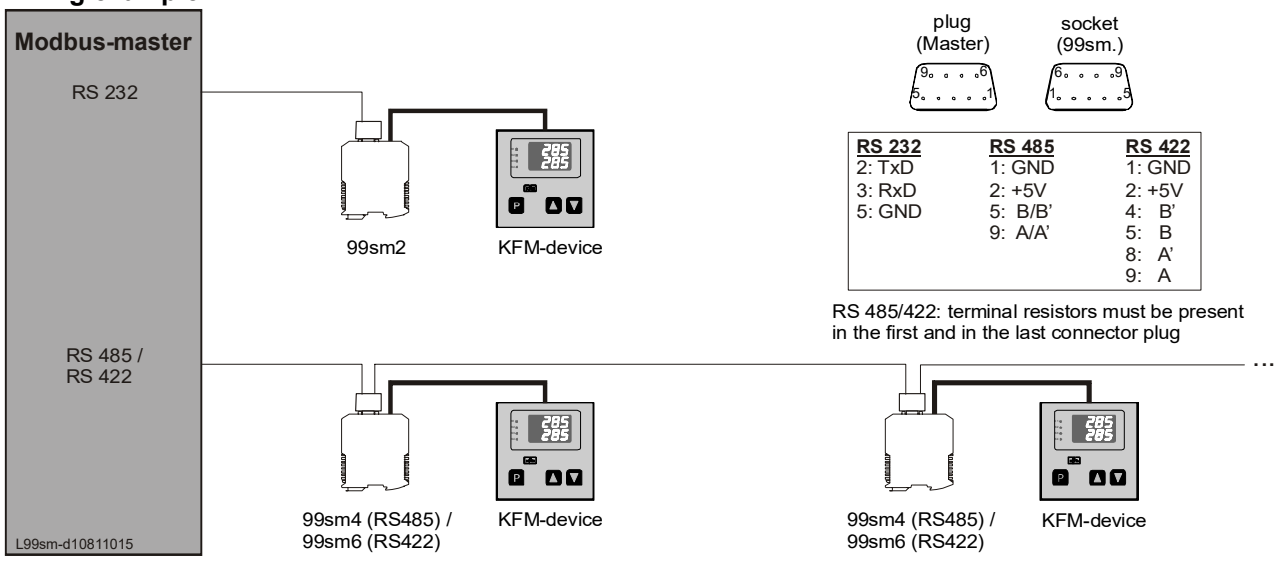
Technical data:

Modbus-interface:	RS232	RS485	RS422
Connection (serial):	asynch.,2-wire (+GND)	asynchronous, 2-wire	asynchronous, 4-wire
Cable lenght	15m	1000m	1000m
Max. number of devices:	1	31	31

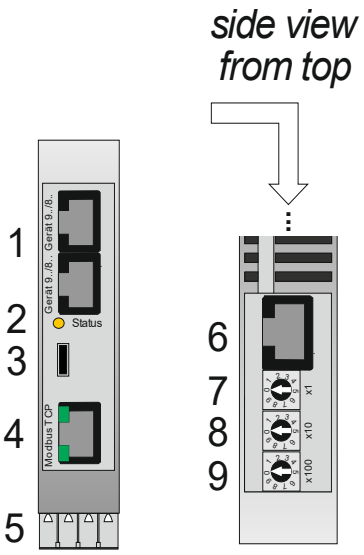
Connection diagram:



Wiring example:



1 RJ-45 KFM device connectors
2 Status LED bus adapter
3 Without functions (mikro- USB connector)
4 RJ-45 connection Modbus TCP
5 Connection power supply. 24V DC
6 RJ-45 service- connection for PC
7 Coding switch IP- address adjustment x1
8 Coding switch IP- address adjustment x10
9 Coding switch IP- address adjustment x100



General:
The Modbus TCP interface can replace the wiring of external analog (external setpoints, signal outputs) or digital signals (via binary inputs and status bits or via relay outputs and control bits).

The Modbus TCP connection is made by means of an intelligent bus adapter 99smt..., which is configured for the addresses of 1-2 KFM devices and the transmission data. Communication between the bus adapter and the service interface of the device(s) is carried out using the patch cables (1.5m) supplied.

With Modbus TCP the bus adapter 99smt... is identified by its IP address, responses are sent to the IP address of the master. The Modbus telegrams are transmitted in a TCP frame via Ethernet.

The data can be accessed via Modbus TCP using the functions "Read a transmission value" (function code 0x03) and "Write a transmission value" (function code 0x16). For this purpose, the write or read commands must contain, in addition to the MBAP header and the function code, the Modbus register set in the adapter and the number of data words to be transmitted (16 bits). Depending on the type of data to be transmitted, 1 (digital values, status and control word 1), 2 (analog values or parameters) or 3 data words (status and control words 2 and 3) are used.

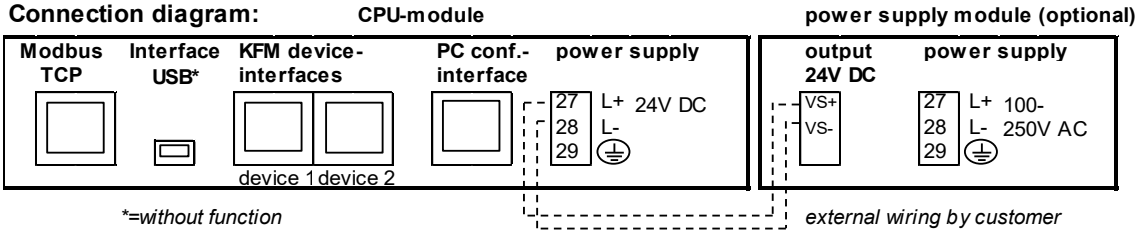
The function of the adapter can be monitored via error bits. Additionally, connection errors are registered in the error memory and are available for diagnosis.

Versions:

99smts12	Adapter for 12 Modbus TCP transmission values (binary, analog values, status and control words as slave, up to two device connections, power supply 24V DC
99smts28	Adapter for 28 Modbus TCP transmission values (binary, analog values, status and control words as slave, up to two device connections, power supply 24V DC
99smtm	Adapter for Modbus TCP transmission values (binary, analog values, status and control words) as master

Power supply module (optional for supplying type 99smt..):
99e500n power supply module 100-250V AC

Connection diagram:



Settings: The Modbus TCP Adapter is delivered preset:

IP-address: 192.168.1.254 / MAC- address (see type plate)
The IP address setting of the Modbus TCP adapter is made via 3 rotary coding switches according to the following table and, if necessary, to set the higher IP addresses (first 3 number blocks) and other communication parameters using a configuration program in the PKS PC software (from version 2.02.81) via the configuration interfaces (Service).

IP Address setting	**IP-address** *(Modbus TCP- Port address: 502)*				**Coding switch table of values** *Hundreds, tens, ones*		
					x100	**x10**	**x1**
DHCP active	automatic						
Manual setting via coding switch, lowest IP address block (max. 254)	192*	168*	1*	254			

**= first 3 number blocks using PKS- PC software*

Transmission data:
The adapters are supplied preset according to the example on page 4. Changes to the transmission data (e.g. actual value, setpoint and status word) can be made with the PKS PC software (from version 2.02.81) via the interface (Service).

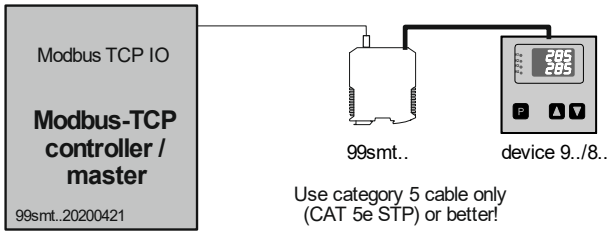
Commissioning:
Please connect the supplied patch cable (1.5m) with the service interface of the KFM device and the RJ-45 socket "9../8.." of the bus adapter. The Modbus TCP connection is made at the Ethernet socket.

The LEDs indicate the operating states:

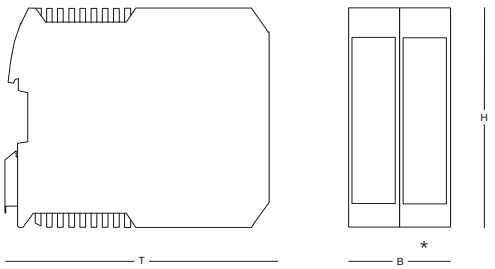
LED	**display**	**Meaning**
Modbus TCP-adapter, LED "status"	yellow permanent	*Normal operation*
	yellow flashing	*Connection error between device 9../8... and bus adapter*
	red flashing	*Connection error between bus adapter and Modbus*
	red yellow flashing	*Connection error between device 9../8... and bus adapter and between bus adapter and Modbus*
	red permanent	*Error while loading the parameters, send in device for repair*
Power supply module, Power Led	yellow permanent	*Power supply connected to power supply module*

Technical data:
Housing: for standard rail mounting
Mounting position: any; protection class: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C; nominal temperature: 20°C
Power supply: 24V DC, approx. 12 VA, aging 100-250V AC, approx. 12 VA
Modbus interface : Ethernet 10Base-T or100Base-TX (autom. Baudr.) according to IEEE802.3

Wiring example:

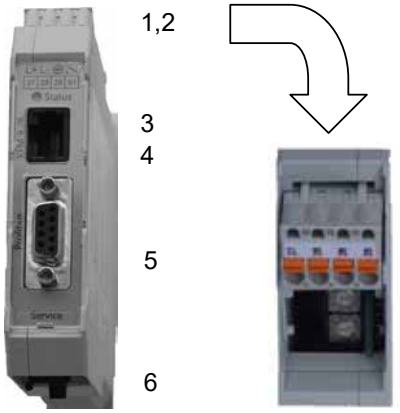


Dimensions:



H= 99mm,*version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug PROFIBUS
4 Configuration interface (service) for PC connection



General description:
The connection of KFM devices to the PROFIBUS DP is realised by the external bus adapter 99spde, which is configured to the requested transmission data e.g. actual value, setpoint. The PROFIBUS interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits). The PROFIBUS-DP interface is carried out as RS 485 bus interface referring to EN50170. The PROFIBUS adapter has to be connected via a 9-pole D-SUB plug directly to the bus wiring. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. For the data transmission data modules for fixed and floating point operation are available. The baudrate is detected automatically up to 12 Mbaud. Further Information refer to the GSD file in the appendix.
An error bit makes it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

Types:

99spde04.	Adapter for 4 PROFIBUS values, power supply 24V DC
99spde12.	Adapter for 12 PROFIBUS values, power supply 24V DC
99spde28.	Adapter for 28 PROFIBUS values, power supply 24V DC

Device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies
..0b	Functional module with binary input 24V DC; terminal open: normal function / read and write possible, terminal closed: read only

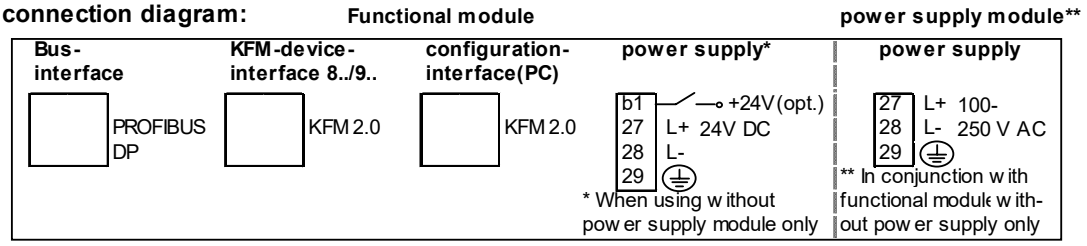
Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments except from the bus address, can easily be modified by a configuration program (WinPKS PC Software from version 1.9L).

		factory setting
Data word 1	Bus setpoint 1 (1060 ref. to protocoll KFM 2.0)	Bus setpoint 1
Data word 2	Actual value 1 (1010 " " ")	Actual value 1
Data word 3	Actual value 2* (1011 " " ")	
Data word 4	Control signal* (1020 " " ")	
	for further parameter codes refer to page 5 and 6	
	** = depending on type*	
Bus address	0..99, Coding switch, available after removing the covering below the power supply terminals	5
	Hint: In case of multiple bus participants different addresses have to be adjusted !	

connection diagram:



Installation note:

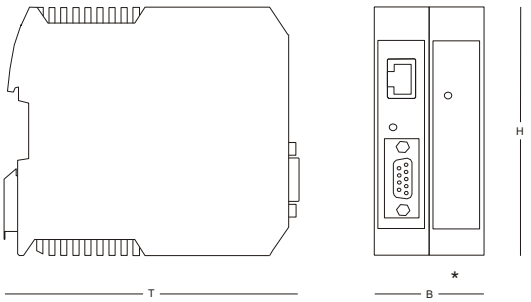
The modules must be locked on the designated mounting rail one after the other and then **pushed together**. The plug connectors connect the individual modules. Before removal, the modules must be **shifted apart** one after the other.

Commissioning:

Set the desired double-digit profibus-address by use of the two coding switches (available after removing the covering below the power supply terminals). Different addresses have to be configured on multiple adapters. Connect Profibus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.The LED on the front signalises the operating status:

yellow permanent*:	Normal operation
yellow flashing*:	Communication error between KFM device and PROFIBUS-DP adapter Hint: all transmitted values are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error PROFIBUS DP, PROFIBUS DP not active Hint: all transmitted values are set to “0“, the respective fault memory will be increased by 1.
red yellow* flashing:	Communication error PROFIBUS DP and KFM device Hint: all transmitted values are set to “0“, each fault memory will be increased by 1. *= alternative green, depending on version

Installation dimensions:

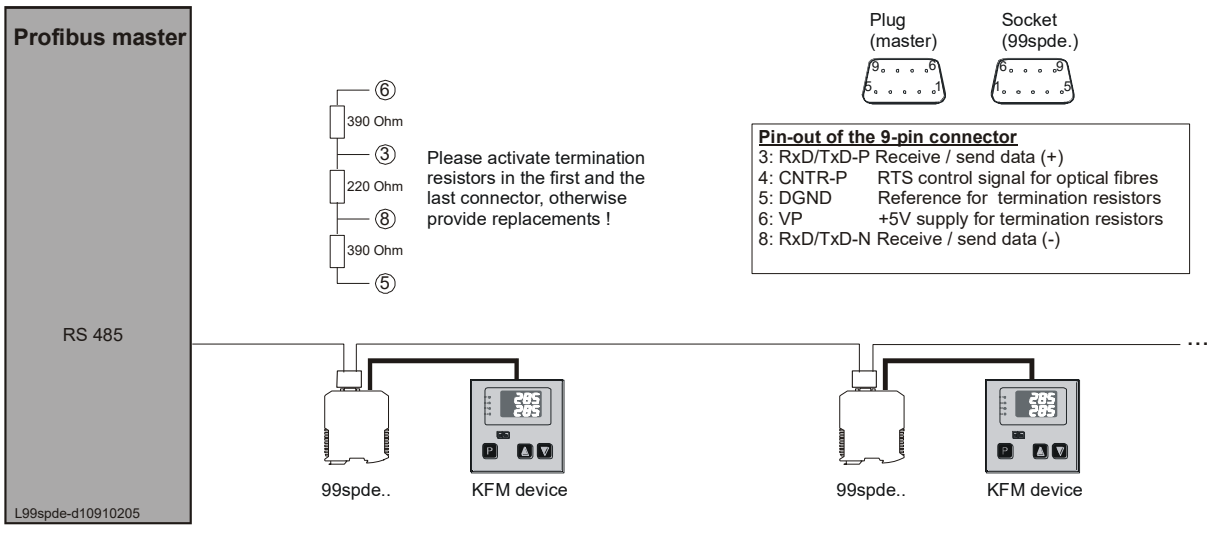


H= 99mm,
* version with or witout power supply module:
B = 22,5mm or 45mm, T = 116mm

Technical data:

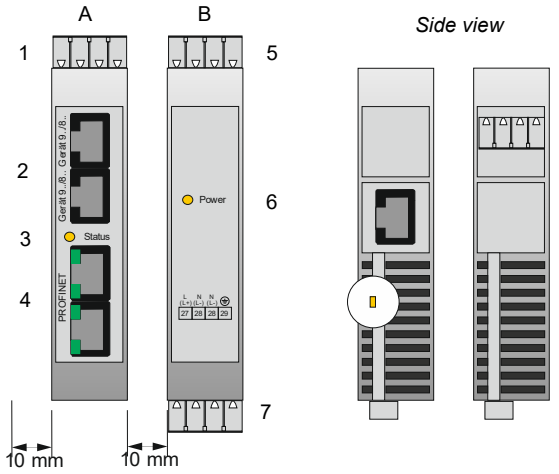
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA,
alternative 100-250V AC, about 12 VA

Wiring example:



1 Terminals power supply voltage. 99spne..
2 RJ-45 device- connectors series 9../8..
3 Status LED bus adapter
4 RJ-45 connector PROFINET
5 Output voltage power supply module*
6 Power LED*
7 Terminals power supply voltage 99e500n*
8 Configuration interface (service) for PC connection
9 DCP- signal- service LED (Visible through the air vents)

A Profinet Adapter (99spne..)
B Power supply module* (99e500n)
*With supply 100-250V AC only



Note: Provide 10mm space on both sides for ventilation.

General description:
The PROFINET interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The connection of devices series 9../8.. to the PROFINET-IO is realised by the intelligent bus adapter 99spne... The bus adapter is configured to the addresses of 1 or 2 connected devices series 9.. or 8.. and the requested transmission data each e.g. actual value, setpoint and status word. The communication between the adapter and the service interface of the device / devices takes place by patch cables(1,5m), which are delivered with each adapter.

The PROFINET -connection is carried out as a standard-ethernet-interface (10 Base-T / 100 Base-TX; Baudrate: 10/100 MBit/s) in accordance with IEEE 802.3 and is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors. A DCP signal service LED is available for visual localization of the device in the field.

Data modules for floating point operation are available for the data transmission, GSDML- files in the XML-format are enclosed. Error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory. GSDML files in XML format are included, alternatively the files can be downloaded from the KFM website.

Depending on version PLC data blocks are available for the data transmission. A repository (file extension .zap15_1) is included, alternatively the file can be downloaded from the KFM website.

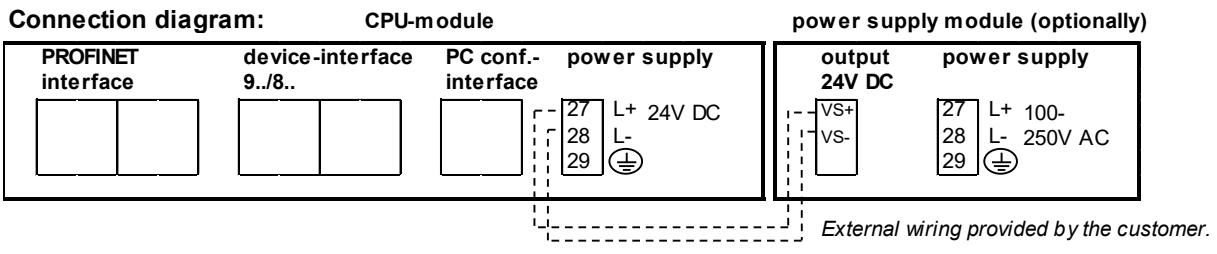
Types:

99spne408	Adapter for 12 PROFINET values, pow. supply 24V DC, two device connectors for series 9../8.. (4 binary-, 8 analogue values, also status- / control word)
99spne820	Adapter for 28 PROFINET values, pow. supply 24V DC, two device connectors for series 9../8.. (8 binary-, 20 analogue values, also status- / control word)

Power supply module (for supply of type 99spne.. optionally):

99e500n	Power supply module 100-250V AC

Connection diagram:



Adjustments:
The PROFINET- adapter is delivered preadjusted:

IP-address: 192.168.1.254 / device name: kfm99spne / MAC- address
Normally, the IP-address is managed dynamically by the Profinet-master.
In case of permanent changes to the IP-address or the device name, the preadjustments can easily be modificated with the supplied pc- configuration program EthDevCon.msi (Ethernet Device Configuration Tool) using the PROFINET- interface.
The MAC- address is readable on the type plate.

Transmission data: In accordance to the example from page 4 or custom specific.
In case of changes to the transmission data (for example actual-, setpoint value and status word) *the adjustments can easily be modificated with a configuration program* in the PKS -PC-software (from version 2.02.78) using the configuration interface (service).

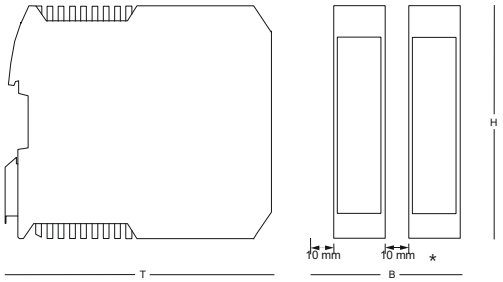
Commissioning:
The enclosed patch cable (1,5m) has to be connected with the service- interface of the device series 9../8.. and the RJ-45 connector "9../8.." of the bus adapter. The profinet connection takes place in- and optional output sided arbitrary at the ethernet- connectors.

The LEDs signalise the operating status:

LED	display	meaning
PROFINET-adapter, LED "status"	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between device 9../8.. and bus adapter
	red flashing	*Communication error* between bus adapter and profinet
	red yellow flashing	*Communication error* between device 9../8.. and bus adapter as well as between bus adapter and profinet
	red permanent	*Fault* when loading the parameter, please send the device for repair
PROFINET-adapter, LED "DCP-service"	off	*Normal operation*
(Visible behind the air vents)	yellow flashing (1Hz, 3 seconds)	*DCP signal service is triggered via the bus.*
Power supply module, power LED	yellow permanent	*Power supply connected to the power supply module*

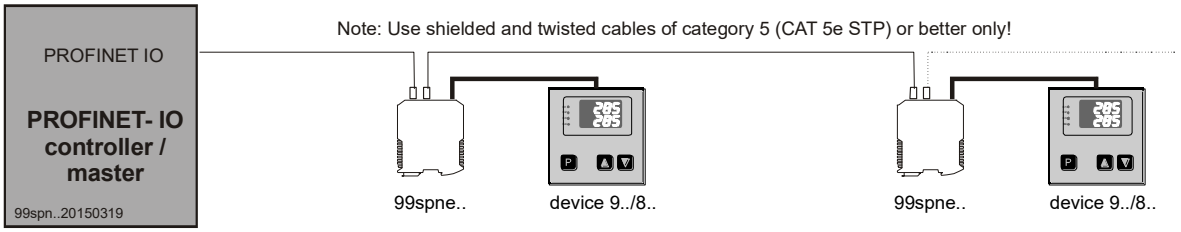
Technical data:
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply:, 24V DC about 12 VA,
alternative 100-250V AC, about 12 VA

Installation dimensions:



H= 99mm,* Version without or with power module:
B= 22,5mm(+ 10mm ventilation on both sides) or
45mm(+ 10mm ventilation on both sides),T=116mm

Wiring example :



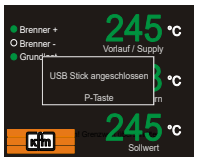
903 / 93 series devices fitted with the USB-Host can read in and out the parameter set, TFT configuration and, depending on version, the complete configuration by means of conventional USB stick. Moreover, again depending on version, data logger recordings and fault history can be read out.
Irrespective of the above selectable functions, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

The data are prepared and processed by the PC with the KFM parametering software PKS in the respective function areas; data logger recordings can be imported and visualised in Excel by means of csv- file.

The stick is inserted from outside into the USB-Host port at the rear.

Without connected USB stick the menu with the functions for data transfer are hidden; they appear once the connection with the USB stick has been successfully established. During a file transfer the progress is shown by means of a progress bar; successful file transfer is acknowledged with a message.

Operating state: USB- connection:



In its operating state the prefect connection of an inserted USB stick is indicated by the message "USB stick connected".

P - briefly press the key to acknowledge the message. Data transfer functions are now available in the parameter level 1.

Parameter level 1:

USB stick Menu (only) if fitted with USB-Host and inserted USB stick:
Data transfer functions
The desired function is marked in blue with the ▼...▲ keys,
to acknowledge input briefly press the P key

"Only load parameters", **"Load TFT project"**,
"Load complete configuration"
Parameter set, TFT project or the complete configuration is transferred from the USB stick to the device; mark desired file and acknowledge with P -key.

Notes:
Submenu "Parameter file": Depending on file type and in consideration to the instructions on the standard path (see next section) existing data can be selected on the USB stick.

No automatic conversion. Please ensure that the software- version of the new configuration complies with the original.

"Only save parameters", **"Save TFT project"**, **"Save complete configuration", Save logger data"**
Parameter set, TFT project or the complete configuration or the fault history as well as the logger data are transferred from the device to the USB stick.

"Abort" to leave the menu or **"Remove USB"** in order to securely interrupt the connection to the USB stick

Instructions on standard path:
Parameter set, TFT project and the complete configuration must be saved on the USB stick in accordance to the following standard path:

- **Parameter set:** \Fbnr\PARAM*.pks
  Example: \21728034\PARAM*.pks
- **TFT projekt:** \Fbnr\TFT*.tft
  Example: \21728034\TFT*.tft
- **Configuration:** \Fbnr\CONFIG*.kfg
  Example: \21728034\CONFIG*.kfg

"Fbnr": Serial number in accordance to the type plate (example: R217 28 034).

Instructions regarding parameter set and configuration:
Depending on the configuration, it may be that the parameter set must also be read in or out after configuration when transferring the current parameters (after exchange of configuration only).

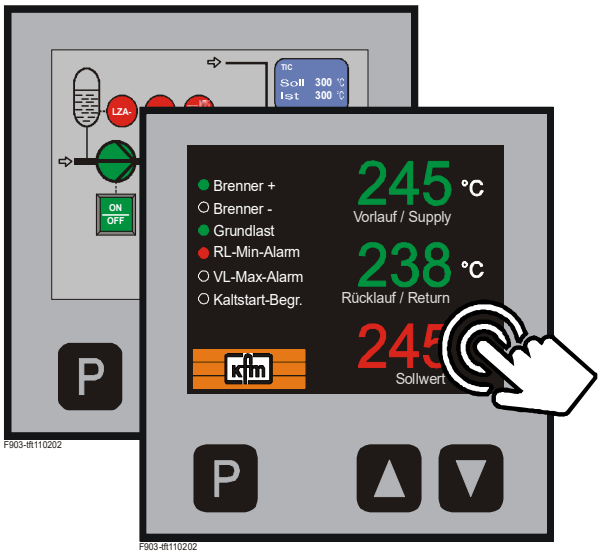
Instructions to the file name on file read out:
The file is automatically named and saved into standard path on the USB stick in accordance with year, month, day and a sequential number. Example: A parameter file is saved on 22 March 2015 on the USB stick as "15032200.pks".
Exception: Automatically saved logger data are named according to year and calendar week. Example; A logger recording within the 22 calendar week 2017 is named "2017_W22.csv".

Supported USB sticks and file systems
The USB-Host function works fine with most commercial USB sticks. Even though, the perfect connection is only assured when using USB sticks that have been obtained from KFM or approved by KFM. Tested, for example: USB Xmore GXQC8A0116R

Only the FAT32 file system is to be used. Other file systems are not recognised by the unit. The USB stick should only contain controller files.

Attention:

- *In order to avoid data loss, the USB stick must not be removed during reading in and out!*
- *Before removing the USB stick, the connection to the USB stick must have been securely interrupted!*
- *The USB stick serves for Setup and is otherwise to be removed. Exception: Long-term logger recordings for diagnosis purposes (> 5 days).*
- *The controller is deactivated during file loading and may need to be automatically restarted after end of transfer!*
- *The service port of the controller is deactivated during file saving.*



General

Controller series 903.. may be delivered with touch- function by the accessory equipment 99t, then they can be operated intuitively by touching the screen within the capability of the TFT-configuration

In the standard version, setpoint values can be set easily just touching the corresponding actual value. Furthermore, page change, switch- / button functions or entering values can be configured using the appropriate touch- elements respectively adjustments. The P-, arrow up and arrow down button are present as mechanical buttons additionally.

The capacitive touch- function ensures wear- free and precise operating and provides real multi-touch.

The operation of custom specific small and medium sized system schemes and flow charts becomes possible with the touch function. The creation of visualization- projects with graphical design tools in the PKD- PC software is distinguished by simple handling.

See sheet 99PKD for more details regarding the software

Versions	**List-No.:**
Controller display with additional touch- function	99t

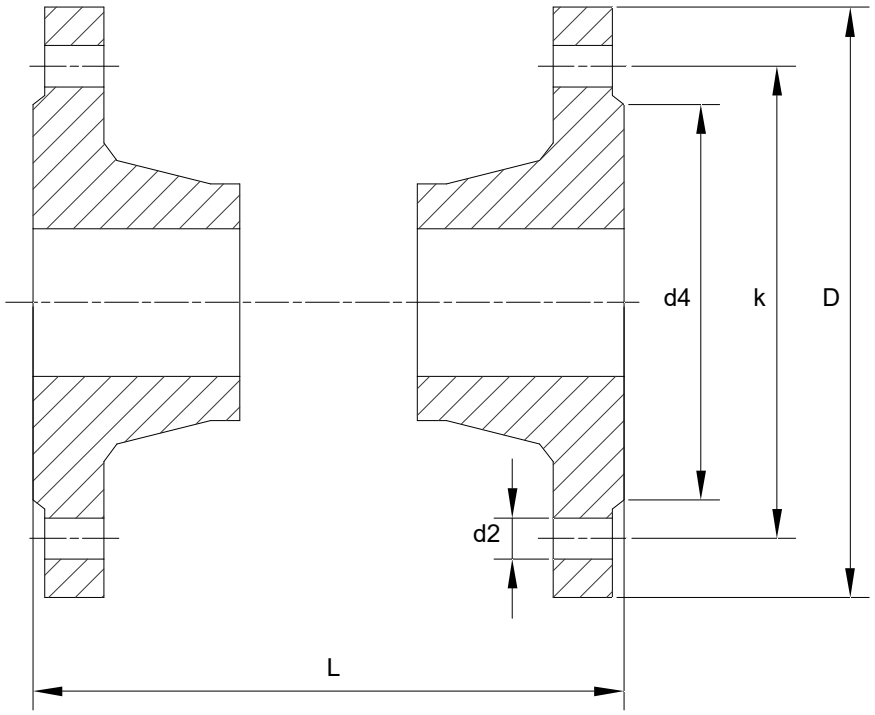
General information for KFM control valves 039200

Operating instructions

Pneumatic control valves ..... B 3
Pneumatic actuator, type 3f1 ..... B 3f1..
Electropneumatic converter, type 39036 ..... B 39036..
Electropneumatic positioner, type Samson 3725 ..... B 390841a
Electropneumatic positioner, type Schneider Electric SRD998..... B 390847Hx
Solenoid valves ..... B 393
Maintenance unit for operating pressure ..... B 394 1
Motor control valves ..... B 4
Electric actuator type 4e1 ..... B 4e1..
Digital positioner for motor control valves, type 49sr7 ..... B 49sr7
Emergency stop- or outlet valves, type 640 ..... B 64
Overflow valves, type 651 ..... B 65
Wiring examples modular hardware ..... B 8_99
Electronic safety temperature limiter with LED- display..... B 845 2...
Electronic safety temperature limiter with TFT-display..... B 846
Modular hardware..... B 852
Industrial compact controller with TFT display, 45 mm wide, for DIN rail mounting ..... B 8521
Industry controller KFM 902 / KFM 93 ..... B 902
Industry controller KFM 903 / KFM 93 ..... B 903
Industry controller KFM 903K / KFM 93 ..... B 903K
Industry controller KFM 91 / KFM 93 ..... B 9100
Industry controller KFM 92 / KFM 93 ..... B 9200
Industry controller KFM 94 ..... B 9400
Modular step controller ..... B 991tz8
KFM TFT display- configuration program ..... B 99pkd
KFM Data logger software ..... B 99pkl
KFM Configuration program for industrial controller type 903K ..... B 99pkm
Module overview for modular controller KFM 903K ..... B 99pkm_m
KFM Interface software PKS ..... B 99pks
Interface 99s ..... B 99s
MODBUS® RTU interface ..... B 99sm
MODBUS® TCP interface..... B 99smt
Profibus interface 99sp ..... B 99sp
PROFIBUS®-DP-interface 99spde ..... B 99spde
PROFINET®-IO-interface 99spne ..... B 99spne

Part lists

Control valve body in two way form, type 21 ..... 6a21-t
Control valve body in three way form, type 31 with mixing plug 6a31-t
Control valve body in three way form, type 32 with diverting plug 6a32-t
Control valve body in two way form, type 51 ..... 6a51-t
Control valve body in three way form, type 61 with mixing plug 6a61-t
Control valve body in three way form, type 62 with diverting plug 6a62-t



Flange connections* according to DIN EN 1092-1/2

	Nominal pressure PN16						Nominal pressure PN25						Nominal pressure PN40					
				Screws						Screws						Screws		
DN	D	d4	k	No.	M..	d2	D	d4	k	No.	M..	d2	D	d4	k	No.	M..	d2
15													95	45	65	4	M12	14
20													105	58	75	4	M12	14
25	see PN40						see PN40						115	68	85	4	M12	14
32													140	78	100	4	M16	18
40													150	88	110	4	M16	18
50													165	102	125	4	M16	18
65	185	122	145	4	M16	18							185	122	145	8	M16	18
80	see PN40												200	138	160	8	M16	18
100	220	158	180	8	M16	18							235	162	190	8	M20	22
125	250	188	210	8	M16	18							270	188	220	8	M24	26
150	285	212	240	8	M20	22							300	218	250	8	M24	26
200	340	268	295	12	M20	22	360	278	310	12	M24	26	375	285	320	12	M27	30

Immersion length* according to DIN EN 558, basic series 1

DN	15	20	25	32	40	50	65	80	100	125	150	200
L	130	150	160	180	200	230	290	310	350	400	480	600
Tol.	± 2	± 2	± 2	± 2	± 2	± 2	± 3	± 3	± 3	±3	± 3	± 4

*dimensions in millimeter

Connections* for flanges drilled to ANSI / JIS

ANSI 150lbs					JIS 10K					JIS 16K				
			Holes					Holes					Holes	
D	d4	k	No.	d2	D	d4	k	No.	d2	D	d4	k	No.	d2
95	45	60	4	16						95	45	70	4	15
105	58	70	4	16	see JIS 16K					105	58	75	4	15
115	68	79	4	16						115	68	90	4	19
140	78	89	4	16						140	78	100	4	19
150	88	98,6	4	16						150	88	105	4	19
165	102	120,6	4	19	165	102	120	4	19	165	102	120	8	19
185	122	139,7	4	19	185	122	140	4	19	185	122	140	8	19
200	138	152,4	4	19	200	138	150	8	19	200	138	160	8	23
235	162	190,5	8	19	235	162	175	8	19	235	162	185	8	23
270	188	216	8	22	270	188	210	8	23	270	188	225	8	25
300	218	241,3	8	22	300	218	240	8	23	300	218	260	12	25
360	278	298,5	8	22	360	278	290	12	23	360	278	305	12	25

mensions in millimeter

Pressure-Temperature-Rating

		Max. working gauge pressure in bar at temperature °C acc. To DIN EN 1092-2						
		-10...120	150	200	250	300	350	
EN-GJL-250 (GG-25)	PN16	16	14,4	12,8	11,2	9,6		
GJS-400-18-LT (GGG-40.3)	PN16	16	15,5	14,7	13,9	12,8	11,2	
	PN25	25	24,3	23	21,8	20	17,5	

		Max. working gauge pressure in bar at temperature °C acc. To DIN EN 1092-1							
		-10…50	100	150	200	250	300	350	400
GP240GH+N (GS-C25N)	PN16	16	14,9	13,9	12,4	11,4	10,3	9,6	9,2
	PN25	25	23,3	21,7	19,4	17,8	16,1	15,0	14,4
	PN40	40	37,3	34,7	30,2	28,4	25,8	24	23,1
CrNiMo19-11-2 (1.4408)	PN16	16	14,9	13,5	12,4	11,7	11	10,7	10,2
	PN25	25	23,3	21,1	19,4	18,3	17,2	16,7	16
	PN40	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6

Installation:

Attention: *- Installation, operation and maintenance should be done only by qualified personnel.*
- Disconnect pressure air supply before working on the valve and make sure, that it is impossible to connect it unintentionally (injury hazard)
- It is not permitted to work on the valve body and to exchange the actuator as long as the valve is subjected to pressure and temperature.
- Crushing and injury hazard because of moving parts
- Observe corresponding operating manuals for installed accessories

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position must be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.

Remove flange covers before the installation. Use suitable handling and lifting equipment for installing the valve (see corresponding data sheet for the weights).

Regard the permitted max. operating pressure and temperature as described in the corresponding valve data sheet. Observe the ambient temperature limits (-20...+80°C), if necessary, and for higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

Retighten the screws of all flange connections (also cover and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Pneumatic connection:

The air supply pressure has to be set according to instruction on the nameplate by means of a reducing unit. For protection of actuators, the reducing unit should be combined with filter unit.

The pneumatic supply tube has to be connected to the free thread connection on the pressure side of the actuator. The thread connection on the opposite spring side of the actuator is protected with the sealing and vent cap. The cap must not be removed, the vent hole must not be closed.

By operating mode "spring closes", the pneumatic connections are situated by three way valves with mixing plug on the upper side of the actuator, by two way valves and by three way valves with diverting plug on the lower side of the actuator.
This is reverse by operating mode "spring opens".

The proper mounting side for pneumatic connection can be controlled with stroke indicator:
position without air supply up: pneumatic connection up,
position without air supply down: pneumatic connection down

Maintance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also cover and connection piece flanges), the valve cone should be located in the centre.

Attention: *- Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean it in order to protect stuffing boxes and PTFE-V-rings against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with PTFE-V-rings or bellows.

Undertake maintenance on the actuator in accordance with the corresponding information in the separate operating instructions.

Disassembly of actuator:

- Move actuator with actuating pressure into the middle of the stroke
- Loosen headless setscrew in the cap nut (21)
- Secure coupling (20) position (width across flats 32), unscrew** cap nut (21)
- Unscrew nut (23)
- Remove actuator from valve
- Let off actuating pressure

Assembly of actuator:

- Position actuator onto valve, tighten nut (23)
- Move actuator into middle of stroke with actuating pressure
- Secure coupling (20) position (width across flats 32)
- Tighten cap nut (21) and headless setscrew
- Move valve into end positions, if necessary, and adjust clamping rings towards position indicator (17)

** ***Note:*** *Ensure that the position of coupling (20), indicating plate (19) and fastening nut (18) is not altered, otherwise the starting point of the actuator will require resetting.*

Setting the starting point

Ensure that the actuator is readily assembled on the valve before setting.
Release lock nut (18) (see fig. 1) on the actuator spindle (16) and screw slightly in the direction of the actuator. Temporarily remove the indicating plate (19) located beneath.

Set the desired starting pressure for the actuator on the control air reducing unit. If the access is performed via a positioner, set it to the maximum actuating pressure by the appropriate input signal.

Screw coupling (20) onto the actuator spindle (16) until the valve spindle is just in the CLOSED position or starts moving in the OPEN direction.

If the coupling cannot be adjusted sufficiently on the drive spindle, first of all adjust the coupling ring (22) by approx. 5 mm. It is accessible after the cap nut (21) has been screwed off the coupling (20) and can be turned slightly up or down on the spindle.

First of all loosen the headless setscrews of the position securing element on the coupling ring and cap nut. After completing the measure, ensure that all parts are restored to their original status.

Subsequently, reattach indicating plate (19), secure with lock nut (18) and restore to the normal operating status on the pressure reducing unit or positioner.

Exchanging the diaphragms

- Dismantle actuator from valve - as described above
- Unscrew coupling (20) and nut (18) from the drive spindle (16)
- Remove nuts and screws (5) and diaphragm lid (1)

Attention: *All actuators contain two long screws. Ensure that these screws are loosened last and uniformly on both sides to reduce the spring pretension / preloading.*
Non-observance of this information entails risk of injury !

- Remove springs (2) and spindle-diaphragm-diaphragm plate unit
- Secure spindle (16) position (width over flats 13) and screw off screw (4) together with retaining ring
- Remove clamping element (3) and diaphragm (8), insert new diaphragm (8) and clamping element (3)
- Replace retaining ring, insert screw (4) and tighten against the spindle (16)
- Insert springs (2) and spindle-diaphragm-diaphragm plate unit, ensuring at the same time that the springs are correctly positioned in the diaphragm plate (6) and the diaphragm is aligned in relation to the screw holes
- Put diaphragm lid (1) in place and align, insert screws (5) commencing with the two long screws and tighten in a cross pattern with the nuts
- Screw coupling (20) and nut (18) onto the actuator spindle (16), insert indicating plate (19)
- Mount actuator onto valve - as described above
- Set the starting point - as described above

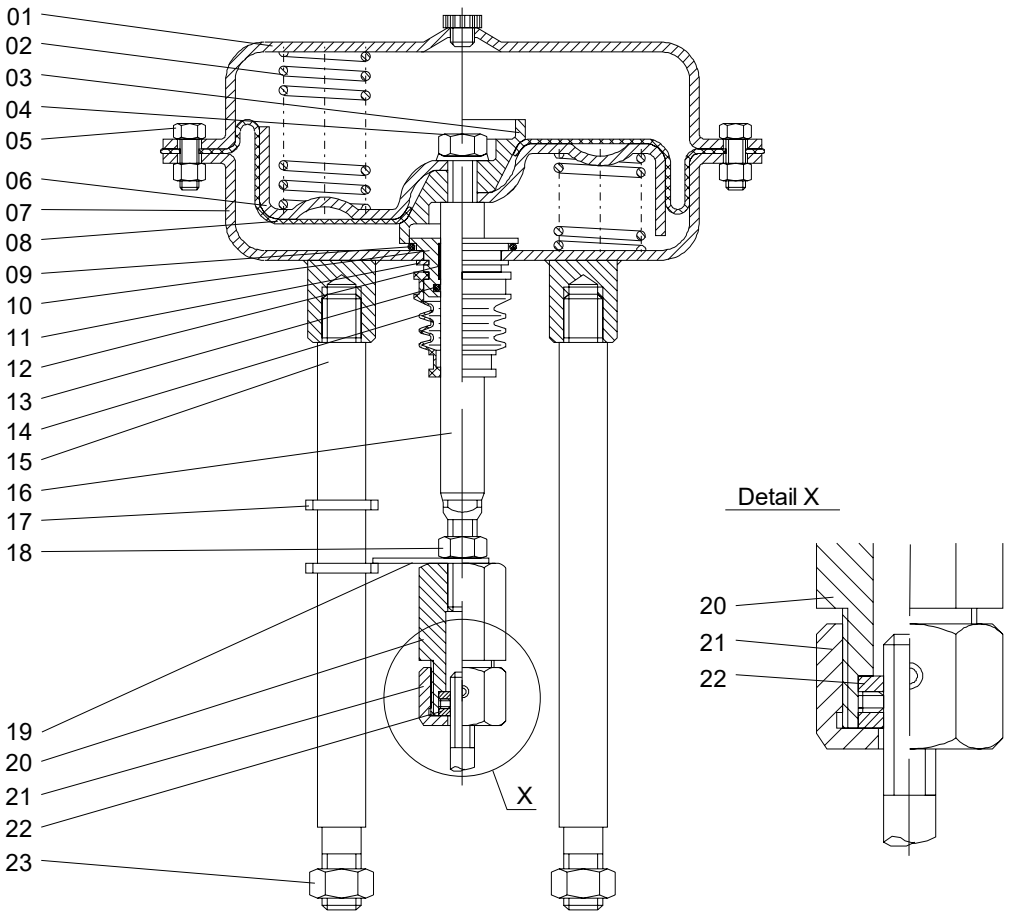


Fig. 1

No.	Designation
01	Diaphragm lid
02	Spring
03	Clamping element
04	Screw M12 with retaining ring
05	Screw M8 with Nut
06	Diaphragm plate
07	Diaphragm housing
08	Diaphragm
09	O-ring
10	Spindle guidance
11	Seeger-ring
12	Guiding tape
13	O-ring
14	Bellow
15	Mounting rod
16	Spindle
17	Stroke indikators
18	Nut M12
19	Indicating plate
20	Coupling
21	Cap nut
22	Coupling ring with headless setscrew
23	Nut M16 with spring ring

Function:

The electro-pneumatic converter is a connecting element between controller and pneumatic control valve.
It creates a control signal from "+"- or "-" impulse of 3-point-step controller and from available compressed air.
Voltage application on exhaust solenoid valve 1 (see drawings on pages 2-3) effects de-aeration of the pneumatic actuator, voltage application on supply solenoid valve 2 effects aeration of the pneumatic actuator.
For proper functioning of converter with quick-exhaust function, it is necessary to apply voltage also on solenoid valve 3.
Voltage interruption on this valve activates the quick-exhaust function: de-aerating of the pneumatic actuator.
The pneumatic output signal depends on the supply air pressure and must not be higher than the maximum permissible pressure of the actuator. The flow rate of the supply and exhaust air can be modified with throttling valves, therefore it is possible to adjust the positioning time of the pneumatic actuator if necessary.

Installation and wiring:

Attention:

- Installation, operation and maintenance should be done only by qualified personnel.
- Disconnect pressure air supply before working on the valve and make sure, that it is impossible to connect it unintentionally (injury hazard)
- Crushing and injury hazard because of moving parts
- Observe corresponding operating manuals for actuator

- Fasten E/P converter with two M8 screws on the actuator cover
  (use convenient adapter if necessary)
- Connect operating air output with pneumatic actuator input using hose or tube
- Connect supply air from the pneumatic maintenance unit to converter input
- Check tightness of all pneumatic connections
- Connect converter electrically with the 3-point-step controller
  Observe applicable accident prevention and safety regulations for electrical equipment!

  Additional for E/P converter with quick-exhaust function (type 390365.):
- Apply voltage from the safety chain on the 3/2-way exhaust solenoid valve 3

Initiation:

- Adjust pressure of the supply air on the pneumatic maintenance unit according to the required air pressure for the pneumatic actuator

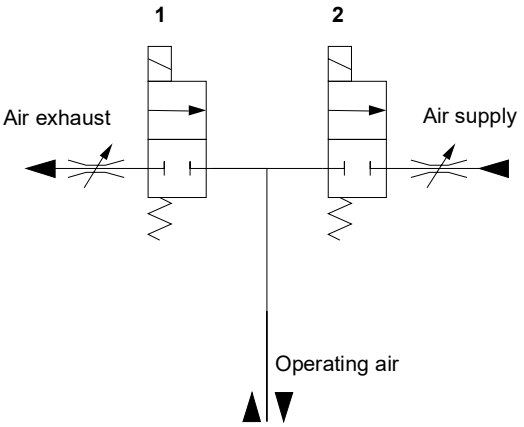
  ***Hint**: Operation with too high air pressure causes reduction of the control quality*
- Generate „+“ or „-“ impulse from the controller by changing of the set point and check the function of the control valve
- Adjust the operating time of the control valve with throttling valves for air supply and air exhaust.
  Clockwise turning of the handwheel: longer operating time
  Anticlockwise turning of the handwheel: shorter operating time
  The operating time by permanent „+“ or „-“ signal should be about 20-30 s (factory setting)
- Dismount the handwheels of the throttling valves to avoid undesirable alterations of the adjustment, if necessary

  Additional for E/P converter with quick-exhaust function (type 390365.):
- Check the voltage on the 3/2-way exhaust solenoid valve
  (there is no control function possible without voltage application on this valve)

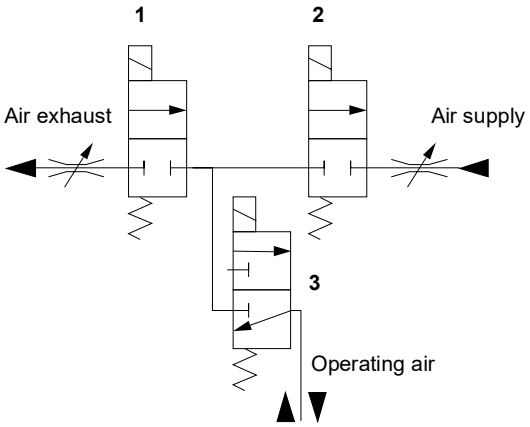
Technical data:

Input signal:	3-point-step signal
Supply:	230V / 50Hz, alternatively: 24V / 50Hz, 24V DC
Electrical connection:	Connector acc. to DIN EN 175301-803, Form A
Connecting cable:	ø4,5-6 mm / max. 0,75 mm²
Compressed air supply:	Class 3 acc. to ISO 8573-1
Air pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air pressure
Air connection:	G 1/4"
Protecting class:	IP65 acc. to DIN EN 60529





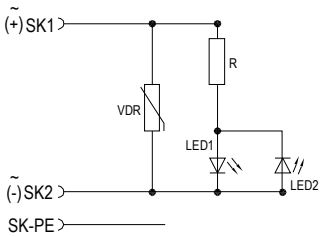
Type 390 360.*
without quick-exhaust function



Type 390 365.*
with quick-exhaust function

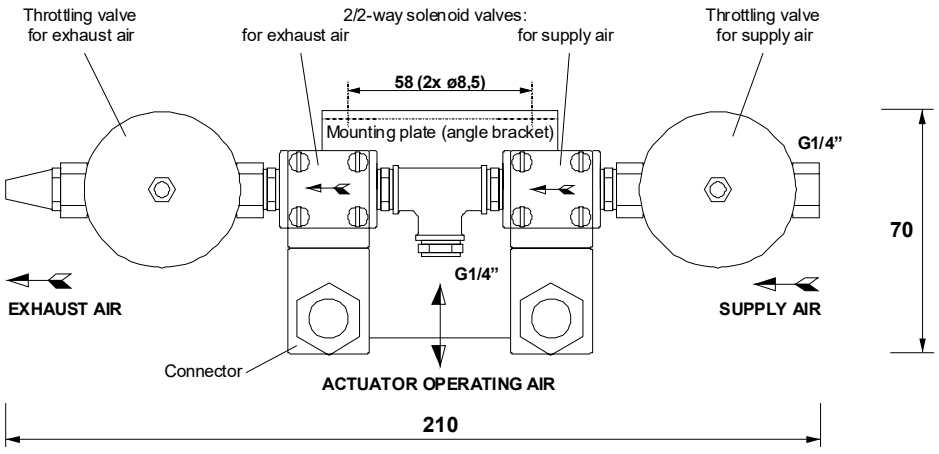
** = All solenoid valves are shown currentless*

Electrical wiring - connector:

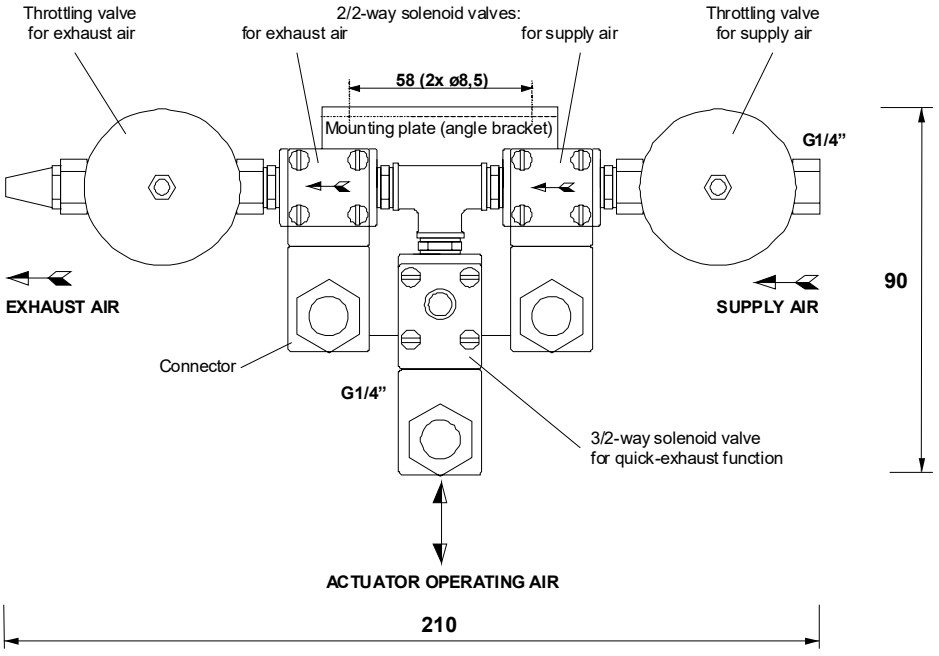


Types overview:**		**List– No.**
230V / 50 Hz	without quick-exhaust function	**390 360**
24 V / 50 Hz	without quick-exhaust function	**390 3602**
24V DC	without quick-exhaust function	**390 3608**
230V / 50 Hz	with quick-exhaust function	**390 365**
24 V / 50 Hz	with quick-exhaust function	**390 3652**
24V DC	with quick-exhaust function	**390 3658**

*** Ex-type of solenoid valves on request*



Type 390360. without quick-exhaust function



Type 390365. with quick-exhaust function

MOUNTING AND OPERATING INSTRUCTIONS

EB 8394 EN

Translation of original instructions



Hardware version 01.xx.xx



Hardware version GI:00

Series 3725

Type 3725 Electropneumatic Positioner

Firmware version 1.12

CE Ex certified

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices. The images shown in these instructions are for illustration purposes only. The actual product may vary.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON's After-sales Service (aftersalesservice@samsongroup.com).

Documents relating to the device, such as the mounting and operating instructions, are available on our website at ***www.samsongroup.com > Downloads > Documentation***.

Definition of signal words

⚠ DANGER
Hazardous situations which, if not avoided, will result in death or serious injury

⚠ WARNING
Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE
Property damage message or malfunction

Note
Additional information

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1.02 (old)	**1.03** (new)
	Internal revisions
1.03 (old)	**1.10** (new)
	Setting of the travel in steps of 0.5 mm (P4 parameter code)
	Monitoring of the end stops only during initialization and in manual mode
	To suppress common-mode interference on the signal lines, the D component of the positioner is switched off when the actuator is at a standstill.
1.10 (old)	**1.11** (new)
	Internal revisions
1.11 (old)	**1.12** (current version)
	Internal revisions

Hardware revisions	
GI:00 (old)	**01.00.00** (new)
	New device cover made of polyphthalamide (PPA) with a round window made of polycarbonate (PC) (old: device cover with square window made of polycarbonate (PC))

1 Safety instructions and measures

Intended use

The SAMSON Type 3725 Positioner is mounted on pneumatic control valves and used to assign the valve position to the control signal. The device is designed to operate under exactly defined conditions (e.g. operating pressure, temperature). Therefore, operators must ensure that the positioner is only used in applications where the operating conditions correspond to the technical data. In case operators intend to use the positioner in applications or conditions other than those specified, contact SAMSON.

SAMSON does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

➔ Refer to the technical data for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse

The Type 3725 Positioner is ***not*** suitable for the following applications:

– Use outside the limits defined during sizing and by the technical data

Furthermore, the following activities do not comply with the intended use:

– Use of non-original spare parts

– Performing maintenance activities not described in these instructions

Qualifications of operating personnel

The positioner must be mounted, started up and serviced by fully trained and qualified personnel only; the accepted industry codes and practices must be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Explosion-protected versions of this device must be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas.

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Personal protective equipment

No personal protective equipment is required for the direct handling of the positioner. Work on the control valve may be necessary when mounting or removing the device.

➔ Observe the requirements for personal protective equipment specified in the valve documentation.

➔ Check with the plant operator for details on further protective equipment.

Revisions and other modifications

Revisions, conversions or other modifications of the product are not authorized by SAMSON. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Safety features

Upon failure of the air supply and/or electrical signal, the positioner vents the actuator, causing the valve to move to the fail-safe position determined by the actuator.

Warning against residual hazards

The positioner has direct influence on the control valve. To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the control valve by the process medium, the operating pressure, the signal pressure or by moving parts by taking appropriate precautions. Plant operators and operating personnel must observe all hazard statements, warnings and caution notes in these mounting and operating instructions, especially for installation, start-up and service work.

If inadmissible motions or forces are produced in the pneumatic actuator as a result of the supply pressure, it must be restricted using a suitable supply pressure reducing station.

Responsibilities of the operator

Operators are responsible for proper use and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions to the operating personnel and to instruct them in proper operation. Furthermore, operators must ensure that operating personnel or third parties are not exposed to any danger.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the specified hazard statements, warnings and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate, or given the device a mark of conformity. Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device before putting it back into operation and the passing of the routine test is documented by attaching a mark of conformity to the device. Replace explosion-protected components only with original, routine-tested components by the manufacturer.

Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being operated inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

Maintenance, calibration and work on equipment

➔ Only use intrinsically safe current/voltage calibrators and measuring instruments for interconnection with intrinsically safe circuits to check or calibrate the equipment inside or outside hazardous areas.

➔ Observe the maximum permissible values specified in the certificates for intrinsically safe circuits.

Referenced standards, directives and regulations

Devices with a CE marking fulfill the following requirements of the Directives:

– Type 3725-0: 2011/65/EU, 2014/30/EU
– Type 3725-1100: 2011/65/EU, 2014/30/EU, 2014/34/EU

Referenced documents

The following documents apply in addition to these mounting and operating instructions:

– The mounting and operating instructions of the components on which the positioner is mounted (valve, actuator, valve accessories etc.).

1.1 Notes on possible severe personal injury

⚠ DANGER

Risk of fatal injury due to the ignition of an explosive atmosphere.

Incorrect installation, operation or maintenance of the positioner in potentially explosive atmospheres may lead to ignition of the atmosphere and ultimately to death.

➔ The following regulations apply to installation in hazardous areas: EN 60079-14 (VDE 0165, Part 1).

➔ Installation, operation or maintenance of the positioner is to be performed only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas.

1.2 Notes on possible personal injury

⚠ WARNING

Risk of personal injury due to moving parts on the valve.

During initialization of the positioner and during operation, the valve moves through its entire travel range. Injury to hands or fingers is possible if they are inserted into the valve.

➔ During initialization, do not insert hands or fingers into the valve yoke and do not touch any moving valve parts.

1.3 Notes on possible property damage

NOTICE

Risk of damage to the positioner due to incorrect mounting position.

➔ Do not mount the positioner with the back of the device/vent opening facing upward.

➔ Do not seal the vent opening when the device is installed on site.

Risk of malfunction due to incorrect sequence during start-up.

The positioner can only work properly if the mounting and start-up are performed in the prescribed sequence.

➔ Perform mounting and start-up as described in Chapter 30 on page 5.

An incorrect electric signal will damage the positioner.

A current source must be used to power the positioner.

➔ Only use a current source and never a voltage source.

Incorrect assignment of the terminals will damage the positioner and will lead to malfunction.

For the positioner to function properly, the prescribed terminal assignment must be observed.

➔ Connect the electrical wiring to the positioner according to the prescribed terminal assignment.

Malfunction due to initialization not yet completed.

The initialization causes the positioner to be calibrated to adapt it to the mounting situation. After initialization is completed, the positioner is ready for use.

➔ Initialize the positioner on first start-up.

➔ Re-initialize positioner after changing the mounting position.

Risk of positioner damage due to incorrect grounding of the electric welding equipment.

➔ Do not ground electric welding equipment near the positioner.

Incorrect cleaning will damage the housing cover.

The housing cover of the hardware version GI:00 is made of Makrolon® and will be damaged when cleaned with abrasive cleaning agents or agents containing solvents.

➔ Do not rub the housing cover dry.

➔ Do not use any cleaning agents containing chlorine or alcohol or abrasive cleaning agents.

➔ Use a non-abrasive, soft cloth for cleaning.

Risk of damage to the housing cover due to excessively high torque being applied when tightening the housing screws.

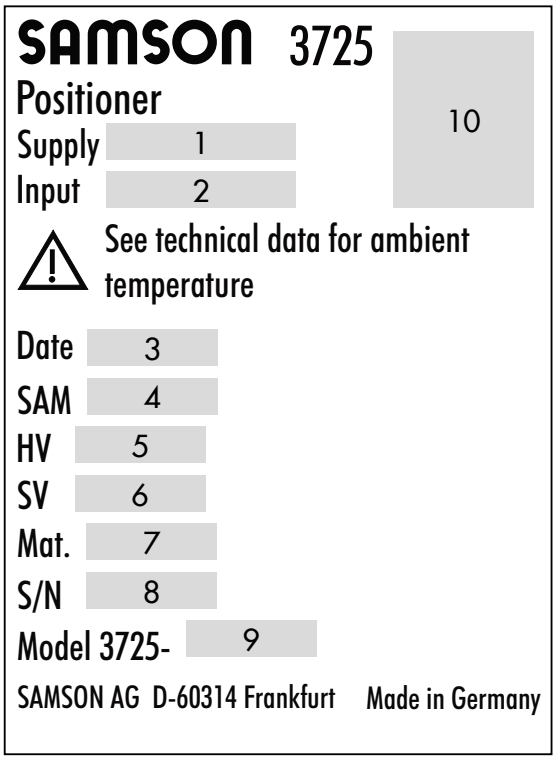
➔ Tighten the cover screws with a tightening torque of 0.8 Nm at the maximum.

2 Markings on the device

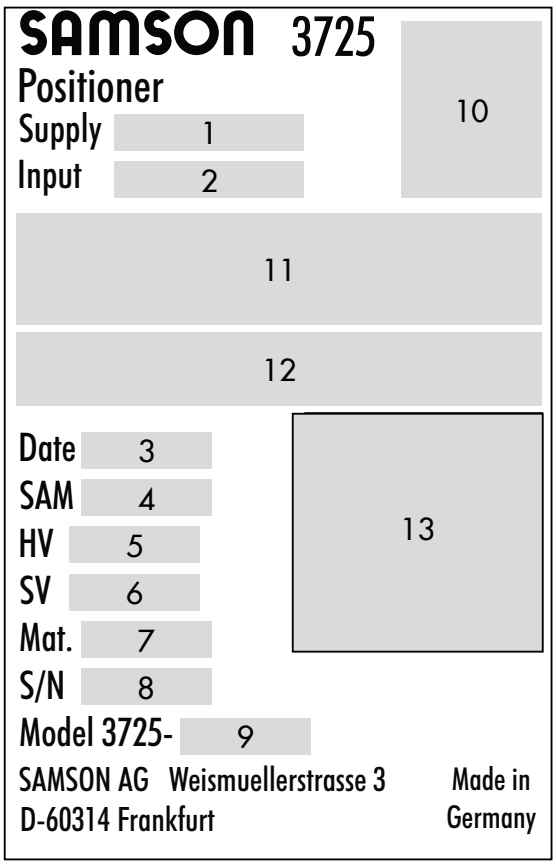
2.1 Nameplate

The nameplate shown was up to date at the time of publication of this document. The nameplate on the device may differ from the one shown.

Version without explosion protection



Explosion-protected version



1 Supply pressure
2 Input signal
3 Date of manufacture
4 Code for NAMUR Recommendation NE 53 (internal specification)
5 Hardware version
6 Software version
7 Material number
8 Serial number
9 Model number
10 Approval and ID of the notified body (if applicable)
11 Explosion protection marking
12 Referenced documents
13 DataMatrix code (electronic nameplate)

2.2 Article code

Positioner	Type 3725-	x	x	x	0	0	0	0	x	0	0	x	x	x	x
With LCD and autotune, 4 to 20 mA reference variable															
Explosion protection [1]															
Without		0	0	0											
ATEX	II 2 G Ex ia IIC T4 Gb	1	1	0								9	8		
CCC Ex	Ex ia II T4 Gb	1	1	2								9	8		
TR CMU 1055	II 2 G Ex ia IIC T4 Gb	1	1	6								9	8		
CSA c/us	Ex ia IIC T4; Class I, Zone 0, AEx ia IIC T4; Class I, Div. 1, Groups A, B, C & D	1	3	0								9	8		
Approval certificates for ships															
Without									0						
Bureau Veritas Certification									1			9	8		
Hardware version															
GI:00												9	8		
01.00.00												9	7		
Firmware version															
1.12														9	3

[1] See Table 1 for details on explosion protection certificates.

Table 1: *Summary of explosion protection certificates*

Type	Certification			Type of protection
3725-1000	ATEX	Number Date	PTB 11 ATEX 2020 X 2019-02-25	II 2 G Ex ia IIC T4 Gb
3725-112	CCC Ex	Number Date Valid until	2021322307003871 2023-04-29 2026-04-04	Ex ia II T4 Gb
3725-116	TR CMU 1055	Number Date Valid until	ZETC/35/2021 2021-07-26 2024-07-24	II 2 G Ex ia IIC T4 Gb
3725-130	CSA c/us	Number Date	2703735 X 2014-06-03	Ex ia IIC T4; Class I, Zone 0, AEx ia IIC T4; Class I, Div. 1, Groups A, B, C, D

Table 2: *Approval certificates for ships*

BV Type Approval Certificate	Number Date Valid until	46564/B0 BV.pdf 2022-01-11 2027-01-11

3 Design and principle of operation

The Type 3725 Electropneumatic Positioner is mounted on pneumatic control valves and used to assign the valve position (controlled variable x) to the control signal (reference variable w). The positioner compares the electric control signal of a control system to the travel or opening angle of the control valve and issues a signal pressure (output variable y) for the pneumatic actuator.

The positioner mainly consists of the following components (see Fig. 1):

- Magnetoresistive sensor (2)
- Analog i/p converter (6) with a downstream air booster (7)
- Electronics unit with microcontroller (4)

The travel or opening angle is measured by the pick-up lever, non-contact magnetoresistive sensor and downstream electronics.

The pick-up lever is connected to a magnet inside the device. The motion of the pick-up lever causes the direction of the magnetic field to change. This change is sensed by the sensor (2). The electronics unit determines the current position of the actuator stem or opening angle from this information.

The position of the actuator stem or opening angle is transmitted to the microcontroller (3) over the A/D converter (4). The PD control algorithm in the microprocessor (4) compares this actual position to the 4 to 20 mA control signal after it has been converted by the A/D converter. In case of a system deviation, the activation of the i/p module (6) is changed so that the actuator of the valve (1) is pressurized or vented accordingly over the downstream booster (7). The supply air is supplied to the air capacity booster (7) and the pressure regulator (8).

The output signal pressure supplied by the booster can be limited to 2.3 bar by software.

The volume restriction Q (10) is used to optimize the positioner by adapting it to the actuator.

Tight-closing function

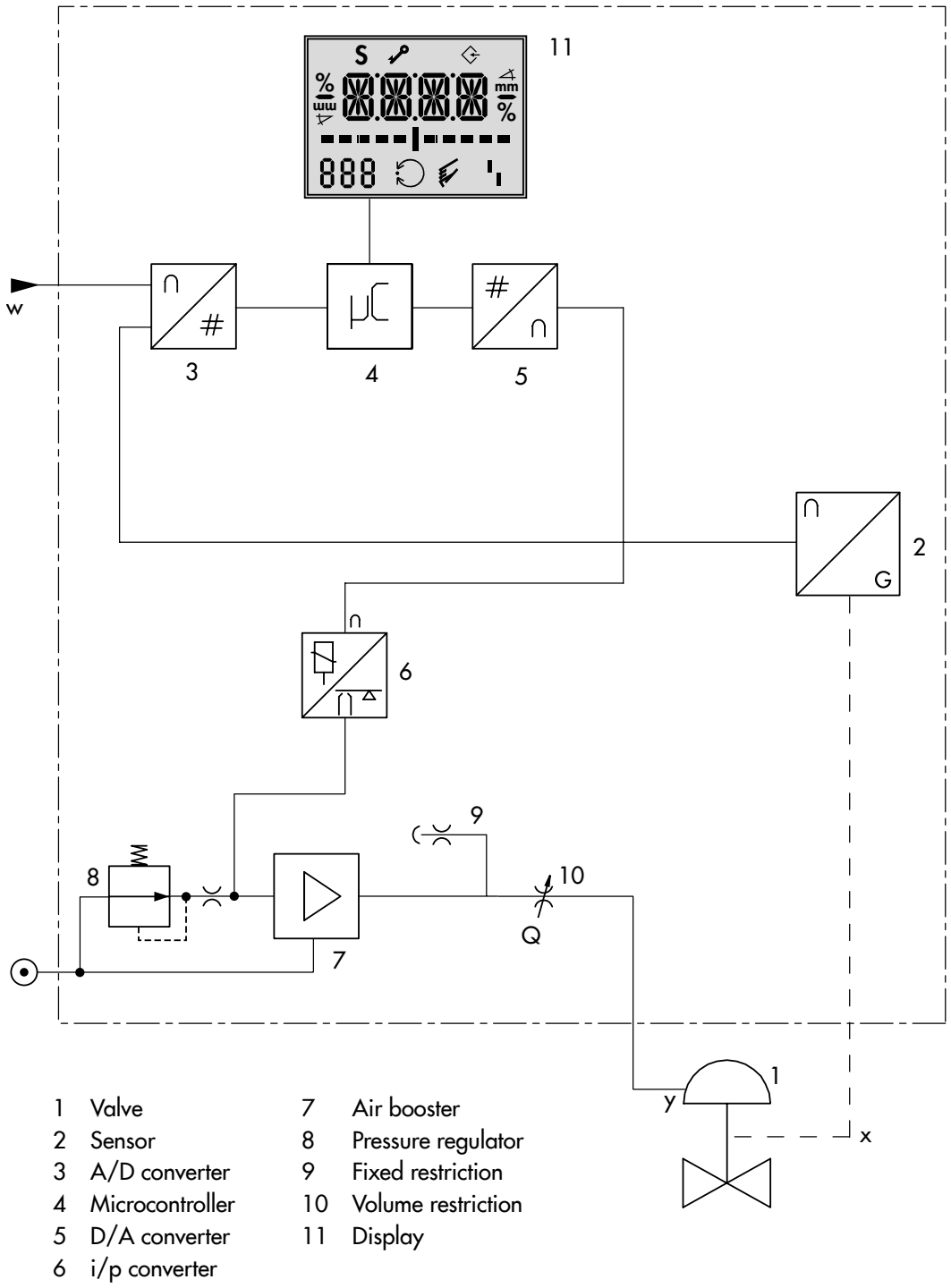
The pneumatic actuator is completely filled with air or vented as soon as the reference variable falls below 1 % or exceeds 99 % (see set point cutoff in P10 and P11 parameter codes).

3.1 Types of attachment

The Type 3725 Positioner is suitable for the following types of attachment:

- Direct attachment to SAMSON Type 3277 and Type 2780-2 Actuators
- Attachment to actuators according to IEC 60534-6 (NAMUR)
- Attachment to Type 3372 Actuator (Series V2001 Valves)
- Attachment to rotary actuators according to VDI/VDE 3845

➔ See Chapter 5.2 onwards for a description of the types of attachment.



1 Valve
2 Sensor
3 A/D converter
4 Microcontroller
5 D/A converter
6 i/p converter
7 Air booster
8 Pressure regulator
9 Fixed restriction
10 Volume restriction
11 Display

Fig. 1: *Circuit diagram*

3.2 Accessories and mounting parts

Table 3: Direct attachment to Type 3277-5 and Type 2780-2 Actuators (see Chapter 5.2)		Order no.
Mounting parts		
For actuators up to 120 cm²		1402-0239
Accessories for actuator		
Switchover plate for Type 3277-5xxxxxx.01 Actuator		1400-6822
Connecting plate for additional attachment of, e.g. a solenoid valve: G ⅛		1400-6823
Accessories for positioner		
Connecting plate (6)	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket (7)	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge bracket for combination with Type 4708-55 Supply Pressure Regulator		1402-1515
Pressure gauge mounting kit (8) up to max. 6 bar	Stainless steel/brass	1402-1637
	Stainless steel/stainless steel	1402-1638

Table 4: Direct attachment to Type 3277 (Chapter 5.2.2)		Order no.
Mounting parts		
Actuators 175, 240, 350, 355, 700, 750 cm²		1402-0240
Accessories		
Connection block with seals and screw	G ¼	1402-0241
	¼ NPT	1402-0242
Pressure gauge mounting kit up to max. 6 bar	Stainless steel/brass	1402-1637
	Stainless steel/stainless steel	1402-1638

Table 5: Pipe connections for Type 3277 (direct attachment)

Pipe connection	Actuator size	Material	Connection	Order no.
Piping with screw fittings – for fail-safe action "actuator stem retracts" – with air purging of the top diaphragm chamber	175 cm²	Steel	G ¼ / G ⅜	1402-0930
			¼ NPT/ ⅜ NPT	1402-0958
		Stainless steel	G ¼ / G ⅜	1402-0950
			¼ NPT/ ⅜ NPT	1402-0964
	240 cm²	Steel	G ¼ / G ⅜	1402-0927
			¼ NPT/ ⅜ NPT	1402-0959
		Stainless steel	G ¼ / G ⅜	1402-0951
			¼ NPT/ ⅜ NPT	1402-0965
	350 cm²	Steel	G ¼ / G ⅜	1402-0928
			¼ NPT/ ⅜ NPT	1402-0960
		Stainless steel	G ¼ / G ⅜	1402-0952
			¼ NPT/ ⅜ NPT	1402-0966
	355 cm²	Steel	G ¼ / G ⅜	1402-0956
			¼ NPT/ ⅜ NPT	1402-0961
		Stainless steel	G ¼ / G ⅜	1402-0953
			¼ NPT/ ⅜ NPT	1402-0967
	700 cm²	Steel	G ¼ / G ⅜	1402-0929
			¼ NPT/ ⅜ NPT	1402-0962
		Stainless steel	G ¼ / G ⅜	1402-0954
			¼ NPT/ ⅜ NPT	1402-0968
	750 cm²	Steel	G ¼ / G ⅜	1402-0957
			¼ NPT/ ⅜ NPT	1402-0963
		Stainless steel	G ¼ / G ⅜	1402-0955
			¼ NPT/ ⅜ NPT	1402-0969

Table 6: Attachment to NAMUR rib or attachment to rod-type yokes according to IEC 60534-6 (Chapter 5.3)		Order no.
5 to 50 mm travel, lever already on positioner		
For actuators		1402-0330
Actuators from other manufacturers and Type 3271 with 120 to 750 cm² effective areas		
Accessories		
Connecting plate	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge mounting kit up to max. 6 bar	Stainless steel/brass	1402-1637
	Stainless steel/stainless steel	1402-1638

Table 7: Attachment to rotary actuators (Chapter 5.5)		Order no.
Light version		
VDI/VDE 3845 (September 2010), fixing level 1 [1], AA1 size		1402-0243
VDI/VDE 3845 (September 2010), fixing level 1 [1], AA2 size		1402-0244
VETEC Type S160 Actuator or SAMSON Type 3278 Rotary Actuator (160 cm²)		1402-0294
VETEC Type S320		1402-0295
Heavy-duty version		
VDI/VDE 3845 (September 2010), fixing level 1 [1], AA1 to AA4 size		1402-1097
VDI/VDE 3845 (September 2010), fixing level 2 [1]		1402-1099
VETEC Type S160/R		1402-1098
Accessories		
Connecting plate	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge mounting kit up to max. 6 bar	Stainless steel/brass	1402-1637
	Stainless steel/stainless steel	1402-1638
Connecting plate for Type 3710 Reversing Amplifier		1402-0512

[1] See page 27 for details.

Table 8: General accessories and spare parts		Order no.
M20x1.5 cable gland		
Black plastic		8808-1011
Blue plastic		8808-1012
Nickel-plated brass		1890-4875
Stainless steel 1.4305		8808-0160
M20x1.5 to ½ NPT adapter		
Powder-coated aluminum		0310-2149
Stainless steel		1400-7114
Brief instructions inside cover		
German	GI:00	0190-6173
	HV 01.00.00	100199873
English	GI:00	0190-6174
	HV 01.00.00	100199875

3.3 Travel tables

Note

*The **M** lever is included in the scope of delivery.*

Direct attachment to Type 3277-5 and Type 3277 Actuators

Actuator size [cm²]	Rated travel [mm]	Adjustment range at positioner			Required lever	Assigned pin position
		Min.	Travel	Max.		
120	7.5	5.0 mm	to	16.0 mm	M	25
120/175/240/350	15	7.0 mm	to	22.0 mm	M	35
355/700/750	30	10.0 mm	to	32.0 mm	M	50

Direct attachment to Type 2780-2 Actuator

Actuator size [cm²]	Rated travel [mm]	Adjustment range at positioner			Required lever	Assigned pin position
		Min.	Travel	Max.		
120	6/12	5.0 mm	to	16.0 mm	M	25
120	15	7.0 mm	to	22.0 mm	M	35

Attachment according to IEC 60534-6 (NAMUR)

SAMSON Type 3271 Actuator Size [cm²]	Rated travel [mm]	Travel of other valves		Required lever	Assigned pin position
		Min.	Max.		
120	7.5	5.0 mm	16.0/25.0 [1] mm	M	25
120/175/240/350	15	7.0 mm	22.0/35.0 [1] mm	M	35
700/750	7.5				
355/700/750	15/30	10.0 mm	32.0/50.0 [1] mm	M	50

[1] When 'MAX' is selected as the nominal range (P4 code, see page 71)

Attachment to rotary actuators according to VDI/VDE 3845

Rotary actuators			Required lever	Assigned pin position
Min.	Opening angle	Max.		
24°	to	100°	M	90°

3.4 Technical data

Type 3725 Positioner		
Travel (adjustable)	Direct attachment to Type 3277: Direct attachment to Type 2780-2: Attachment to Type 3372 Actuator: Attachment according to IEC 60534-6 (NAMUR): Attachment to rotary actuators:	5 to 30 mm 6/12/15 mm 15/30 mm 5 to 50 mm 24 to 100°
Reference variable w (reverse polarity protection) Static destruction limit	4 to 20 mA signal range · Two-wire device Split-range operation 4 to 11.9 mA and 12.1 to 20 mA ±33 V	
Minimum current	3.8 mA	
Load impedance	Max. 6.3 V (corresponding to 315 Ω at 20 mA)	
Supply air Air quality acc. to ISO 8573-1	Supply air: 1.4 to 7 bar (20 to 105 psi) Max. particle size and density: Class 4 · Oil content: Class 3 · Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected	
Signal pressure (output)	0 bar up to the supply pressure · Can be limited to approx. 2.3 bar by software	
Characteristic	3 characteristics for globe valves · 9 characteristics for rotary valves	
Hysteresis	≤0.3 %	
Sensitivity	≤0.1 %	
Transit time	Only for actuators with initialization time > 0.5 s [1)]	
Direction of action	w/x reversible	
Air consumption	≤100 l_n/h with a supply pressure up to 6 bar and a signal pressure of 0.6 bar	
Air output capacity	Actuator (supply): at Δp = 6 bar: 8.5 m_n^3/h, at Δp = 1.4 bar: 3.0 m_n^3/h K_{Vmax}(20 °C) = 0.09 · Air output at the signal pressure output (38) can be restricted with the volume restriction Q to K_{Vmin}(20 °C) ≈ ⅓ K_{Vmax}(20°C)	
	Actuator (exhaust): at Δp = 6 bar: 14.0 m_n^3/h, at Δp = 1.4 bar: 4.5 m_n^3/h K_{Vmax}(20 °C) = 0.15 · Air output at the signal pressure output (38) can be restricted with the volume restriction Q to K_{Vmin}(20 °C) ≈ ⅓ K_{Vmax}(20°C)	
Permissible ambient temperature	–20 to +80 °C –25 to +80 °C with metal cable gland The limits in the test certificates additionally apply for explosion-protected versions	

[1)] For faster actuators, a volume restriction must be used. Otherwise, the initialization cannot be performed successfully.

Safety	
Influences	Temperature: ≤0.15 %/10 K Effect of vibration: ≤0.25 % up to 2000 Hz and 4 g according to IEC 770 Supply air: None
Electromagnetic compatibility	Complying with EN 61000-6-2, EN 61000-6-3 and NAMUR Recommendation NE 21
Explosion protection	See Table 1 on page 14 for details on explosion protection certificates.
Degree of protection	IP 66
Conformity	CE
Materials	
Housing	Polyphthalamide (PPA)
Cover	GI:00 Cover with integrated square window: polycarbonate (PC) HV 01.00.00 Cover made of polyphthalamide (PPA) with round window made of polycarbonate (PC)
External parts	Stainless steel 1.4571 and 1.4301
Cable gland	M20x1.5, black polyamide (PA)
Vent plug	High-density polyethylene (PE-HD)
Weight	**Approx. 0.5 kg**

3.5 Dimensions in mm

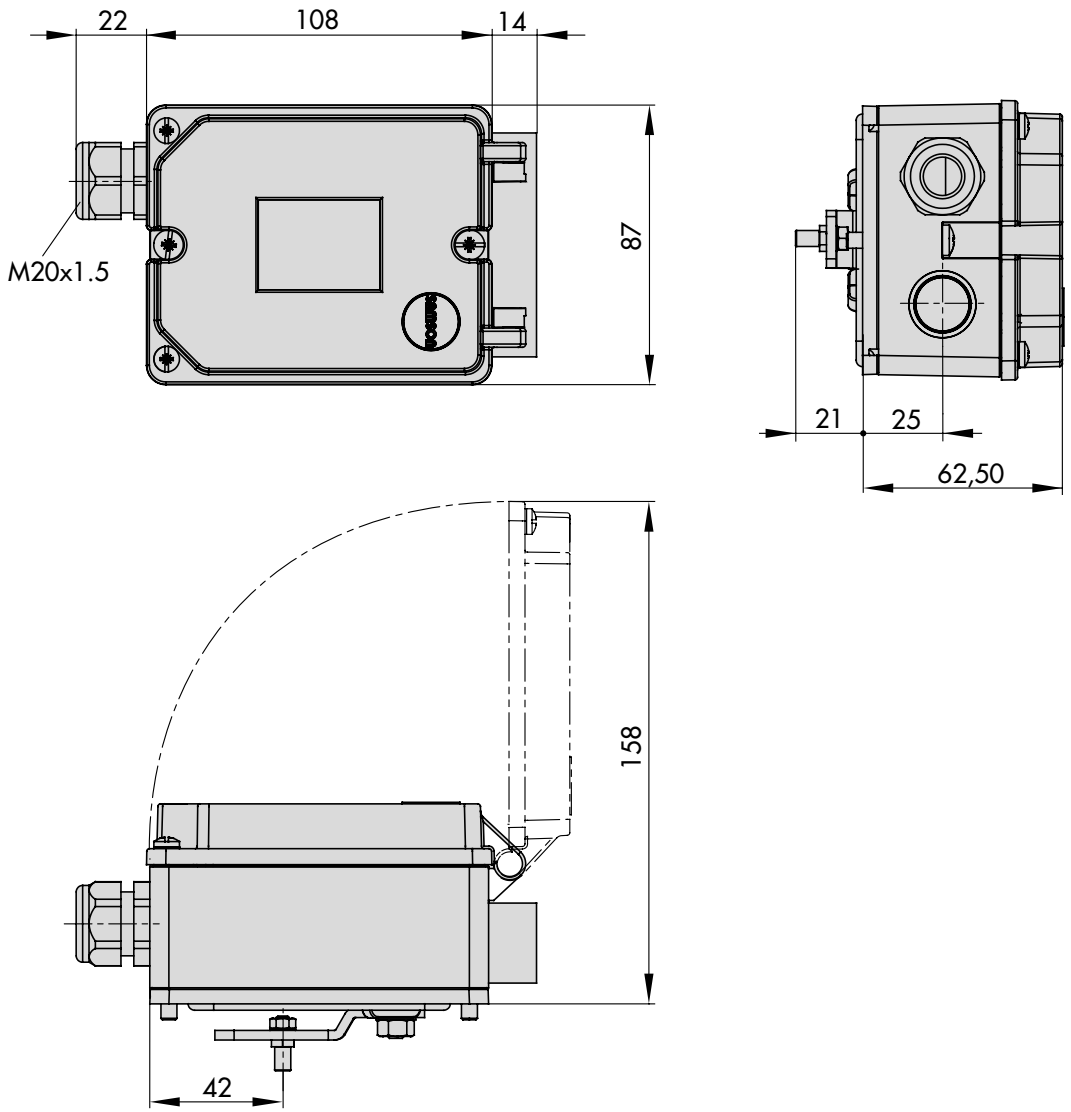


Fig. 2: *Dimensional drawings for Type 3725 Positioner (hardware version GI:00)*

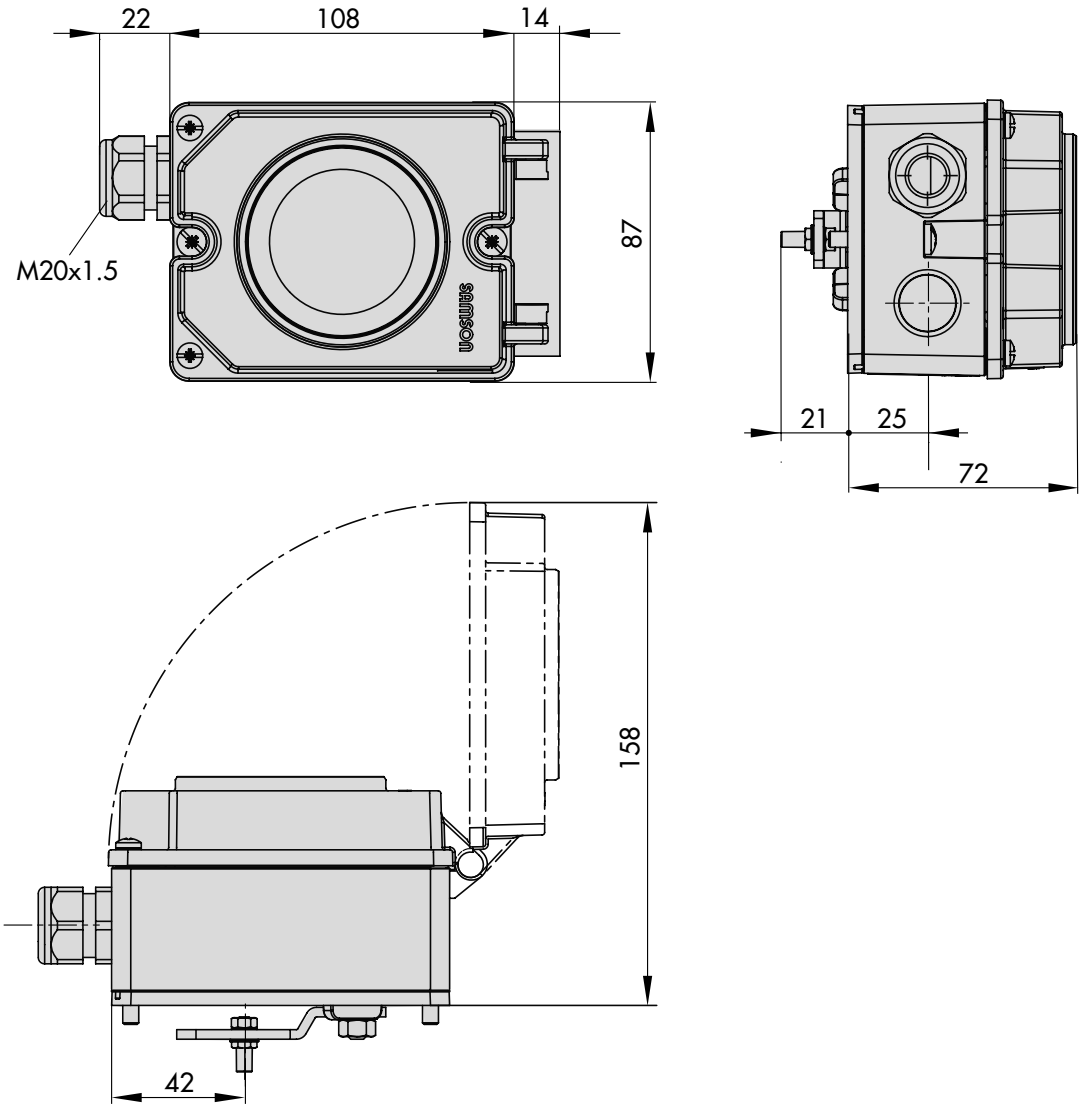
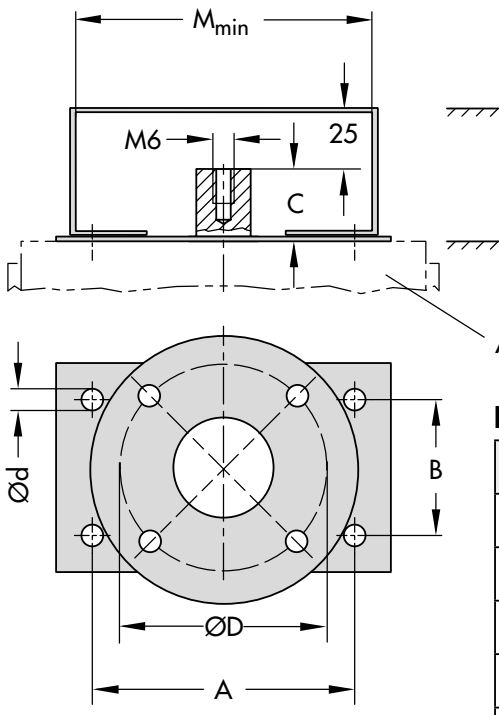


Fig. 3: *Dimensional drawings for Type 3725 Positioner (hardware version HV 01.00.00)*

Fixing levels according to VDI/VDE 3845 (September 2010)



Fixing level 2 (bracket surface)

Fixing level 1 (actuator surface)

Actuator

Dimensions in mm

Size	A	B	C	Ød	M_{min}	ØD [1]
AA0	50	25	15	5.5 for M5	66	50
AA1	80	30	20	5.5 for M5	96	50
AA2	80	30	30	5.5 for M5	96	50
AA3	130	30	30	5.5 for M5	146	50
AA4	130	30	50	5.5 for M5	146	50
AA5	200	50	80	6.5 for M6	220	50

[1] Flange type F05 acc. to DIN EN ISO 5211

4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received with the delivery note.
2. Check the shipment for transportation damage. Report any transportation damage.

4.1 Unpacking

NOTICE

Risk of positioner damage due to foreign particles entering it.

➔ *Do not remove the packaging and protective film/protective caps until immediately before mounting and start-up.*

1. Remove the packaging from the positioner.
2. Dispose of the packaging in accordance with the valid regulations.

4.2 Transporting and lifting

4.2.1 Transporting

– Protect the positioner against external influences (e.g. impact).
– Protect the positioner against moisture and dirt.
– Observe transport temperature depending on the permissible ambient temperature (see technical data in Chapter 3.4).

4.2.2 Lifting

Due to the low service weight, lifting equipment is not required to lift the positioner.

4.3 Storage

NOTICE

Risk of positioner damage due to improper storage.

➔ *Observe the storage instructions.*
➔ *Avoid longer storage periods.*
➔ *Contact SAMSON in case of different storage conditions or longer storage times.*

Storage instructions

– Protect the positioner against external influences (e.g. impact, shocks, vibration).
– Do not damage the corrosion protection (coating).
– Protect the positioner against moisture and dirt. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
– Observe storage temperature depending on the permissible ambient temperature (see technical data in Chapter 3.4).
– Store the positioner with the cover closed.
– Seal pneumatic and electrical connections.

5 Mounting and start-up

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation and start-up.

➔ *Observe the prescribed sequence.*

➔ Sequence to be kept on mounting, installing and starting up the positioner:

1. **Remove the protective caps from the pneumatic connections.**
2. **Mount the positioner on the valve.**
   ➔ Chapter 5.2 onwards
3. **Perform pneumatic installation.**
   ➔ Chapter 5.6 onwards
4. **Perform electrical installation.**
   ➔ Chapter 5.8 onwards
5. **Perform settings.**
   ➔ Chapter 7 onwards

The following applies when mounting the positioner:

➔ **Do not mount the positioner with the vent opening (Fig. 5) facing upward.**

➔ **Do not seal the vent opening.**

The following applies to the housing cover of the positioner:

➔ **Tighten the cover screws with a tightening torque of 0.8 Nm at the maximum.**

5.1 Lever and pin position

The positioner is adapted to the actuator and to the rated travel by the lever on the back of the positioner and the pin inserted into the lever.

The travel tables on page 22 show the assignment between the required lever and pin position.

The positioner is equipped with the **M** lever (pin position **35**) as standard (see Fig. 4).

Removing the lever and changing the pin position:

NOTICE

Incorrect removal of the lever will damage the positioner.

➔ *Only remove the lever when it is positioned at the bottom mechanical stop.*

1. Move the lever to the bottom mechanical stop (see Fig. 5) and hold it in place. Undo and remove the nut using a wrench (width across flats SW 10).
2. Remove the lever from the shaft.
3. Insert pin in position as listed in the travel table.
4. Fasten the lever.

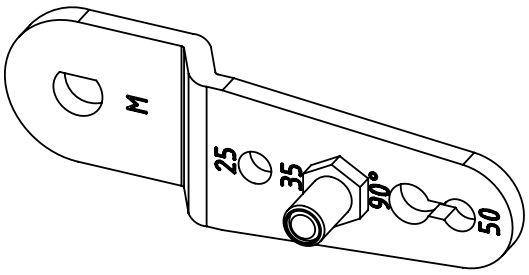


Fig. 4: *M lever with pin position 35*

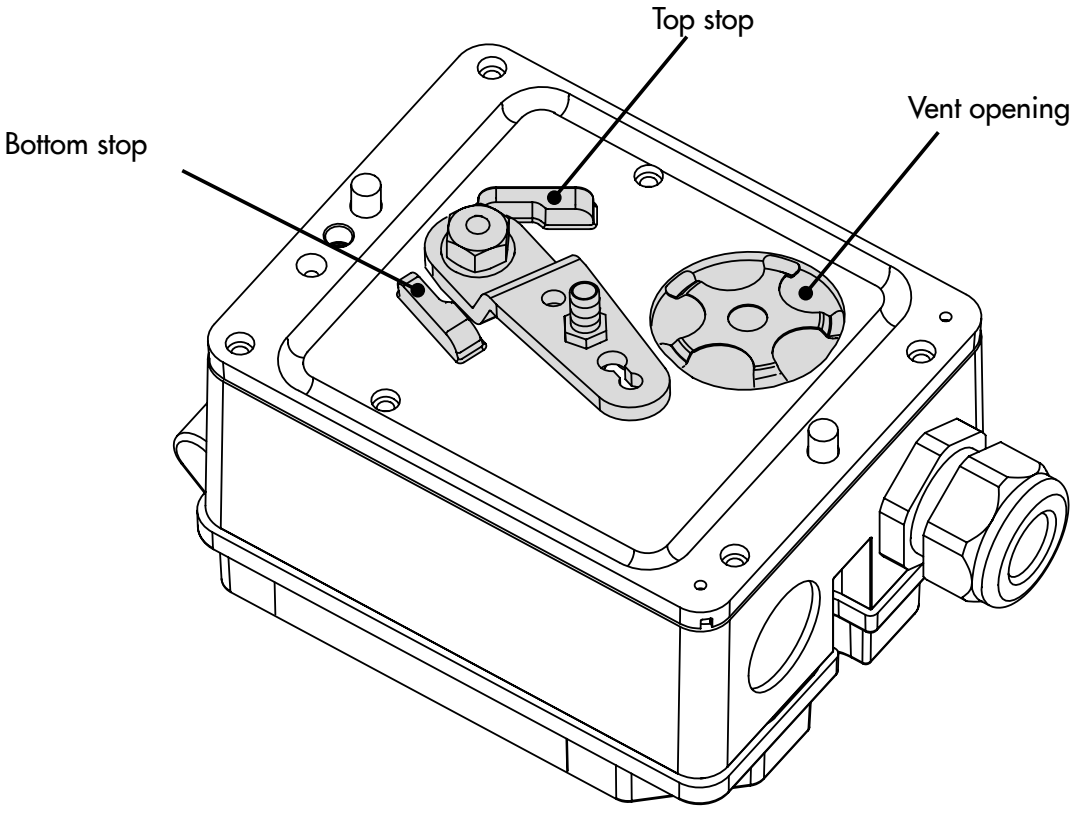


Fig. 5: *Mechanical stops and vent opening*

5.2 Direct attachment

5.2.1 Type 3277-5 and Type 2780-2 Actuators

➔ Required mounting parts and accessories: Table 3 on page 18.

➔ Observe travel tables on page 22.

Actuator (120 cm²)

Depending on the type of positioner attachment, the signal pressure is routed either left or right of the yoke through a hole to the actuator diaphragm.

➔ Depending on the fail-safe action of the actuator "actuator stem extends" or "actuator stem retracts", first attach the switchover plate (9) to the actuator yoke (while aligning it with the corresponding symbol for left or right attachment according to the marking, see Fig. 7).

1. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner. Make sure that the two seals (6.1) are seated properly.
2. Screw the screw plug (4) on the back of the positioner into the hole below it (park position) (see Fig. 9) and seal the signal pressure output on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.
3. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.
4. **15 mm travel:** Keep the follower pin (2) on the M lever (1) on the back of the positioner in the pin position 35 (delivered state). **7.5 mm travel:** Remove the follower pin (2) from the pin position 35, reposition it in the hole for pin position 25 and screw tight.
5. Insert molded seal (15) into the groove of the positioner housing.
6. Place positioner on the actuator in such a manner that the follower pin (2) rests on top of the follower clamp (3). While doing this, press on the ribbed area shown in Fig. 7 to lock the pick-up lever in the top position. The lever (1) must rest on the follower clamp with spring force.

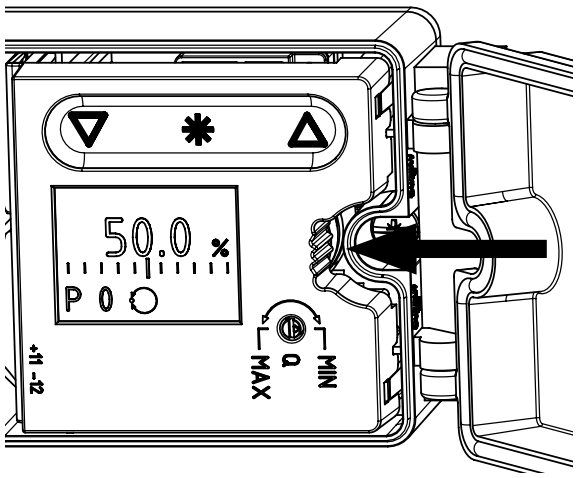


Fig. 6: *Locking the pick-up lever in position*

7. Mount the positioner on the actuator using the two fixing screws.
8. Mount cover (11) on the other side. Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off (Fig. 8).

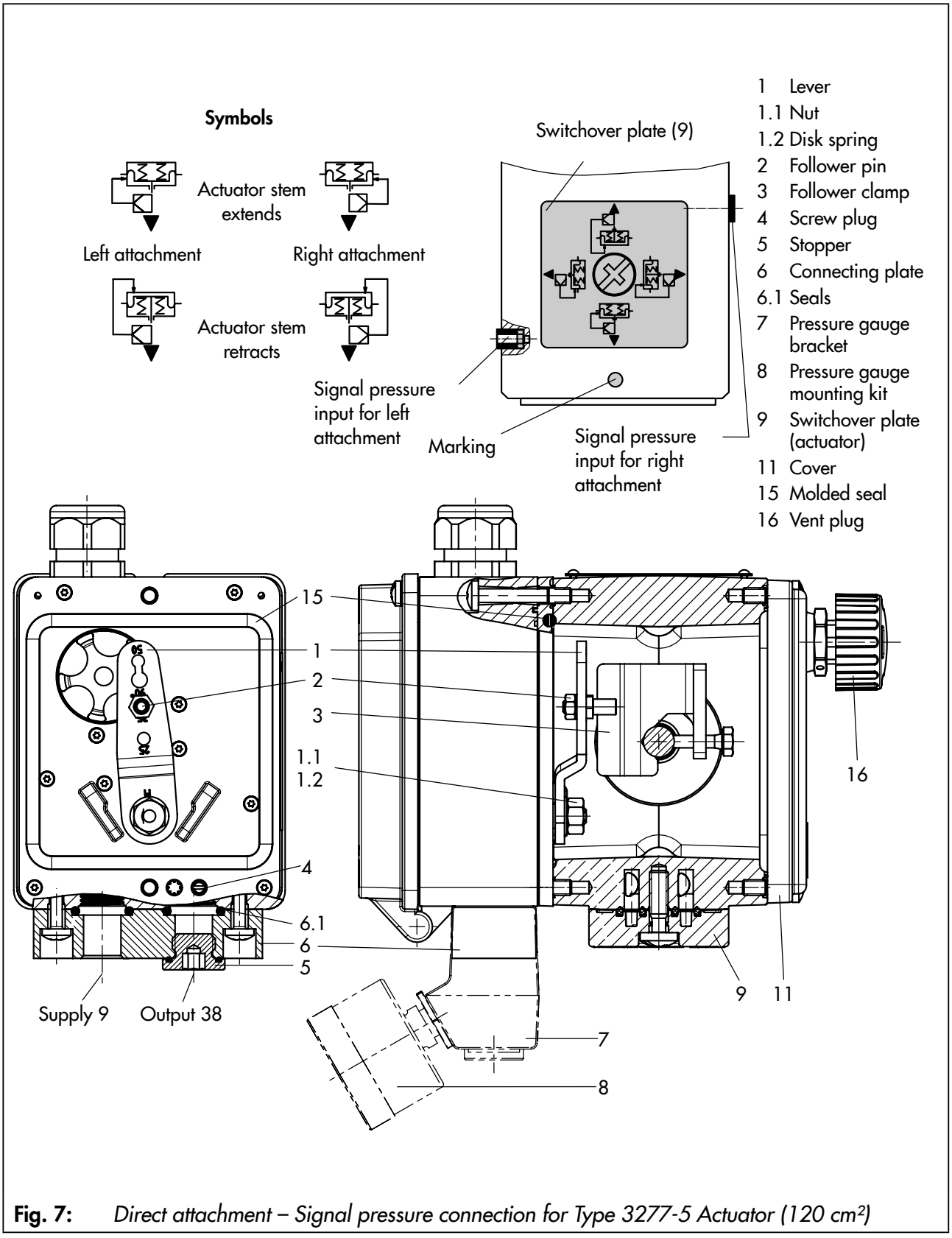


Fig. 7: *Direct attachment – Signal pressure connection for Type 3277-5 Actuator (120 cm²)*

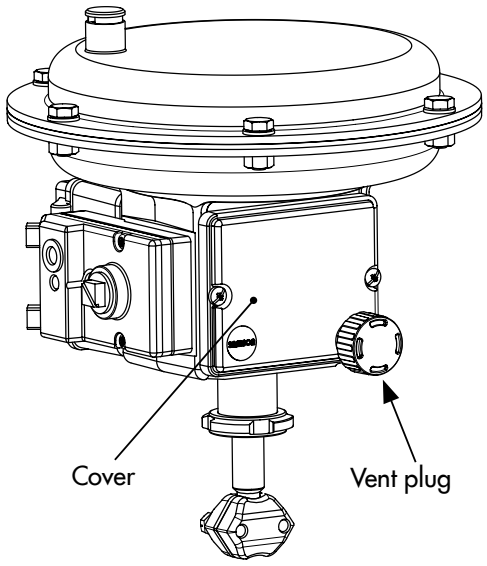


Fig. 8: *Cover with vent plug when the valve is installed*

Additional solenoid valve

If a solenoid valve is additionally mounted onto the actuator, the signal pressure port at the back of the positioner must be sealed (see Fig. 9). To do this, unscrew the screw plug located in the middle hole (screw plug in park position) and screw it into the signal pressure port to seal it.

In this case, route the signal pressure from the signal pressure output to the actuator over the connecting plate (6) or pressure gauge bracket (7). The connecting plate (accessories for the actuator) replaces the switchover plate (9).

Note

The switchover plate and connecting plate are accessories for the actuator (120 cm²). They are listed in Chapter 3.2 on page 18

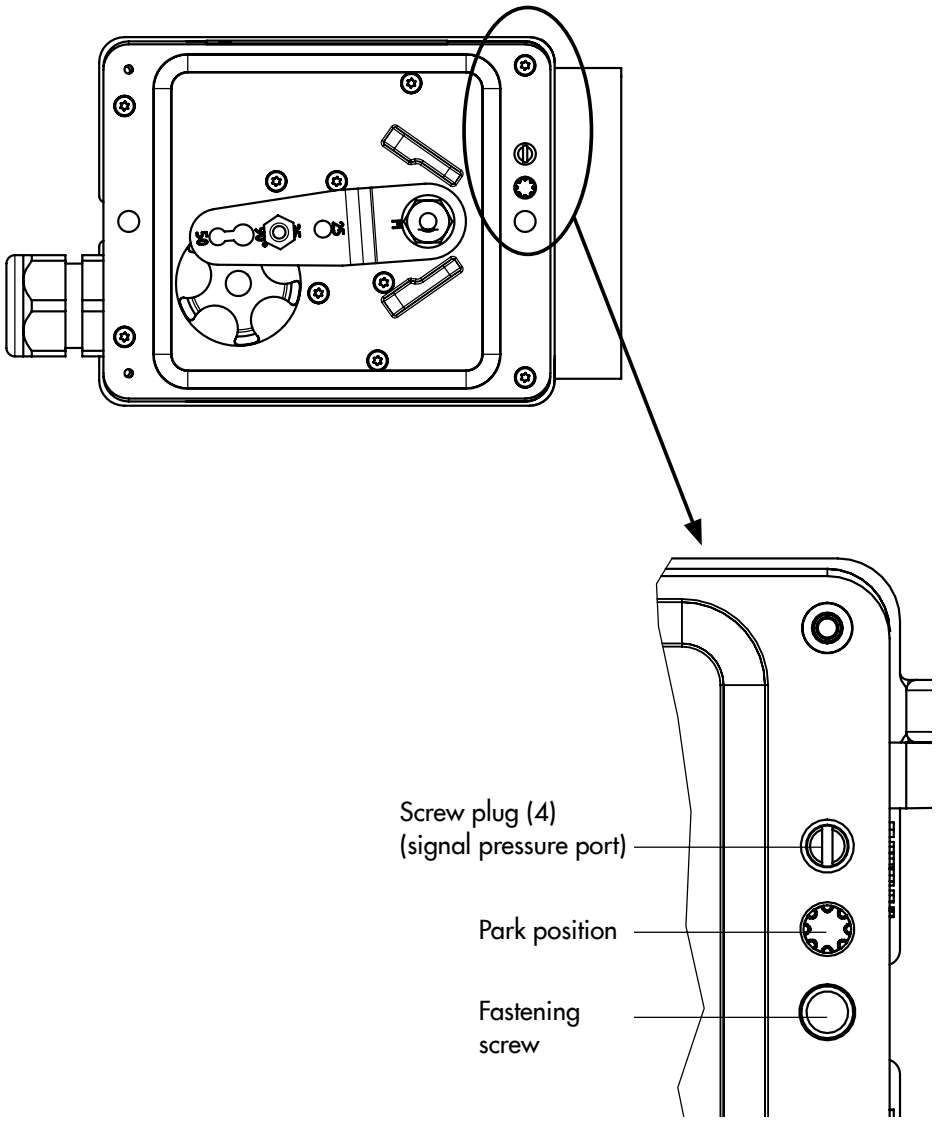


Fig. 9: *Signal pressure port and park position for screw plug*

5.2.2 Type 3277 Actuator

➔ Required mounting parts and accessories: Table 4 on page 18.

➔ Observe travel tables on page 22.

Actuators with 175 to 750 cm² effective areas

The positioner can be mounted either on the left or right side of the yoke. The signal pressure is routed to the actuator over the connection block (12), for actuators with fail-safe action "actuator stem extends" internally through a hole in the valve yoke and for "actuator stem retracts" through an external pipe.

Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

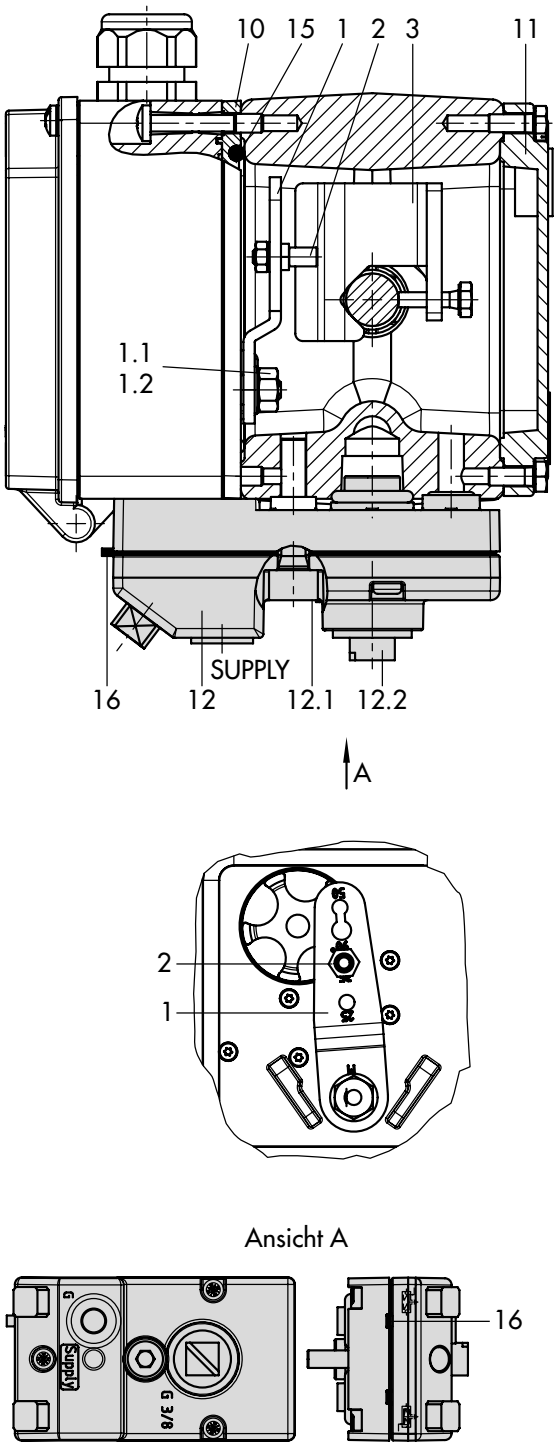
1. For actuators 175 and 350 cm² with 15 mm travel, keep the pin (2) in pin position 35.

   For actuators with 355 or 750 cm², remove the pin (2) on M lever (1) on the back of the positioner from pin position 35, reposition it in the hole for pin position 50 and tighten.
2. Insert molded seal (15) in the groove of the positioner housing.
3. Place positioner on the actuator in such a manner that the pin (2) rests on top of the follower clamp (3).
4. While doing this, press on the ribbed area to lock the lever in the top position (see Fig. 6).

   The lever (1) must rest on the follower clamp with spring force.
   Fasten the positioner on the actuator using the two fixing screws.
5. Make sure that the tip of the gasket (16) projecting from the side of the connection block is positioned to match the actuator symbol for the actuator's fail-safe action "actuator stem extends" or "actuator stem retracts". If this is not the case, unscrew the three fastening screws and lift off the cover. Turn the gasket (16) by 180° and re-insert it.
6. Place the connection block (12) with the associated seals against the positioner and the actuator yoke and fasten using the screw (12.1).
7. For actuators with fail-safe action "Actuator stem retracts", additionally remove the stopper (12.2) and mount the external signal pressure pipe.
8. Mount cover (11) on the other side.
   Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off (see Fig. 8 on page 34).

Type 3277 Actuator with Type 3725 Positioner (direct attachment) (image shows device cover of hardware version GI:00)





1	M lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower clamp
11	Cover
12	Connection block
12.1	Screw
12.2	Stopper or connection for external piping
15	Molded seal
16	Gasket

Fig. 10: *Direct attachment · Signal pressure connection for Type 3277 Actuator with 240 to 750 cm²*

5.3 Attachment according to IEC 60534-6

The positioner is attached to the control valve using a NAMUR bracket (10).

➔ Required mounting parts and accessories: Table 6 on page 20.

➔ Observe travel tables on page 22.

1. Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) for fastening.
2. Fasten the NAMUR bracket (10) to the control valve.

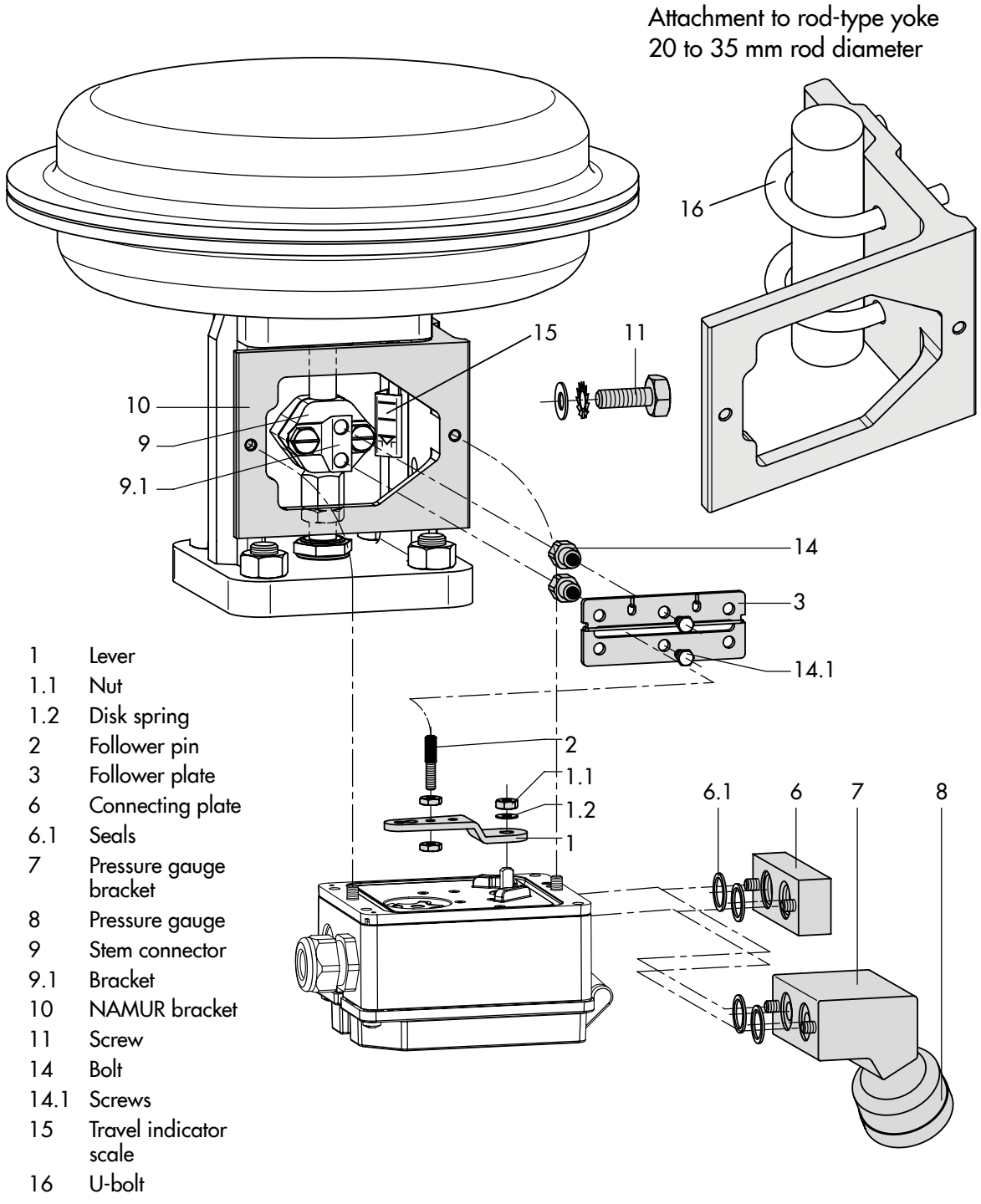
– For valve with NAMUR rib: Fasten the NAMUR bracket (10) using the M8 screw (11) and toothed lock washer directly to the yoke hole.

– For valves with rod-type yoke: Place the two U-bolts (16) around the stem. Position the NAMUR bracket (10) and fasten it using the nuts, washers and toothed lock washers.

3. Align the NAMUR bracket (10) so that its mounting holes are approximately in line to the middle of the travel scale indicator (15) (the slot of the follower plate must be centrally aligned with the NAMUR bracket at mid valve travel).
4. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner. Make sure that the two seals (6.1) are seated properly.
5. Place positioner on the NAMUR bracket in such a manner that the pin (2) rests in the slot of the follower plate (3). Adjust the lever (1) correspondingly.

Fasten the positioner to the NAMUR bracket using its two mounting screws.

back to contents Electropneumatic Positioner Type 3725 Typ 3725 B 390841a



1	Lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower plate
6	Connecting plate
6.1	Seals
7	Pressure gauge bracket
8	Pressure gauge
9	Stem connector
9.1	Bracket
10	NAMUR bracket
11	Screw
14	Bolt
14.1	Screws
15	Travel indicator scale
16	U-bolt

Fig. 11: *Attachment according to IEC 60534-6*

5.4 Attachment to Type 3372 Actuator (V2001)

The Type 3725 Positioner is already included in the scope of delivery for Series V2001 Valves (Fig. 12).

The attachment is briefly described below to allow conversion work to be performed.

Actuator with 120/350 cm², stem extends

The signal pressure is routed through the corresponding port in the support element to the actuator diaphragm.

➔ Thread the screw plug on the positioner into the hole below (park position) (see Fig. 9 on page 35).

Actuator with 120/350 cm², stem retracts

The signal pressure is routed through piping at the side of the support element to the actuator diaphragm.

Attachment including solenoid valve

The signal pressure is routed from the output port of the positioner to the solenoid valve and through a corresponding hole in the support element to the actuator diaphragm.



Type 3372 Actuator, version with 120 cm²

Type 3372 Actuator, version with 350 cm²



Fig. 12: *Attachment to Type 3372 Actuator (image shows device cover of hardware version GI:00)*

5.5 Attachment to rotary actuators

The positioner is mounted to the rotary actuator using a mounting bracket.

➔ Required mounting parts and accessories: Table 7 on page 20.

➔ Before attaching the positioner onto the SAMSON Type 3278 Rotary Actuator (160 cm²) or VETEC Type S160 Actuator, first mount the adapter (13) to the free end of the shaft end using four screws (10.2).

1. Place follower clamp (3) on the slotted actuator shaft or adapter (13).
2. Place coupling wheel (4) with flat side facing the actuator on the follower clamp (3). Align slot so that it matches the direction of rotation when the valve is in its closed position (see Fig. 13).
3. Fasten the coupling wheel (4) and follower clamp (3) tightly onto the actuator shaft using screw (4.1) and disk spring (4.2).
4. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner. Make sure that the two seals are seated properly.
5. Fasten the mounting bracket (10) to the actuator using four screws (10.1).
6. Unscrew the standard follower pin (2) from the positioner's M lever (1). Use the metal follower pin (Ø 5 mm) included in the mounting kit and screw tight into the hole for pin position 90°.
7. Place positioner on the mounting bracket (10) and tighten. Taking the actuator's direction of rotation into account, adjust lever (1) so that it engages in the slot of the coupling wheel (4) with its follower pin (Fig. 14).

➔ The lever (1) must be parallel to the long side of the positioner when the actuator is at half its angle of rotation.

8. Stick the scale plate on the coupling wheel (4) so that the arrow tip indicates the closed position and it can be easily read when the valve is installed.

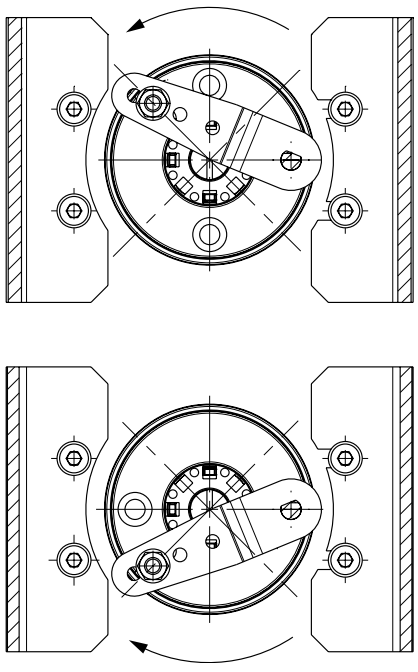
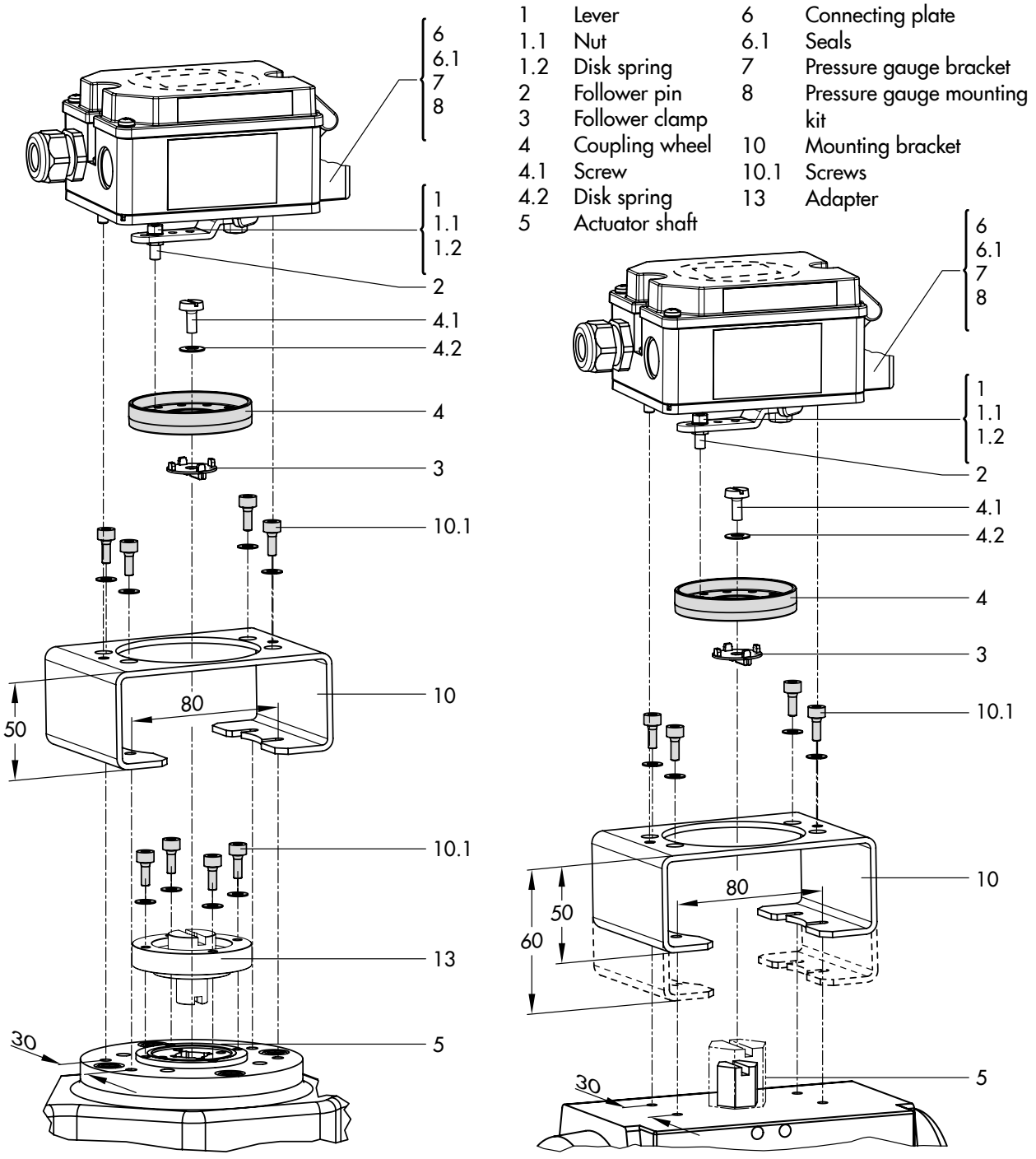


Fig. 13: *Direction of rotation*



Attachment to SAMSON Type 3278 Rotary Actuator (160 cm²) or VETEC Type S160 Actuator

Attachment according to VDI/VDE 3845, level 1

Fig. 14: *Attachment to rotary actuators*

5.5.1 Heavy-duty version

➔ Required mounting parts and accessories: Table 7 on page 20.

Prepare actuator and mount possibly required adapter supplied by the actuator manufacturer.

1. Mount the housing (10) onto the rotary actuator. In case of VDI/VDE attachment, place spacers (11) underneath, if necessary.
2. For **SAMSON Type 3278 and VETEC S160 Rotary Actuators**, fasten the adapter (5) onto the free end of the shaft and for **VETEC R Actuator**, place on the adapter (5.1). For **Type 3278, VETEC S160** and **VETEC R Actuators**, place on the adapter (3). For Type 3278, VETEC S160 and **VETEC R** Actuators, place on the adapter (3). For VDI/VDE version, this step depends on the actuator size.
3. Stick adhesive label (4.3) onto the coupling wheel in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the housing, if required.
4. Fasten coupling wheel (4) on the slotted actuator shaft or adapter (3) using screw (4.1) and disk spring (4.2).
5. Unscrew the standard follower pin (2) from the positioner's M lever (1). Attach the follower pin (Ø5 mm) included in the mounting kit to pin position 90°.
6. Mount connecting plate (6) for required G ¼ connecting thread or pressure gauge bracket (7) with pressure gauges on the positioner. Make sure that the two seals (6.1) are seated properly. Double-acting springless rotary actuators require the use of a reversing amplifier on the connection side of the positioner housing (see Chapter 5.5.2).
7. For actuators with a volume of less than 300 cm³, screw the screw restriction (order no. 1400-6964) into the signal pressure output of the positioner (or the output of the pressure gauge bracket or connecting plate).
8. Fasten the positioner onto the adapter plate (12).
9. Place the positioner together with the adapter plate on the housing (10) and screw it tight. Taking the actuator's direction of rotation into account, adjust lever (1) so that it engages in the correct slot with its follower pin (Fig. 15).

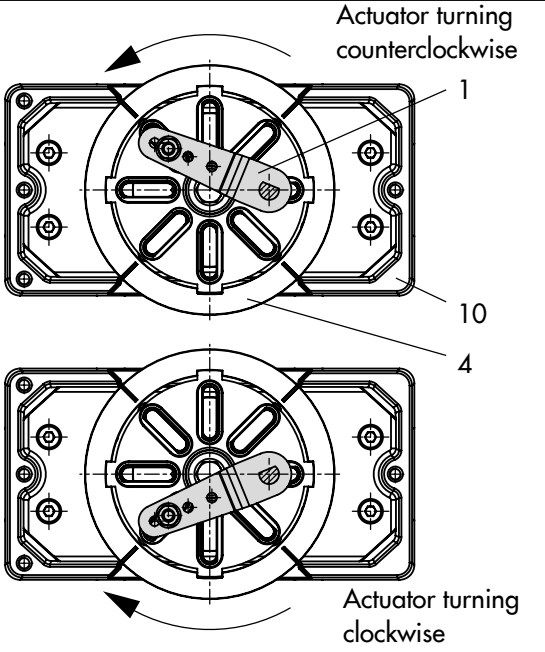


Fig. 15: *Direction of rotation*

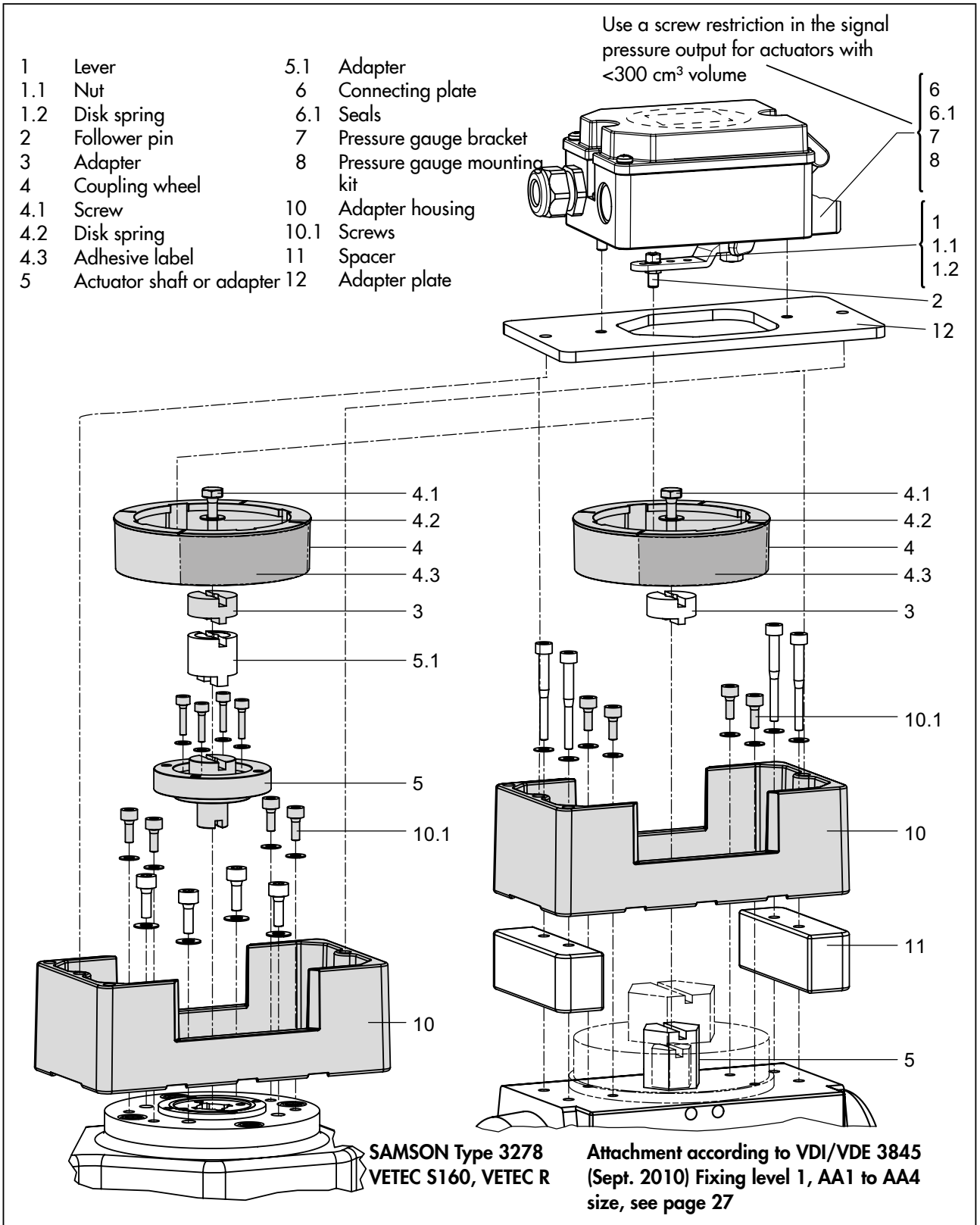


Fig. 16: *Attachment to rotary actuators (heavy-duty version)*

5.5.2 Mounting the Type 3710 Reversing Amplifier

When a Type 3710 Reversing Amplifier is used, a connecting plate is placed between the positioner and reversing amplifier. The reversing amplifier is fastened together with the connecting plate to the positioner using screws (Fig. 17).

i Note

The screws supplied with the connecting plate have a TORX PLUS® profile (size 25 IP) and must be tightened using a suitable tool.

Details on the Type 3710 Reversing Amplifier: Mounting and Operating Instructions
▶ EB 8392

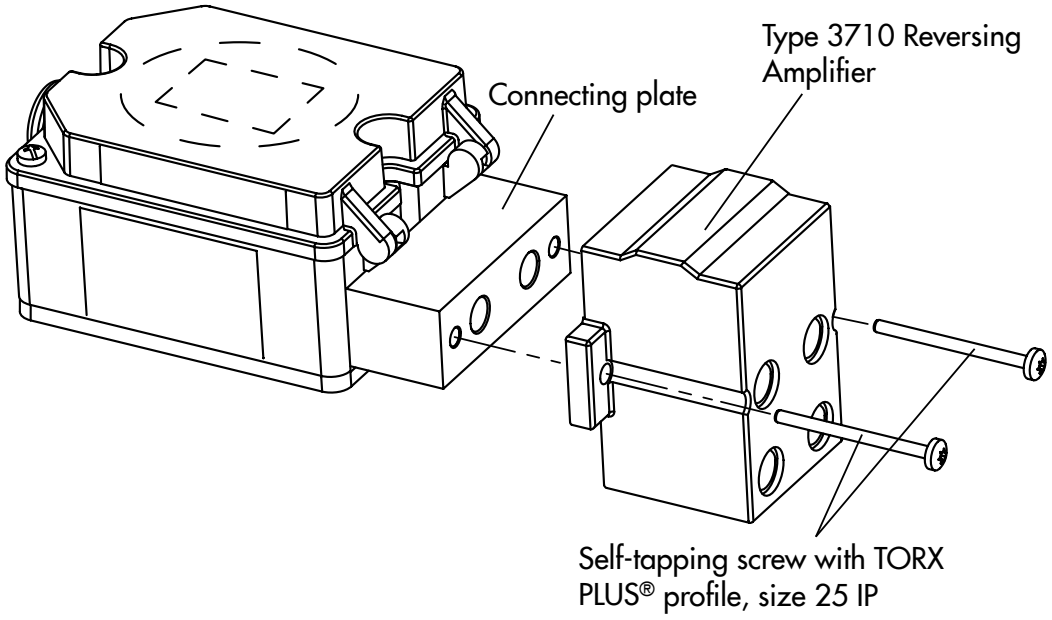


Fig. 17: *Mounting the Type 3710 Reversing Amplifier*

5.6 Pneumatic connections

⚠ WARNING

Risk of injury by possible movement of the actuator stem after connecting the signal pressure.

➔ *Do not touch or block the actuator stem.*

NOTICE

Incorrect connection of the supply air will damage the positioner and will lead to malfunction.

➔ *Screw the screw fittings into the connecting plate, pressure gauge mounting block or connection block from the accessories.*

➔ *Keep the length of the line as short as possible to avoid delays in control signal transmission.*

The pneumatic connections are optionally designed as a bore with ¼ NPT or G ¼ thread. The customary fittings for metal and copper pipes or plastic hoses can be used.

NOTICE

Risk of malfunction due to failure to comply with air quality requirements.

➔ *Only use supply air that is dry and free of oil and dust.*

➔ *Read the maintenance instructions for upstream pressure reducing stations.*

➔ *Blow through all air pipes and hoses thoroughly before connecting them.*

5.7 Connecting the supply air

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation and start-up.

Observe the following sequence.

1. *Remove the protective caps from the pneumatic connections.*
2. *Mount the positioner on the valve.*
3. *Connect the supply air.*
4. *Connect the electrical power.*
5. *Perform the start-up settings.*

5.7.1 Signal pressure connection

The signal pressure connection depends on how the positioner is mounted onto the actuator:

Type 3277 Actuator

➔ The signal pressure connection is fixed when the positioner is directly attached to the Type 3277 Actuator.

Attachment according to IEC 60534-6 (NAMUR)

➔ For attachment according to IEC 60534-6 (NAMUR), the signal pressure can be routed to either the top or bottom diaphragm chamber of the actuator, depending on the actuator's fail-safe action "actuator stem extends" or "actuator stem retracts".

Rotary actuators (heavy-duty version)

➔ For rotary actuators, the manufacturer's specifications for connection apply.

Tip

To monitor the supply air and signal pressure, SAMSON recommends mounting pressure gauges (see Table 7 in Chapter 3.2).

Mounting the pressure gauges:

➔ See Fig. 11 and Chapter 5.3

5.7.2 Supply pressure

The required supply air pressure depends on the bench range and the actuator's operating direction (fail-safe action). The bench range is written on the nameplate either as the bench range or signal pressure range. The operating direction is marked **FA** or **FE** or by a symbol.

Fail-close or ATO (air to open):
Actuator stem extends

Fail-open or ATC (air to close):
Actuator stem retracts

Supply pressure for fail-close valves (for globe and angle valves):

➔ Required supply pressure = Upper bench range value + 0.2 bar, minimum 1.4 bar.

Supply pressure for fail-open valves (for globe and angle valves):

➔ For tight-closing valves, the maximum signal pressure pst_{max} is roughly estimated as follows:

$$pst_{max} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \text{ [bar]}$$

d = Seat diameter [cm]
Δp = Differential pressure across the valve [bar]
A = Actuator area [cm²]
F = Upper bench range value [bar]

If there are no specifications, calculate as follows:

➔ Required supply pressure = Upper bench range value + 1 bar

Note

The signal pressure at the output (38) of the positioner can be restricted to approx. 2.3 bar by setting P9 parameter code to ON.

5.8 Electrical connections

⚠ DANGER

Risk of fatal injury due to the formation of an explosive atmosphere.
For installation in hazardous areas, observe the relevant standards that apply in the country of use.
Standard applicable in Germany: EN 60079-14 (VDE 0165, Part 1) Explosive Atmospheres – Electrical Installations Design, Selection and Erection.

⚠ WARNING

Incorrect electrical connection will render the explosion protection unsafe.

- ➔ *Adhere to the terminal assignment.*
- ➔ *Do not undo the enameled screws in or on the housing.*
- ➔ *Do not exceed the maximum permissible values specified in the EC type examination certificates when interconnecting intrinsically safe electrical equipment (U_i or U_0, I_i or I_0, P_i or P_0, C_i or C_0 and L_i or L_0).*

Selecting cables and wires

- ➔ **Observe clause 12 of EN 60079-14 (VDE 0165, Part 1) for installation of the intrinsically safe circuits.**
- ➔ Clause 12.2.2.7 applies when running multi-core cables and wires with more than one intrinsically safe circuit.
- ➔ **Radial thickness of the insulation** of a conductor for common insulating materials (e.g. polyethylene): **minimum 0.2 mm**.
- ➔ **Diameter of an individual wire** in a fine-stranded conductor: **minimum 0.1 mm.**
- ➔ Strip **8 mm** insulation off the wire ends.
- ➔ Protect the conductor ends against splicing, e.g. by using wire-end ferrules.
- ➔ Cable glands available:
See Table 8 on page 21

Equipment for use in zone 2/zone 22

In equipment operated according to type of protection Ex nA II (non-sparking equipment) according to EN 60079-15: 2003:

➔ Circuits may be connected, interrupted or switched while energized only during installation, maintenance or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15: 2003:

➔ Equipment may be switched under normal operating conditions.

The maximum permissible values specified in the statement of conformity and its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

5.8.1 Electric power supply

➔ Only use a current source and never a voltage source!

➔ Ensure that the reference variable remains below the static destruction limit of ±33 V.

5.8.2 Cable entry

The M20x1.5 cable gland is designed for a clamping range of 6 to 12 mm.

The cage clamp terminals hold wire cross-sections of 0.2 to 1.5 mm².

➔ To unlock the cage clamp terminals: place a slotted screwdriver on the plastic part (Fig. 18) and lightly push it into the terminal block.

➔ Insert or remove the wire **without force**.

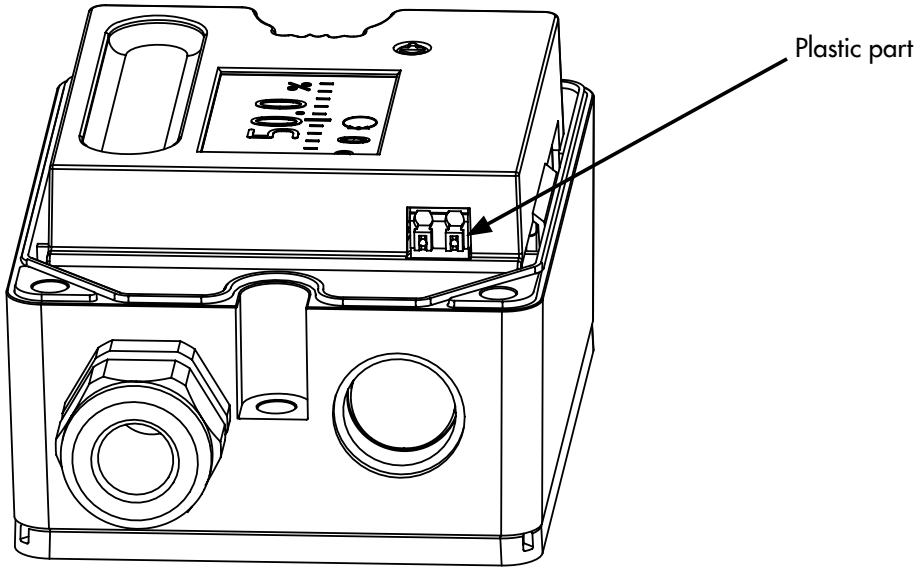
5.8.3 Connecting the electrical power

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation and start-up.
Observe the following sequence.

1. *Remove the protective caps from the pneumatic connections.*
2. *Mount the positioner on the valve.*
3. *Connect the supply air.*
4. *Connect the electrical power.*
5. *Perform the start-up settings.*

➔ Connect the electrical power (mA signal) as shown in Fig. 18.



Terminal assignment for mA control signal:

+11	-12

Fig. 18: *Electrical connections*

6 Operation

6.1 Operating controls

The positioner is operated using three capacitive keys. These capacitive keys allow the user to navigate within the menu on the display (Fig. 19). The volume restriction Q serves to adapt the air output capacity to the size of the actuator:

6.1.1 Capacitive keys

△: ***Up***

✳: ***Confirm***

▽: ***Down***

Touch △ or ▽ key to select a parameter code (***P0*** to ***P20***). Then touch ✳ key to confirm the selected code.

To save changes to parameters in a non-volatile memory, proceed as follows:

➔ After changing parameters, press △ or ▽ to change to Code ***P0*** or

➔ wait three minutes until the display returns automatically to ***P0***.

i *Note*

– *The ◇ icon on the display indicates that the changed parameter settings have not yet been saved in the non-volatile memory.*
– *The selected parameter code remains active until you change the setting or exit the parameter code.*
– *After changing settings in **P2**, **P4** and **P8** parameter codes, the positioner must be re-initialized.*

6.1.2 Volume restriction Q

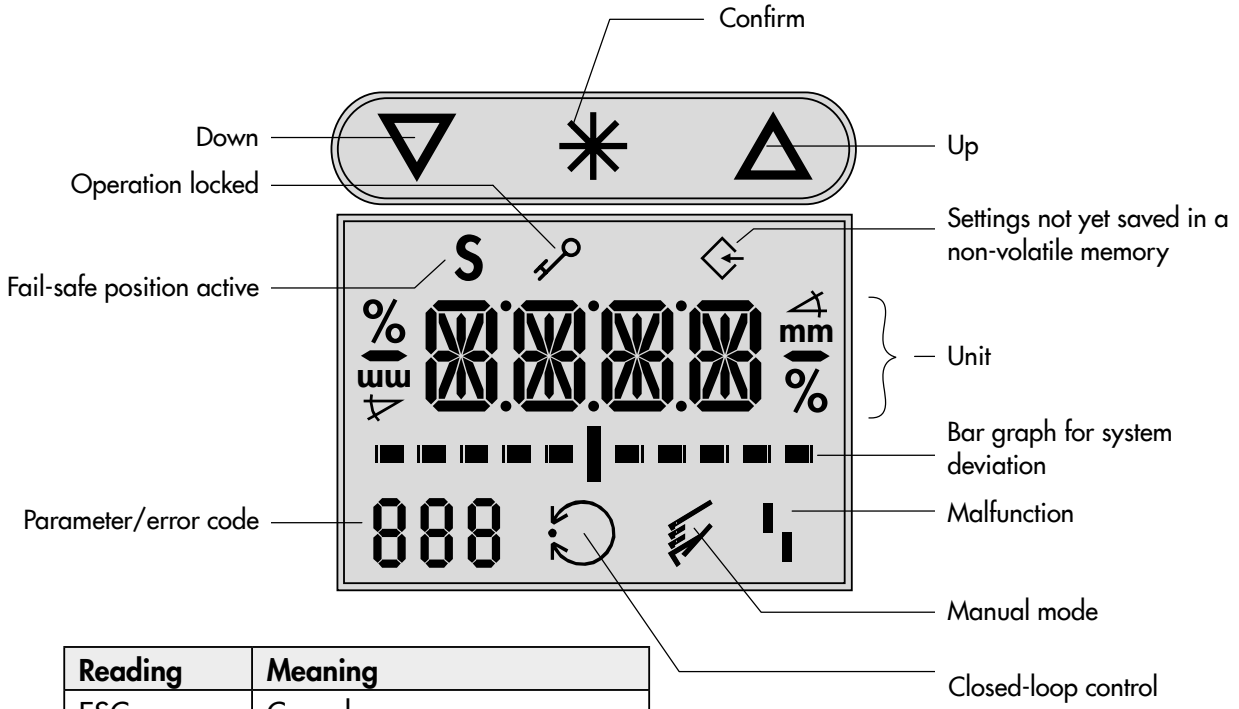
The volume restriction serves to adapt the air output capacity to the size of the actuator. Two fixed settings are possible (see Chapter 7.3).

6.1.3 Display

Icons which are assigned to certain codes and functions are indicated on the display (Fig. 19). The bar elements indicate the system deviation that depends on the sign (+/–) and the value. One bar element appears per 1 % system deviation.

If the positioner has not yet been initialized, the lever position in degrees in relation to the mid-axis is indicated. One bar element corresponds to approximately a 7° angle of rotation.

If the fault indication icon is displayed, press ▲ or ▼ until ***ERR*** is displayed to view the ***E0*** to ***E15*** error codes (see Chapter 9.2).



Reading	Meaning
ESC	Cancel
Err	Malfunction
LOW	w too low
MAN	Manual mode
MAX	Maximum range
RST	Reset
INIT	Initialization
ON/OFF	Activated/deactivated
ZERO	Zero calibration

Fig. 19: *Display with all readings*

7 Operating the positioner

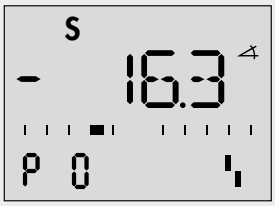
Before start-up, mount the positioner following the sequence described in Chapter 5. Apply the electric reference variable to start up the positioner (see Chapter 5.8.3).

i Note

– ***LOW*** *on the display indicates that the reference variable is lower than 3.8 mA.*
– *The positioner is ready for operation with its default settings for most applications.*
– *After connecting the electrical signal (power supply), the positioner performs a calibration of the capacitive keys which takes approx. three seconds. During this time, do not touch the key panel. Otherwise, the keys will not work properly. Disconnect and reconnect the electrical signal to restart the calibration of keys.*

Reading after connecting the power supply

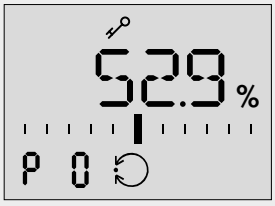
Reading when the positioner has **not** yet been initialized



Code ***P0*** is displayed. The fault indication icon and ***S*** (fail-safe position) appear on the display.

The reading indicates the lever position in degrees in relation to the mid-axis.

Reading when the positioner has been initialized:



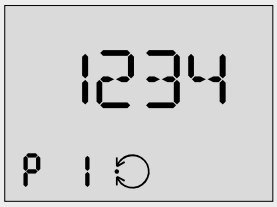
Code P0 is displayed. The positioner is in closed-loop operation indicated by the closed-loop operation icon.

The indicated value corresponds to the control position in %.

Details on initialization of the positioner: Chapter 7.8.

7.1 Adapting the display

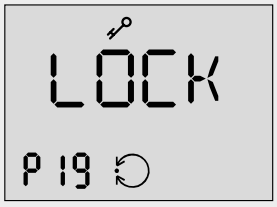
The display reading direction can be rotated by 180°. If the displayed data appear upside down, proceed as follows:



6. Touch △ or ▽ until Code ***P1*** appears.
7. Press ✳ to confirm the selected code. ***P1*** blinks.
8. Touch △ or ▽ until the display is set in the desired direction.
9. Press ✳ to confirm display direction.

7.2 Enabling configuration to change parameters

Before changing parameter settings in an initialized positioner, configuration must be enabled first by selecting Code ***P19***:



LOCK and the key icon indicate that the configuration is locked. Deactivate locking as follows:

1. Touch △ or ▽ until Code ***P19*** appears.
2. Press ✳ to confirm the selected code. ***P19*** blinks.
3. Touch △ or ▽ until ***OPEN*** is displayed.
4. Touch ✳ to unlock operation.

i Note

If no settings are entered within three minutes, the enabled configuration function becomes invalid.

7.3 Adjusting the volume restriction Q

The volume restriction Q (see Fig. 20) serves to adapt the air output capacity to the size of the actuator:

Actuators with a **transit time < 1 s**, e.g. linear actuators with an effective area smaller than 240 cm², require a restricted air flow rate.

➔ Setting to ***MIN*** (reduces the air flow rate by ⅓).

Actuators with a **transit time ≥ 1 s** do not require the air flow rate to be restricted.

➔ Setting to MAX

Additional points that apply concerning the volume restriction:

➔ Intermediate settings are not permitted.

➔ Re-initialize positioner after changing the volume restriction setting.

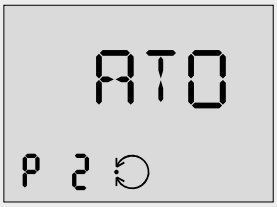


Fig. 20: *Volume restriction Q (MAX/MIN setting) (image shows device cover of hardware version GI:00)*

7.4 Entering the direction of action

– ATO (air to open) applies to a valve opening as the signal pressure increases.
– ATC (air to close) applies to a valve closing as the signal pressure increases.

The signal pressure is the pneumatic pressure at the output of the positioner applied to the actuator.



Default direction of action: ***ATO***

Change the direction of action (enable configuration as described in Chapter 7.2):

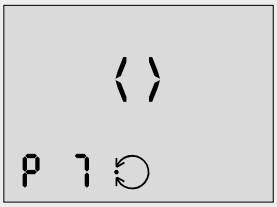
1. Touch △ or ▽ until Code ***P2*** appears.
2. Press ✳ to confirm selected code. ***P2*** blinks.
3. Touch △ or ▽ until the required direction of action appears.
4. Press ✳ to confirm setting.

i ***Note***

The changed direction of action first becomes effective after the positioner has been re-initialized.

7.5 Entering the direction of action

The direction of action (***P7***) is set to increasing/increasing (>>) by default, i.e. when the positioner is initialized, ***0 %*** is displayed when the valve is closed and ***100 %*** when the valve is fully open. If necessary, the direction of action can be changed (enable configuration as described in Chapter 7.2):



Changing the direction of action to increasing/decreasing:

1. Touch △ or ▽ until Code ***P7*** appears.
2. Press ✳ to confirm selected code. ***P7*** blinks.
3. Touch △ or ▽ until **<>** appears.
4. Press ✳ to confirm setting.

The following correlation applies:

Valve	CLOSED	OPEN
Display	0 %	100 %
Direction of action increasing/increasing (>>)	4 mA	20 mA
Direction of action increasing/decreasing (<>)	20 mA	4 mA

7.6 Limiting the signal pressure

If the maximum actuator force is too high for the valve used, the signal pressure limit can be activated in Code ***P9***. The pressure is then limited to approx. 2.3 bar.



Activate the signal pressure limitation (enable configuration as described in Chapter 7.2):

1. Touch △ or ▽ until Code ***P9*** appears.
2. Press ✳ to confirm selected code. ***P9*** blinks.
3. Touch △ or ▽ until ***ON*** appears.
4. Press ✳ to confirm setting.

7.7 Setting other parameters

The following table lists all the parameter codes and their default settings. Proceed as described previously to change parameters.

More details concerning the parameter codes can be found in Chapter 11.2.

Parameter codes [default settings]			
P0	Status reading	P10	Set point cutoff decrease (end position w <) [ON]
P1	Reading direction	P11	Set point cutoff increase (end position w >) [OFF]
P2 [1)]	ATO/ATC [ATO]	P14	Display of reference variable w
P3 [1)]	Pin position [35]	P15	INIT Start initialization
P4 [1)]	Nominal range [MAX]	P16	ZERO Start zero calibration
P5	Characteristic [0]	P17	MAN Manual mode
P6	Reference variable [4 to 20 mA]	P18	RST Reset
P7	w/x direction of action [>>]	P19	Enable configuration
P8 [1)]	Gain Kp [50]	P20	Firmware version
P9	Pressure limitation 2.3 bar [OFF]		

1) Positioner needs to be re-initialized after changing the parameter setting

7.8 Initialization

During initialization the positioner adapts itself optimally to the friction conditions and the signal pressure required by the control valve.

⚠ WARNING

Risk of injury due to the actuator stem extending or retracting.

➔ *Do not touch or block the actuator stem.*

NOTICE

The process is disturbed by the movement of the actuator stem.

➔ *Do not initialize the positioner while the process is running and only after isolating the plant by closing the shut-off valves.*

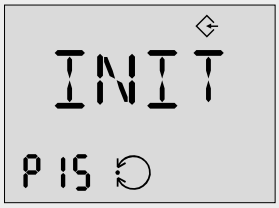
The type and extent of self-adaptation depends on the preset parameters. ***MAX*** applies as the default setting for the nominal range (Code ***P4***). During the initialization process, the positioner determines the total travel range or rotational range of the valve (from the CLOSED position to the opposite end position).

Alternatively, a different travel can be selected in Code **P4** (see code list in Chapter 11.2).

i Note

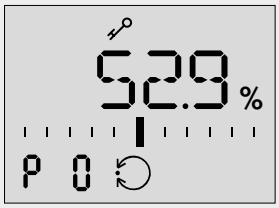
*The travel set in Code **P4** is only limited during initialization. However, it might be exceeded in closed-loop control when the control signal is higher than 20 mA.*

Start initialization (enable configuration as described in Chapter 7.2).



1. Touch △ or ▽ until Code ***P15*** appears.
2. Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.

The initialization starts and ***INIT*** blinks. The time required for the initialization procedure depends on the actuator transit time, which means that initialization can take a few minutes.



Initialization successfully completed. The positioner is in closed-loop operation indicated by the ⟲ closed-loop operation icon.

The indicated value corresponds to the control position in %.

Configuration is locked indicated by the key icon.

The fault indication icon ▮ appears when the initialization fails.

7.8.1 Canceling initialization

The initialization can be canceled:

1. During initialization touch ✳: ***ESC*** blinks on the display.
2. Press ✳ to confirm: Initialization is canceled.

i Note

This code must be confirmed by pressing ✳. Otherwise, the code remains active.

Initial state 1:
*The positioner is **not** initialized.*
The positioner goes to the fail-safe position after the initialization process has been canceled.

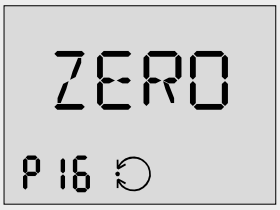
Initial state 2:
The positioner is initialized.
On canceling a new initialization process, the positioner returns to closed-loop operation. The settings of the previous initialization are used.

A new initialization can be started directly afterwards.

7.9 Zero calibration

In case of inconsistencies in the closing position of the valve, e.g. with soft-seated plugs, it might be necessary to recalibrate zero over Code ***P16*** (enable configuration as described in Chapter 7.2).

Start the zero calibration by activating Code ***P16*** as follows:



1. Touch △ or ▽ until Code ***P16*** appears.
2. Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.

Zero calibration starts, ***ZERO*** blinks on the display.

The time required for the initialization procedure depends on the actuator transit time, which means that initialization can take a few minutes.

The positioner moves the control valve to the CLOSED position and recalibrates the internal electric zero point.

When the zero calibration has been successfully completed, the positioner changes to closed-loop operation.

7.9.1 Canceling zero calibration

Zero calibration can be canceled:

1. During zero calibration touch ✳: ***ESC*** blinks on the display.
2. Press ✳ to confirm: Zero calibration is canceled.

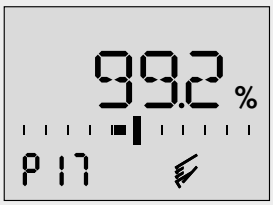
i Note

This code must be confirmed by pressing ✳. Otherwise, the code remains active.

The positioner changes to closed-loop operation without performing a zero calibration. A new zero calibration can be started directly afterwards.

7.10 Manual mode

The valve position can be moved as follows using the ***Manual mode*** function:



Enable configuration as described in Chapter 7.2.

1. Touch △ or ▽ until Code ***P17*** appears.
2. Press ✳ and hold for six seconds. ***6-5-4-3-2-1-*** is counted down on the display and ***P17*** blinks.

   The manual set point is indicated on the display of an initialized positioner.

   The lever position in degrees in relation to the mid-axis is indicated on the display of a positioner that has not been initialized.
3. Touch △ or ▽ to change the manual set point.

Initialized positioner

The manual mode starts using the last set point used in closed-loop operation, ensuring a bumpless changeover.

The bar elements on the display indicate the system deviation between the manual set point and set point used for closed-loop control while manually moving the valve in Code ***P17***.

The manual set point is adjusted in steps of 0.1 %. You can move the valve controlled within its range.

Positioner that has not been initialized

Touch △ or ▽ for a long time to move the valve manually.

The valve is only moved in one direction uncontrolled. The bar elements on the display indicate the change in direction.

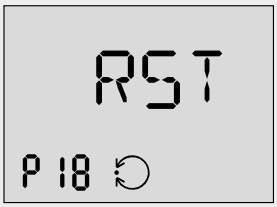
Touch ✳ to deactivate manual mode.

i Note

*The Manual mode function can only be exited as described or by interrupting the electrical supply (cold start). The positioner does **not** automatically exit this function and return to the display showing the status indication.*

7.11 Reset

A reset causes an initialization to be undone and all parameters settings are reset to the default settings (see code list in Chapter 11.2).



Enable configuration as described in Chapter 7.2.

1. Touch △ or ▽ until Code ***P18*** appears.
2. Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.

RST blinks while ✳ is pressed. As soon as the key is released, the reset process is completed and the display returns to status indication (***P0***).

i Note

*The fault indication icon is displayed after a reset since the positioner needs to be re-initialized. The error code **E2** is also activated (see Chapter 9.2).*

8 Servicing

Note

The positioner was checked by SAMSON before it left the factory.

– The product warranty becomes void if service or repair work not described in these instructions is performed without prior agreement by SAMSON's After-sales Service.

– Only use original spare parts by SAMSON, which comply with the original specifications.

The Type 3725 Positioner requires no maintenance. There are filters with a 100 µm mesh size in the pneumatic connections for supply and output which can be removed and cleaned, if required.

➔ Observe the maintenance instructions of any upstream supply air pressure reducing stations.

8.1 Cleaning the housing cover

NOTICE

Incorrect cleaning will damage the housing cover.

The housing cover of the hardware version GI:00 is made of Makrolon® and will be damaged when cleaned with abrasive cleaning agents or agents containing solvents.

➔ *Do not rub the housing cover dry.*

➔ *Do not use any cleaning agents containing chlorine or alcohol or abrasive cleaning agents.*

➔ *Use a non-abrasive, soft cloth for cleaning.*

8.2 Preparation for return shipment

Defective positioners can be returned to SAMSON for repair.

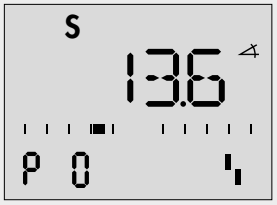
Proceed as follows to return devices to SAMSON:

1. Put the control valve out of operation. See associated valve documentation.
2. Remove the positioner (see Chapter 10.2)
3. Proceed as described on our website at www.samsongroup.com > Service > After-sales Service > Returning goods.

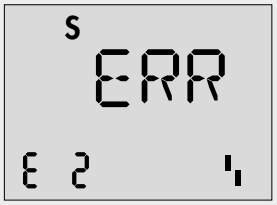
9 Malfunctions

In case of a fault, the fault indication icon is displayed. Switch past Code ***P0*** or ***P20*** to display the respective error code ***E0*** to ***E15*** together with ***ERR*** appear on the display. Refer to the error code list in Chapter 9.2 for the cause of the errors and the recommended action.

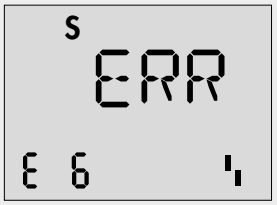
Example:
If, for instance, a travel has been entered in Code ***P4*** (nominal range) which is larger than the maximum valve travel possible, the initialization process would be interrupted (***E2*** error code) because the rated travel would not have been reached (***E6*** error code). The valve moves to the fail-safe position (***S*** indicated on the display).



Display of the fault indication:
- *Fault indication icon appears.*
- *Valve moves to fail-safe position (S indicated on the display).*



E2 error code: Initialization canceled.

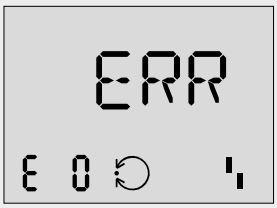


E6 error code: Rated travel not achieved.

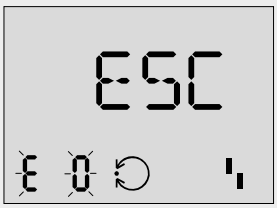
The nominal range (Code P4) must be changed and the positioner re-initialized to remedy this problem.

9.1 Clearing error codes

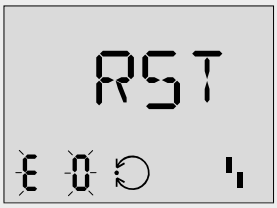
The E0 and E8 error codes can be cleared as follows:



4. Touch △ or ▽ to select the error code.



5. Touch ✳ to confirm the error code. ***ESC*** is displayed and the error code blinks.



6. Touch △ or ▽ until ***RST*** appears.
7. Press ✳ to clear the error.

   *The clearing procedure can be canceled by touching ✳ when **ESC** appears.*

9.2 Error codes

The errors listed in the following table are assigned to error classes:

Error class 1: No operation possible

Error class 2: Manual operation only possible

Error class 3: Manual operation and closed-loop control possible

Contact SAMSON's After-sales Service for malfunctions not listed in the table in Chapter 11.1.

Code	Description		Class
E0	**Zero error** (operational error)	Only with tight-closing function ***P10*** (set point cutoff decrease set to ON). The zero point has shifted by more than 5 % compared to initialization. The error may arise when the valve seat trim is worn.	3
	Recommended action	Check valve and positioner attachment. If the positioner is mounted correctly, perform a zero calibration over Code ***P16*** (see Chapter7.9). **Error code can be cleared (see Chapter 9.1).**	
E1	**Displayed and INIT values are not identical** (operational error)	Adjusted and displayed values are not identical to the INIT values as the parameters were changed after initialization.	3
	Recommended action	Reset parameters or perform initialization.	
E2	**Positioner has not been initialized**	Malfunction or parameter change requiring the positioner to be re-initialized.	2
	Recommended action	Set parameters and initialize the positioner over Code ***P15***.	
E3	**K_P setting** (initialization error)	Positioner hunts. Volume restriction set incorrectly, too much gain.	2
	Recommended action	Check the volume restriction setting as described in Chapter 7.3. Limit gain K_P in Code ***P8***. Re-initialize the positioner.	
E4	**Transit time too short** (initialization error)	The transit times of the actuator determined during initialization are so short (below 0.5 second) that optimal positioner tuning is not possible.	2
	Recommended action	Check the volume restriction setting as described in Chapter 7.3. Re-initialize the positioner.	

E5	**Standstill detection is not possible** (initialization error)	Supply pressure varies. Mounting incorrect.	2
	Recommended action	Check supply air and positioner mounting. Re-initialize the positioner.	
E6	**Travel is not achieved during initialization** (initialization error)	Supply pressure is too low, actuator leaks, incorrect travel adjusted or pressure limit function activated. When MAX is selected for ***P4*** code (nominal range): the measuring span of the lever is too small (incorrect lever, incorrect pin position). Initialization is canceled when the angle of rotation of the positioner shaft is smaller than 11°.	2
	Recommended action	Check supply air, positioner mounting, lever, pin position and setting. Re-initialize the positioner.	
E7	**Actuator does not move** (initialization error)	No supply air, mounting blocked.	2
	Recommended action	Check supply air, positioner mounting and mA input signal. Re-initialize the positioner.	
E8	**Travel signal at lower/ upper limit**	Wrong pin position, wrong lever, wrong attachment direction when NAMUR attachment is used.	1
	Recommended action	Clear error code (see Chapter 9.1). Check positioner mounting and re-initialize the positioner.	
E9 to **E15**	**Device error (internal)**	Return device to SAMSON for repair.	1/3

9.3 Emergency action

Upon failure of the air supply and/or electrical signal, the positioner vents the actuator, causing the valve to move to the fail-safe position determined by the actuator.

Plant operators are responsible for emergency action to be taken in the plant.

Tip

Emergency action in the event of valve failure is described in the associated valve documentation.

10 Decommissioning and removal

⚠ DANGER

Risk of fatal injury due to ineffective explosion protection.

The explosion protection becomes ineffective when the positioner cover is opened.

➔ *The following regulations apply to installation in hazardous areas: EN 60079-14 (VDE 0165, Part 1).*

NOTICE

The process is disturbed by interrupting closed-loop control.

➔ *Do not mount or service the positioner while the process is running and only after isolating the plant by closing the shut-off valves.*

10.1 Decommissioning

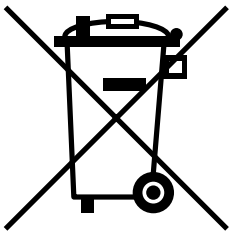
To decommission the positioner before removing it, proceed as follows:

1. Disconnect and lock the air supply and signal pressure.
2. Open the positioner cover and disconnect the wires for the control signal.

10.2 Removing the positioner

1. Disconnect the wires for the control signal from the positioner.
2. Disconnect the lines for supply air and signal pressure (not required for direct attachment using a connection block).
3. To remove the positioner, loosen the three fastening screws on the positioner.

10.3 Disposal



SAMSON is a producer registered in Europe,
▶ https://www.samsongroup.com/en/about-samson/environment-social-governance/material-compliance/waste-electrical-and-electronic-equipment-weee-and-its-safe-disposal/
WEEE reg. no.:
DE 62194439

➔ Observe local, national and international refuse regulations.

➔ Do not dispose of components, lubricants and hazardous substances together with your other household waste.

Note

SAMSON can provide you with a recycling passport according to PAS 1049 on request. Simply e-mail us at aftersalesservice@samsongroup.com giving details of your company address.

Tip

On request, SAMSON can appoint a service provider to dismantle and recycle the product as part of a distributor take-back scheme.

11 Appendix

11.1 After-sales service

Contact SAMSON's After-sales Service for support concerning service or repair work or when malfunctions or defects arise.

E-mail address

You can reach our after-sales service at aftersalesservice@samsongroup.com.

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on our website (www.samsongroup.com) or in all SAMSON product catalogs.

Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, serial number, firmware version, device version

11.2 Code list

11.2.1 Parameter codes

Code	Display, values [default setting]	Description
Note: Codes marked by an asterisk (*) indicate that the positioner needs to be re-initialized afterwards		
P0	**Status reading with basic information**	The reading indicates the valve position or angle of rotation in % when the positioner is initialized. On touching ✳ when the positioner is not initialized, the position of the lever in relation to the mid-axis is displayed.
P1	**Reading direction**	The reading direction of the display is turned by 180°.
P2*	**ATO/ATC** [ATO]	Parameter to adapt the positioner to how the valve functions: ATO: Air to open (valve CLOSED in fail-safe position), ATC. Air to close (valve OPEN in fail-safe position)
P3*	**Pin position** 17/25/[35]/50/90°	Insert follower pin in the proper position depending on the valve travel/opening angle (select according to travel tables on page 22).
P4*	**Nominal range [MAX]** Values with default setting [35]: e.g. 7.5/8.92/10.6/12.6/15.0/17.8/21.2 mm	**Firmware 1.03 and lower:** The possible adjustment range can be selected in stages depending on the selected pin position: ***25*** From 5.3 to 15.0 mm ***35*** From 7.5 to 21.2 mm ***50*** From 10.6 to 30.0 mm For ***90°***: Maximum range only, if ***P3*** = 90° ***MAX:*** Maximum possible travel
	Nominal range [MAX]	**Firmware 1.10 and higher:** The possible adjustment range can be selected in steps of 0.5 mm depending on the selected pin position: ***25*** From 5.0 to 16.0 mm, alternatively ***MAX*** (up to 25.0 mm) ***35*** From 7.0 to 22.0 mm, alternatively ***MAX*** (up to 35.0 mm) ***50*** From 10.0 to 32.0 mm, alternatively ***MAX*** (up to 50.0 mm) For ***90°***: Maximum range only, if ***P3*** = 90° ***MAX:*** Maximum possible travel

P5	**Characteristic** 0 to 8 [0]	Select characteristic: 0, 1, 2 for globe valves, 0 to 8 with rotary actuators (P3 = 90°) 0 Linear 1 Equal percentage 2 Reverse equal percentage 3 SAMSON butterfly valve, linear 4 SAMSON butterfly valve, equal percentage 5 VETEC rotary plug valve, linear 6 VETEC rotary plug valve, equal percentage 7 Segmented ball valve, linear 8 Segmented ball valve, equal percentage
P6	**Reference variable** [4 to 20 mA] SRLO/SRHI	For split-range operation: **SRLO**: low range 4 to 11.9 mA **SRHI**: high range 12.1 to 20 mA
P7	**w/x** [>>]/<>	Direction of action of the reference variable w to the travel/ rotational angle x (increasing/increasing or increasing/ decreasing)
P8*	**Gain K_p** 30/[50]	On initializing the positioner, the gain is set to the selected value. If the positioner hunts, the K_p value can be reduced.
P9	**Pressure limitation** ON/[OFF]	The signal pressure can take on the same pressure as the supply air at the maximum [**OFF**] or, in the case that the maximum actuator force can damage the valve, the pressure is limited to approx. 2.3 bar.
P10	**Set point cutoff decrease (end position w <)** [ON]/OFF	Lower tight-closing function: If ***w*** reaches up to 1 % towards the final value that causes the valve to close, the actuator is immediately completely vented (with **ATO** - air to open) or filled with air (with **ATC** - air to close).
P11	**Set point cutoff increase (end position w >)** ON/[OFF]	Upper tight-closing function: If ***w*** reaches up to 99 % towards the final value that causes the valve to open, the actuator is immediately completely filled with air (with **ATO** - air to open) or vented (with **ATC** - air to close).
P14	**Info w** Initialized	Indicates the internally adjusted set point in the positioner (adjusted set point in 0 to 100 % according to the settings in ***P6*** and ***P7***). Touch ✳ to display external set point (applied set point in 0 to 100 % according to the 4-20 mA signal).
	Not initialized	Displays external set point in 0 to 100 % according to the 4-20 mA signal.

P15	**Start initialization**	Press ✳ button to cancel the initialization process. As a result, the valve moves to the fail-safe position. After a power supply failure during initialization, the positioner starts with the values of the last initialization (if available).
P16	**Start zero calibration**	The zero calibration process can be interrupted by touching ✳. The control valve returns to closed-loop operation. ***Note:*** *A zero calibration cannot be started when* ***E1*** *error code exists.* After a power supply failure during zero calibration, the positioner starts with the settings from the last zero calibration.
P17	**Manual mode**	Press △ or ▽ to enter the set point.
P18	**Reset**	Parameters are reset to their default setting. The positioner can only return to closed-loop operation after it has been re-initialized.
P19	**Enable configuration** [LOCK]/OPEN	Enable configuration to change parameter settings. This function is automatically canceled when none of the keys are touched within three minutes.
P20	**Firmware version**	Installed firmware version is displayed. Touch ✳ to display the last four digits of the serial number.

SMART IN FLOW CONTROL.

SAMSON

EU Konformitätserklärung / EU Declaration of Conformity / Déclaration UE de conformité

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller/
This declaration of conformity is issued under the sole responsibility of the manufacturer/
La présente déclaration de conformité est établie sous la seule responsabilité du fabricant.

Für das folgende Produkt / For the following product / Nous certifions que le produit

Elektropneumatischer Stellungsregler / Electropneumatic Positioner / Positionneur électropneumatique
Typ / Type / Type 3725

wird die Konformität mit den einschlägigen Harmonisierungsrechtsvorschriften der Union bestätigt /
the conformity with the relevant Union harmonisation legislation is declared with/
est conforme à la législation d'harmonisation de l'Union applicable selon les normes:

EMC 2014/30/EU	EN 61000-6-2:2005, EN 61000-6-3:2007 +A1:2011, EN 61326-1:2013
RoHS 2011/65/EU	EN 50581:2012

Hersteller / Manufacturer / Fabricant:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany/Allemagne

Frankfurt / Francfort, 2017-07-29

Im Namen des Herstellers/ On behalf of the Manufacturer/ Au nom du fabricant.

i.V. H. Zager

Hanno Zager
Leiter Qualitätssicherung/Head of Quality Managment/
Responsable de l'assurance de la qualité

i.V. Dirk Hoffmann

Dirk Hoffmann
Zentralabteilungsleiter/Head of Department/Chef du département
Entwicklungsorganisation/Development Organization

ce_3725-0_de_en_fra_rev07.pdf

SAMSON AKTIENGESELLSCHAFT
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Telefon: 069 4009-0 · Telefax: 069 4009-1507
E-Mail: samson@samson.de
Revison 07

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Für das folgende Produkt / For the following product / Nous certifions que le produit

Elektropneumatischer Stellungsregler / Electropneumatic Positioner / Positionneur électropneumatique
Typ/Type/Type 3725-1100..

entsprechend der EU-Baumusterprüfbescheingung PTB 11 ATEX 2020 X ausgestellt von der/
according to the EU Type Examination PTB 11 ATEX 2020 X issued by/
établi selon le certificat CE d'essais sur échantillons PTB 11 ATEX 2020 X émis par:

Physikalisch Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig
Benannte Stelle/Notified Body/Organisme notifié 0102

wird die Konformität mit den einschlägigen Harmonisierungsrechtsvorschriften der Union bestätigt /
the conformity with the relevant Union harmonisation legislation is declared with/
est conforme à la législation d'harmonisation de l'Union applicable selon les normes:

EMC 2014/30/EU	EN 61000-6-2:2005, EN 61000-6-3:2007 +A1:2011, EN 61326-1:2013
Explosion Protection 94/9/EC (bis/to 2016-04-19) Explosion Protection 2014/34/EU (ab/from 2016-04-20)	EN 60079-0:2009, EN 60079-11:2012
RoHS 2011/65/EU	EN 50581:2012

Hersteller / Manufacturer / Fabricant:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany/Allemagne

Frankfurt / Francfort, 2017-07-29
Im Namen des Herstellers/ On behalf of the Manufacturer/ Au nom du fabricant.

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Hanno Zager
Leiter Qualitätssicherung/Head of Quality Managment/
Responsable de l'assurance de la qualité

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E-Mail: samson@samson.de
Revison 07

ce_3725-1100_de_en_fra_rev07.pdf

EU-TYPE EXAMINATION CERTIFICATE

(1) (Translation)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 11 ATEX 2020 X **Issue: 1**

(4) Product: e/p-positioner, type 3725-1100..

(5) Manufacturer: SAMSON AG

(6) Address: Weismüllerstraße 3, 60314 Frankfurt, Germany

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 19-29022.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012 + A11:2013 **EN 60079-11:2012**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

Ex II 2 G Ex ia IIC T4 Gb

Konformitätsbewertungsstelle Sektor Explosionsschutz Braunschweig, February 25, 2019
On behalf of PTB:

Dr.-Ing. F. Lienesch
Direktor und Professor

ZSEx001e c

sheet 1/3

EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(13) # SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 11 ATEX 2020 X, Issue: 1**

(15) Description of Product

The e/p-positioner, type 3725-1100.. is a single-acting positioner intended for the installation onto pneumatic lift drives and slewing-motion actuators. It is used for the assignment of a valve position to an actuating signal. Non-flammable media serve as pneumatic auxiliary power.
The e/p-positioner, type 3725-1100.. is a passive two-terminal network which may be connected to all certified intrinsically safe circuits provided that the permissible maximum values for U_i, I_i and P_i are not exceeded.
The equipment is installed inside the hazardous area.
The permissible ambient temperature range is -25 °C ... 80 °C.

Electrical data

Signal circuit (terminals 11/12)	type of protection Intrinsic Safety Ex ia IIC only for connection to a certified intrinsically safe circuit
	Maximum values:
	U_i = 28 V
	I_i = 115 mA
	P_i = 1 W
	C_i = 8.3 nF
	L_i negligibly low

(16) Test Report PTB Ex 19-29022

(17) Specific conditions of use

The manufacturer documentation and the operating instructions manual shall include all required information to restrict the risk of electrostatic charge to a minimum. A warning label shall be affixed to the equipment.

EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.
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Quick Guide

07.2019 QG EVE0108 B1-(int)

SRD998 Intelligent Positioner with HART Communication



Quick Guide . . . . . (English)

Kurzanleitung . . . . . .(Deutsch)

Guide d'utilisation rapide . . . . . .(Français)

Equipment should be installed, operated, serviced, and maintained only by qualified personnel.
No responsibility is assumed by Schneider Electric for any consequences arising from the use of this material.

Quick Guide

07.2019 **QG EVE0108 A-(en)**

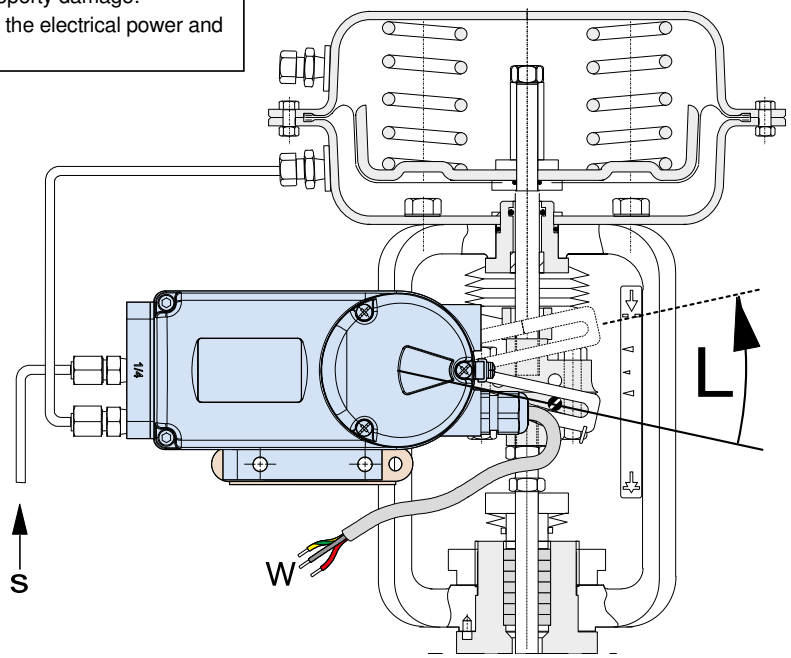
SRD998 Intelligent Positioner with HART Communication

These instructions are to be used as a guide for quick start-up. For more detailed information please refer to the standard documents “Master Instructions” and “Product Specification Sheet”. These can be found on our Website.

⚠ WARNING

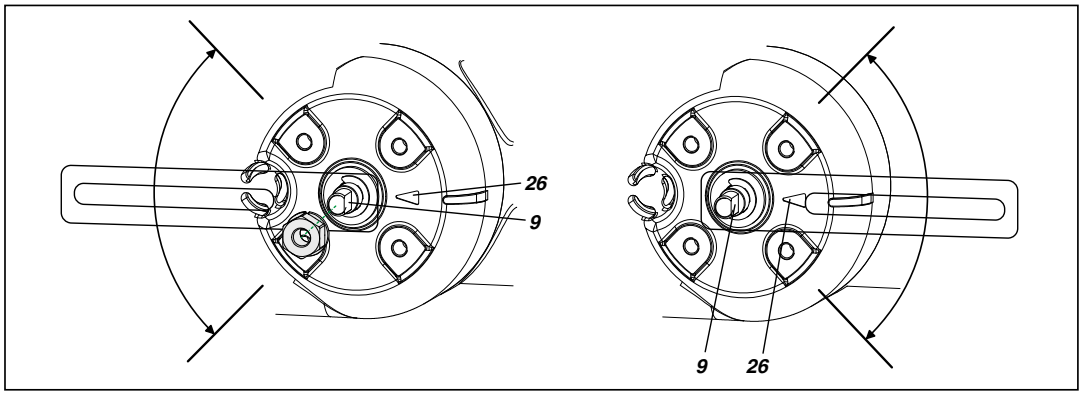
To avoid any personal injury or property damage:
During installation work, switch off the electrical power and the supply air!

Typical mounting



1. MOUNTING TO ACTUATORS

During operation, the flat side of the spindle ***9*** on the back of the positioner shall **always** point towards the arrow ***26***. The working angle around this position is ±45º.



Equipment should be installed, operated, serviced, and maintained only by qualified personnel.
No responsibility is assumed by Schneider Electric for any consequences arising from the use of this material.

Schneider Electric

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

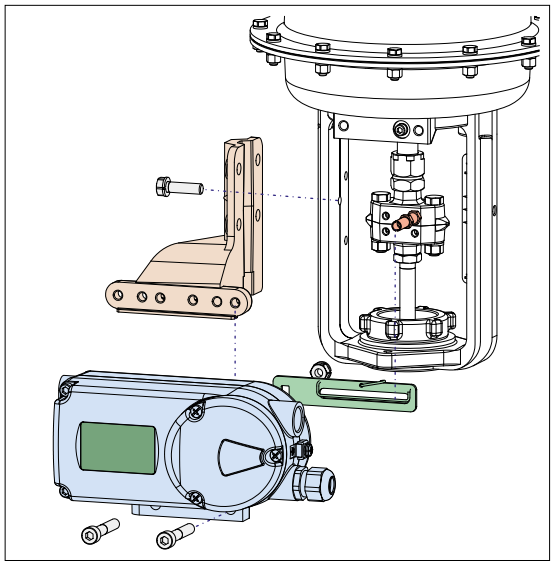
Please Note

Electrical equipment should be installed, operated, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

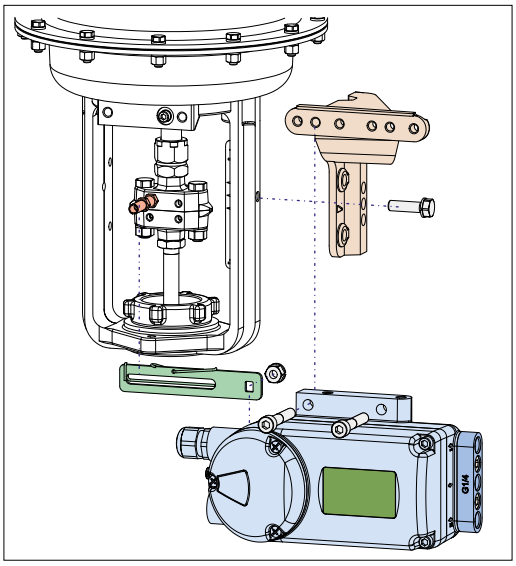
A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

MOUNTING TO LINEAR ACTUATORS

NAMUR Mounting - left hand -

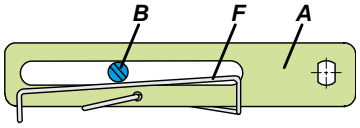


NAMUR Mounting - right hand -



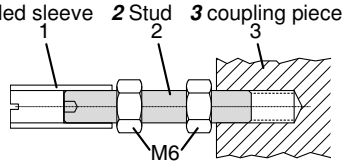
Feedback lever for linear actuators:

The carrier bolt ***B*** is in the slot of the feedback lever ***A*** and the compensating spring ***F*** touches the carrier bolt.

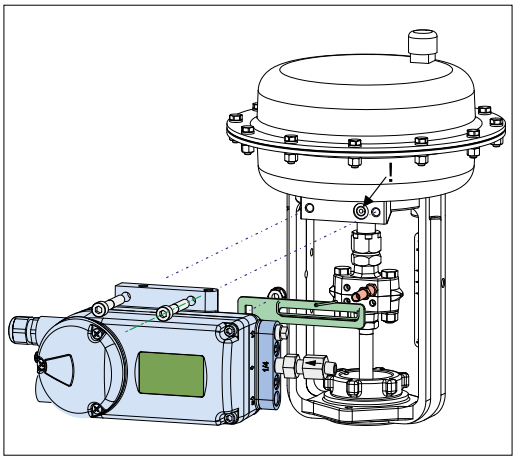


Carrier bolt *B*:

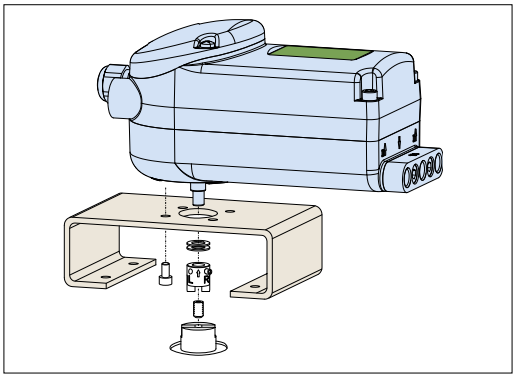
1 threaded sleeve ***2*** Stud ***3*** coupling piece



Direct Mounting

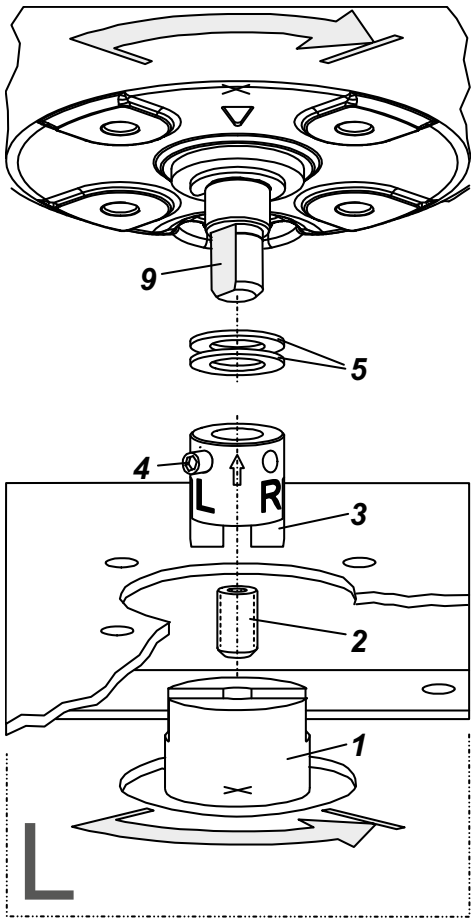


MOUNTING TO ROTARY ACTUATORS

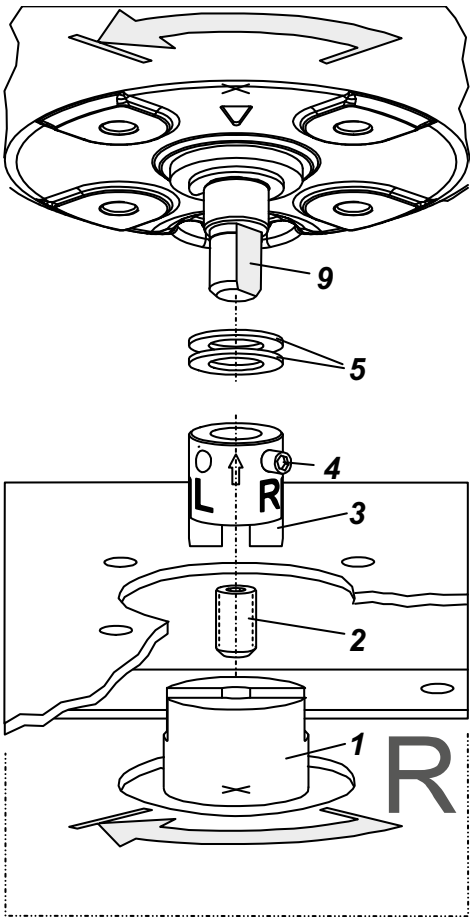


- Do not tighten grub screw ***4*** against the thread of spindle ***9***!
- When in use the flat side of the spindle ***9*** shall move (0 ➠ 100%) in front of the arrow ***26***.
- When the product temperature rises, the drive shaft ***1*** increases in length. Therefore, the rotary adapter ***3*** shall be mounted so that approx. 1 mm (0.04 in.) of clearance results between the drive shaft ***1*** and the rotary adapter ***3***. This is achieved by placing an appropriate number of washers ***5*** on the feedback spindle ***9***, before attaching the rotary adapter. Two washers should result in a clearance of 1 mm.

Actuator, left turning



Actuator, right turning



2. CONNECTIONS

Check before mounting fittings and cable glands if threads are matching, otherwise housing can be damaged. NPT thread is marked at connection block.

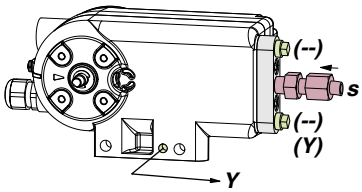
Ground

Connect earth cable to screw ***4*** (see next page) inside or outside of the electrical compartment.

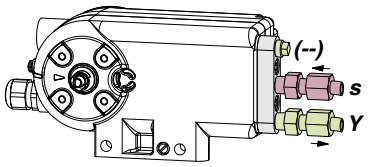
PNEUMATIC CONNECTIONS

Air supply (s): 1.4 to 6 bar (but not more than the max. pressure of actuator), free of oil, dust and water!

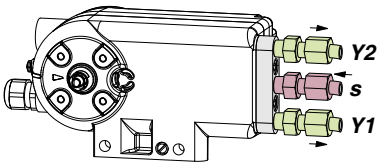
Single acting, Direct mounting



Single acting



Double acting

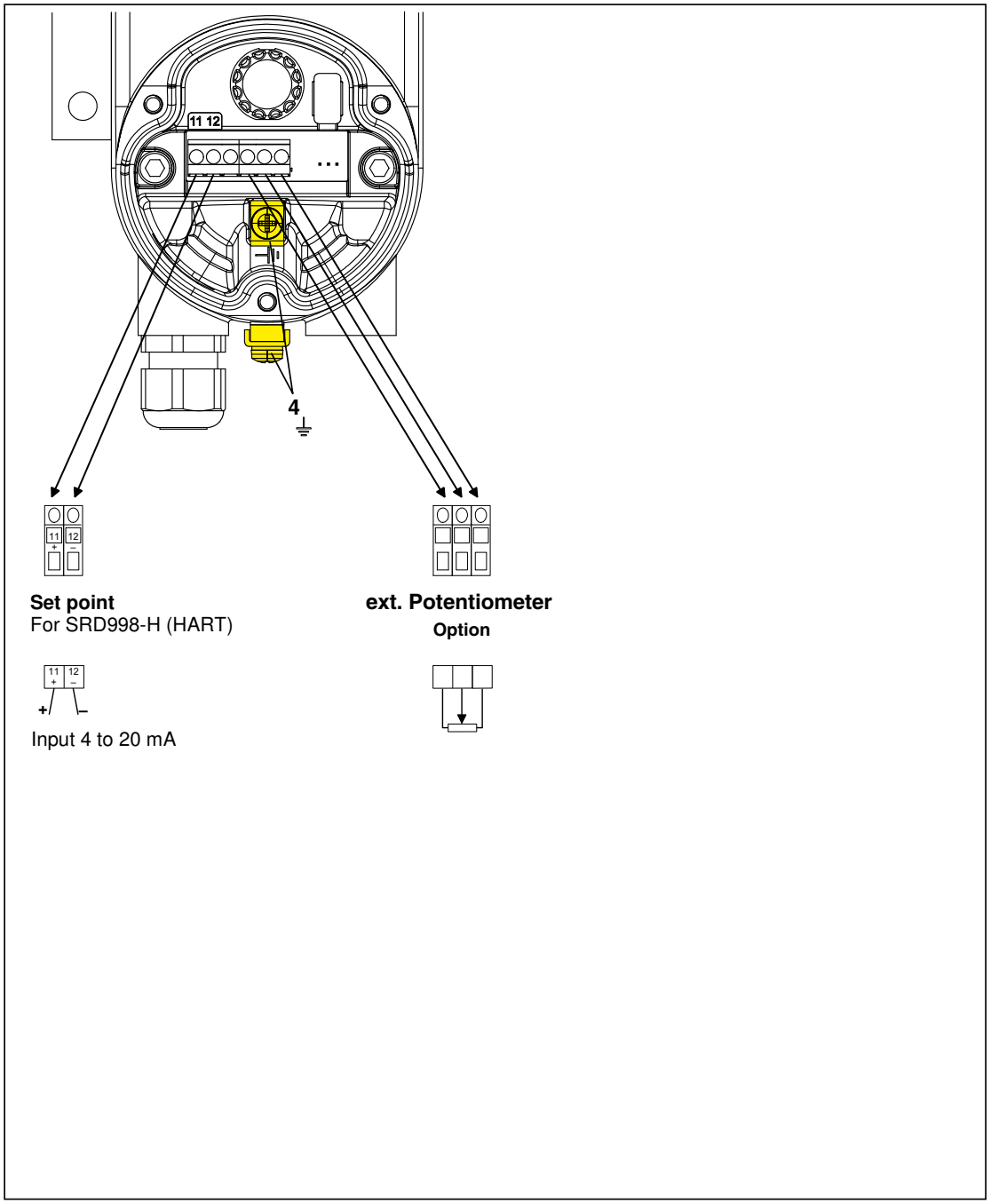


s: supply Y=Y1=I, Y2=II: pneumatic outputs (--): closed

3. ELECTRICAL CONNECTIONS

⚠ DANGER

The safety requirements of document EX EVE0108 as well as the requirements of PSS EVE0108 and MI EVE0108 for SRD998 shall be observed!



Set point
For SRD998-H (HART)

Input 4 to 20 mA

ext. Potentiometer
Option

More detailed technical specifications see PSS EVE0108.
For intrinsically safe circuits please refer to certificate / data label for max. operating voltages etc.

4. START UP

After mounting the positioner on the actuator, air and electrical input connected, you can start-up the SRD. Configuration of SRD can be carried out via PC, HART communication and FDT/DTM software, or local with the Rotary Selector ***15*** and LCD. This is described on the following pages.

⚠ WARNING

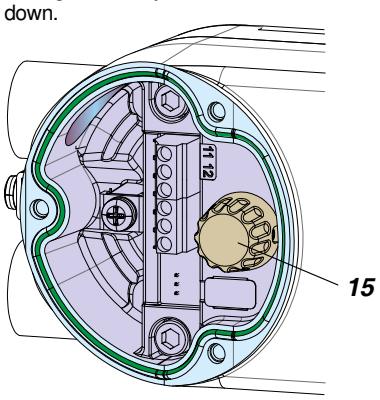
To avoid any personal injury or property damage at any time:

Do not put your finger or other part at any time inside the valve or in any moving part of the actuator or in the feedback lever mechanism.

Do not touch the rear part of the positioner at any time.

Setting by means of Rotary Selector and LCD

The SRD can be adjusted when the cover is removed.
To configure the various items, select the relevant menu by turning the Rotary Selector ***15*** and confirm by pushing it down.



After power ON, the SRD goes to configuration, if no Autostart has already been done.
First select the display orientation...

```
LCD orient
  Normal
  Upside down
```

Select with Rotary selector and confirm by pushing it down.
... then the LCD text language is selected ...

```
Language
  English
  Deutsch
  Francais
```

(default is: English)

Select with Rotary selector and confirm by pushing it down. To exit this menu, turn Rotary selector until “Exit” appears, then confirm by pushing it down.
... then automatically continued to configuration

```
SRD Main Menu
  Mounting
  Autostart
  Valve Action
```

To leave any menu, select “Exit” and confirm by pushing down the Rotary Selector ***15***.

Display at IN OPERATION

```
87.5
Position [%]
```

Process variable

```
87.5
⊗ Position [%]
```

Process variable and diagnostics

By *turning* the Rotary Selector, further information of process will be displayed.

By *pushing down* the Rotary Selector, the configuration menus will be displayed.

At configuration, the selected item is displayed with dark background.

Display at configuration: Main menu

```
SRD Main Menu
  Mounting
  Autostart
  Valve Action
```

In menu 1 you can select the type of mounting:

```
MOUNTING
  Stroke left
  Stroke right
  Rotary ccw
```

Stroke actuator, left-hand mounted
Stroke actuator, right-hand mounted
etc.

Select, confirm and "Exit" to Main menu.
Now turn Rotary Selector to select Autostart:

```
SRD Main Menu
  Mounting
  Autostart
  Valve Action
```

Push Rotary Selector, and different Autostart options are available:

Endpoints	Determines only the mechanical stops of actuator/valve
Standard	Recommended for standard application
Enhanced [1)]	Optimized control behaviour compared to Standard Autostart
Smooth resp[1)]	Damped control behaviour for smaller actuators
Fast resp.[1)]	Undamped control behaviour for larger actuators.

Select and confirm to launch Autostart.

1) After running one of these Autostart options, the SRD branches to Menu 6.11 Position tuning at Stroke actuators.

After "Exit" the device is IN OPERATION.

Menu structure for SRD998

SRD Main Menu

Menu	Factory configuration	Description
		07.2016
1 Mounting		
1.1 Stroke left	✓	Stroke actuator, left-hand or direct mounting
1.2 Stroke right		Stroke actuator, right-hand mounting
1.3 Rotary ccw		Rotary actuator, opening counter-clockwise
1.4 Rotary clockw		Rotary actuator, opening clockwise
1.5 Linear Pot.		Mounting with external linear potentiometer
2 Autostart		
2.1 Endpoints		Adaptation of the mechanical stops only
2.2 Standard		Autostart recommended for standard application
2.3 Extended		Enhanced Autostart. Optimized control behaviour compared to Standard Autostart
2.4 Smooth response		Extended Autostart. Damped control behaviour for smaller actuators
2.5 Fast response		Extended Autostart. Undamped control behaviour for larger actuators
3 Action menu		
3.1 Valve action		Action of Positioner:
3.1.1 Direct	✓	Valve opens with increasing setpoint value
3.1.2 Reverse		Valve closes with increasing setpoint value
3.2 Feedback action		Action of Feedback unit:
3.2.1 Direct	✓	Increasing Current with increasing valve position
3.2.2 Reverse		Decreasing Current with increasing valve position
4 Accessories		
4.1 None		No accessories mounted
4.2 Booster		Booster mounted
5 Valve character		
5.1 Linear	✓	Linear characteristic
5.2 Equal % 1:50		Equal percentage characteristic 1:50
5.3 Quick open		Inverse equal percentage characteristic 1:50 (quick opening)
5.4 Custom		Custom characteristic (configuration via DTM)
6 Limits/Alarms		
6.1 Lower limit	0 %	Closing limit is set to input value
6.2 Cutoff low	1 %	0%-tight sealing point is set to input value
6.3 Cutoff high	100 %	100%-tight sealing point is set to input value
6.4 Upper limit	100 %	Opening limit is set to input value
6.5 Split-range 0 %	4 mA	Split range 0 %: input value corresponds to 0 %
6.6 Split-rng 100 %	20 mA	Split range 100 %: input value corresponds to 100 %
6.7 Lower Alarm	-10 %	Lower position alarm on output 1 is set to input value
6.8 Upper Alarm	110 %	Upper position alarm on output 2 is set to input value
6.9 Valve 0 %	4 mA	Configuration of rated-stroke of 0% at 4 mA
6.10 Valve 100%	20 mA	Configuration of rated-stroke of 100% at 20 mA
6.11 Pos Tuning		Tuning of position for mounting adaption
6.12 Stroke	x° / 20mm	Configuration of nominal travel

7 Tuning		10.2018
7.1 P closing	15	P: Proportional gain for 'close valve'
7.2 P opening	2	P: Proportional gain for 'open valve'
7.3 I closing	7.5	I: Integration time for 'close valve'
7.4 I opening	2.4	I: Integration time for 'open valve'
7.5 D closing	0.35	D: Derivative time for 'close valve'
7.6 D opening	0.35	D: Derivative time for 'open valve'
7.7 Trav time close		Positioning time for 'close valve'
7.8 Trav time open		Positioning time for 'open valve'
7.9 Deadband	0.1	Permitted neutral zone for control difference
7.10 Booster tuning		Fine tuning of control for booster applications
8 Output		Manual setting of IP-Module for testing of pneumatic output
9 Setpoint		Manual setting of valve position:
9.1 12.5 % Steps		Setpoint changes of 12.5% steps by turning Rotary Selector
9.2 1 % Steps		Setpoint changes of 1% steps by turning Rotary Selector
9.3 Start PST		Starts the Partial Stroke Test, with the given parameters by DTM
10 Workbench		
10.1 Reset to fact		Resetting of configuration to settings "ex factory"
10.2 Go in operation		Service function: Start of controller w/o Autostart. Not for regular use
10.3 Language		Language on LCD:
10.3.1 English	✓	Standard, English
10.3.2 Deutsch		Standard, German
10.3.3 Français		Standard, French
10.3... & more		
10.4 LCD orient		Orientation of LCD:
10.4.1 Normal	✓	Normal orientation of writing on LCD
10.4.2 Upside down		Reverse orientation of writing on LCD
10.5 LCD contrast		
10.6 Units		Configuration of temperature and pressure unit SI or Anglo US
10.6.1 SI (metric)	✓	
10.6.2 Imperial (US)		
11 not with HART		
11 Profibus PA - Bus address		
11.1 Address LSB		Ratio from Dec. 0 / Hex 00 to Dec. 15 / Hex 0F
11.2 Address MSB		Ratio from Dec. 0 / Hex 00 to Dec. 112 / Hex 70
11.3 Address	126	Display of Bus Address from Dec. 1 to 127 (Hex 00 to 7F)
11 FOUNDATION Fieldbus H1		
11.1 Simulate		
Disabled	✓	Simulate disabled
Enabled		Simulate enabled
11.2 Profile		
Link Master	✓	Link Master active
Basic Device		Link Master de-activated

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https://pasupport.schneider-electric.com

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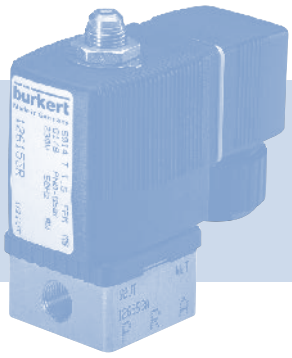
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DOKT 558 742 081 i02
FD-QG-PO-998-EN 0719

bürkert
FLUID CONTROL SYSTEMS

Type 6014

3/2-way solenoid valve
3/2-Wege-Magnetventil
Électrovanne 3/2 voies



Operating Instructions
Bedienungsanleitung
Manuel d'utilisation

MAN 1000010024 ML Version: OStatus: RL (released | freigegeben) printed: 04.02.2025

english

1 OPERATING INSTRUCTIONS

The operating instructions contain important information.
- Read the operating instructions carefully and follow the safety instructions in particular, and also observe the operating conditions.
- Operating instructions must be available to each user.
- The liability and warranty for the product / device are void if the operating instructions are not followed.

1.1 Symbols

- Designates an instruction to prevent risks.

→ designates a procedure which you must carry out.

Warning of injuries:

DANGER!
Imminent danger! Serious or fatal injuries.

WARNING!
Potential danger! Serious or fatal injuries.

CAUTION!
Danger! Minor or moderately severe injuries.

Warns of damage to property:
NOTE!

2 INTENDED USE

Incorrect use of the solenoid valve Type 6014 can be dangerous to people, nearby equipment and the environment.
The device is designed for blocking, dosing, filling and venting neutral gaseous and liquid media.
- In potentially explosive environments, the device must only be used in accordance with the specifications on the separate Ex type label. The additional information and safety instructions relating to Ex areas enclosed with the device must be adhered to when deploying the device.
- Do not use devices without a separate Ex type label in potentially explosive atmospheres.
- Do not use the device outdoors.
- Use according to the permitted data, operating conditions and conditions of use specified in the contract documents and operating instructions. These are described in the chapter entitled "5 Technical data".
- The device may be used only in conjunction with third-party devices and components recommended and authorised by Bürkert.
- Correct transportation, correct storage and installation and careful use and maintenance are essential for reliable and problem-free operation.
- Use the device only as intended.

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2.1 Restrictions

If exporting the product/device, observe any existing restrictions.

2.2 Definition of term

In these operating instructions, the term “device” or “product” always refers to the solenoid valve Type 6014.

2.3 Approvals

The approval mark indicated on the Bürkert type labels refers to the Bürkert products.

e 1
03 5791

Devices which must bear the type approval mark were approved at the Kraftfahrtbundesamt under the type approval number

e1*72/245*2006/96*5791*00

and are put into circulation with the indicated type approval mark. You can obtain an extract of the type approval from the address below.

Bürkert Werke GmbH
Zulassungsbeauftragter,
Christian-Bürkert-Str. 13-17,
D-74653 Ingelfingen

2.4 Ex approval

The Ex approval is only valid if you use the modules and components authorized by Bürkert as described in these operating instructions.

You may use the electronic modules only in combination with the pneumatic valve types released by Bürkert, otherwise the Ex approval will be void!

If you make unauthorized changes to the system, the modules or components, the Ex approval will also be void.

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3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any contingencies and events which may arise during installation, operation and maintenance.

⚠

Risk of injury from high pressure in the equipment/device.
- Before working on equipment or device, switch off the pressure and deaerate/drain lines.

Risk of electric shock.
- Before working on equipment or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of burns/Risk of fire if used continuously through hot device surface.
- Keep the device away from highly flammable substances and media and do not touch with bare hands.

General hazardous situations.
To prevent injury, ensure that:
- The system cannot be activated unintentionally.
- Installation and repair work may be carried out by authorized technicians only.
- After an interruption in the power supply or pneumatic supply, ensure that the process is restarted in a defined or controlled manner.
- The device may be operated only when in perfect condition and in consideration of the operating instructions.
- The general rules of technology apply to application planning and operation of the device.

To prevent damage to property of the device, ensure:
- Supply the media connections only with those media which are specified as flow media in the chapter entitled “5 Technical data”.
- With alternating voltage, ensure that the core can move.
- Do not put any loads on the device (e.g. by placing objects on it or standing on it).
- Do not make any modifications to the device. Do not paint the body parts or screws.

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3.1 Versions with explosion protection

DANGER!

Danger of explosion.
Improper use in the potentially explosive area may result in an explosion.

- In potentially explosive environments, the device must only be used in accordance with the specifications on the separate Ex type label. The additional information and safety instructions relating to Ex areas enclosed with the device must be adhered to when deploying the device.
- Do not use devices without a separate Ex type label in potentially explosive atmospheres.
- Also follow the specifications in the certificate of conformity.

4 PRODUCT DESCRIPTION

The direct-acting solenoid valve Type 6014 is available in two designs.

Type 6014 is used for the blocking, dosing, filling and venting of neutral gaseous and liquid media, in particular for controlling single-acting pneumatic actuators or technical vacuum. The modular designed valve can be installed individually or in a block on the multiple manifold.



Type 6014P is used as a special pilot valve for direct installation on the externally controlled pneumatic actuators. It consists of the magnetic actuator Type 6014 and a special body with hollow screw which can be connected directly to the pilot air port of the actuator. The valve features manual actuation as standard.



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5 TECHNICAL DATA

5.1 Standards and directives

The device complies with the relevant EU harmonisation legislation. In addition, the device also complies with the requirements of the laws of the United Kingdom.

The harmonised standards that have been applied for the conformity assessment procedure are listed in the current version of the EU Declaration of Conformity/UK Declaration of Conformity.

5.2 Operating conditions

WARNING!

Risk of injury from discharge of medium and pressure.

- If the device is used outdoors, do not expose it unprotected to the weather conditions.
- Avoid heat sources which may cause the allowable temperature range to be exceeded.

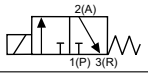
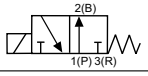
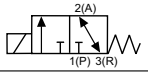
Ambient temperature	-10 – +55 °C
Degree of protection	IP65 in accordance with EN 60529 with cable plug

5.3 Mechanical data

Dimensions	See data sheet	
Port connection	Type 6014	G1/8, G1/4, flange
	Type 6014P	G1/8, G1/4
	Hollow screw	G1/8, G1/4
Materials		
Body	Type 6014	brass, stainless steel 1.4305, polyamide (PA, flange)
	Type 6014P	brass, polyamide (PA)
Hollow screw	Type 6014P	brass, stainless steel 1.4301/304
Base plate	Type 6014P	aluminium anodized or IXEF
Sealing	Type 6014	FKM, EPDM on request
	Type 6014P	FKM

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5.4 Fluidic data

Circuit functions		
C (NC)		3/2-way valve, direct-acting, normal output A unloaded
D (NO)		3/2-way valve, direct-acting, normal output B pressurized
T		3/2-way valve, direct-acting, universal valve

Tab. 1: Circuit functions

Pressure range see type label

Media neutral gaseous and liquid media, which do not attack body and sealing materials (e.g. compressed air, town gas, natural gas, water, hydraulic fluid, petrol, technical Vacuum).

See Chemical Resistance Chart
country.burkert.com

Medium temperature
FKM -10 – +100 °C (PA coil)
-10 – +120 °C (Epoxid coil)

Viscosity max. 21 mm²/s

5.5 Type label

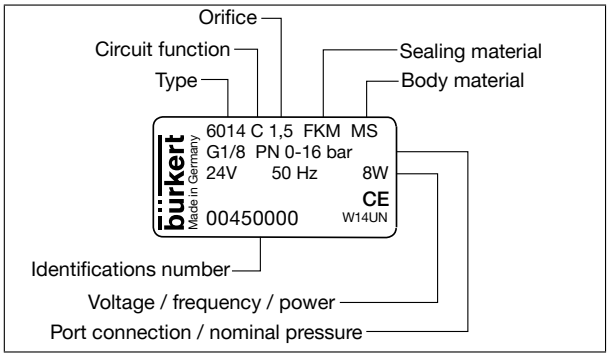


Fig. 1: Type label (example)

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5.6 Electrical data

Connection DIN EN 175301-803 (DIN 43 650), form A for cable plug Type 2508/2518

Operating voltage 24 V DC ± 10 % - max. residual ripple 10 %
24 V / 50 Hz
230 V / 50 Hz

Voltage tolerance ± 10 %

Nominal output 8 W
Impulse version 7 W

Nominal operating mode 100 % continuous operation

for block installation 5 W continuous operation on request
8 W intermittent operation 60 % (30 min)

6 INSTALLATION

DANGER!

Risk of injury from high pressure in the equipment/device.
- Before working on equipment or device, switch off the pressure and deaerate/drain lines.

Risk of electric shock.
- Before working on equipment or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

Risk of injury from improper installation.
- Installation may be carried out by authorized technicians only and with the appropriate tools!
- Secure system from unintentional activation.
- Following installation, ensure a controlled restart.

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6.1 Fluid installation

DANGER!

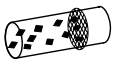
Risk of injury from high pressure in the equipment/device.
- Before working on equipment or device, switch off the pressure and deaerate/drain lines.

Installation position: any, coil preferably upwards.

Procedure:

→ Before installation, clean any possible dirt off the pipelines and flange connections.

→ If required, install a dirt trap to prevent malfunctions.



Mesh size:
0,2 – 0,4 mm

Pay attention to the flow direction of the valve.
from 1(P) → 2(A) (Circuit function C) or
from 1(P) → 2(B) (Circuit function D)

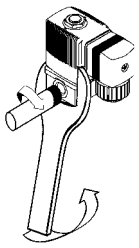
Valve with threaded connection:

→ Use PTFE tape as sealing material.

NOTE!

Caution risk of breakage.
- Do not use the coil as a lifting arm.

→ Hold the device with a suitable tool (open-end wrench) on the body and screw into the pipeline.



Valve with flanged connection:

→ Remove the cover plate.

→ Loosen the nut on the coil and remove coil.

WARNING!

Risk of injury due to escaping medium.
- Make certain the seals included with delivery are properly seated in the valve.
- Ensure that the manifold is even.
- Ensure that the surface quality of the manifold is adequate.

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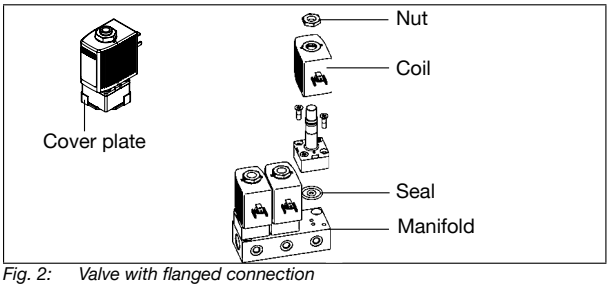


Fig. 2: Valve with flanged connection

→ Insert the seal into the body.

→ Screw the body onto the manifold (tightening torque: max. 1.5 Nm).

→ Attach the coil and screw on the nut (tightening torque: max. 5 Nm).

Type 6014P

Observe a tightening torque of 4-5 Nm when tightening the hollow screw.

6.2 Electrical connection with cable plug

DANGER!

Risk of electric shock.
- Before working on equipment or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

If the protective conductor contact between the coil and body is missing, there is danger of electrical shock.
- Always connect protective conductor.
- Check electrical continuity between coil and body.

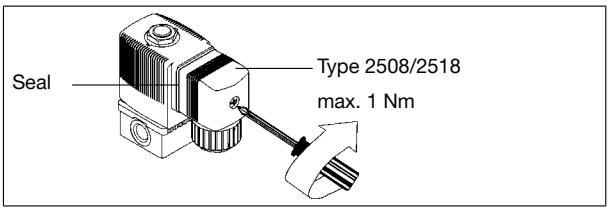


Fig. 3: Electrical connection with cable plug

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Note the voltage and current type as specified on the type label.

→ Check that seal is fitted correctly.
→ Connect and tighten the cable plug (tightening torque: max. 1 Nm).

The cable plug can be turned by 4 x 90°.

Control of pulse version

Correct polarity is essential to ensure that the device functions: Note identification on the upper side of the coil.
Pulse duration at least 50 ms.

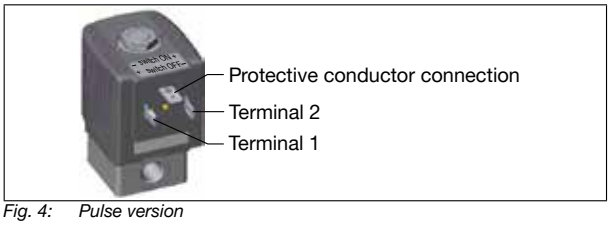


Fig. 4: Pulse version

Polarity	Specifications	Terminal connections
- Switch ON +	Valve (P seat) will be opened	(+) on terminal 2, (–) on terminal 1
+ Switch OFF -	Valve (P seat) will be closed	(+) on terminal 1, (–) on terminal 2

Tab. 2: Control of pulse version

Use only cable plug without electrical wiring for pulse versions.

6.3 Rotation of coil

WARNING!

Risk of electric shock.
If the protective conductor contact between the coil and body is missing, there is danger of electrical shock.
▸ Check protective conductor contact after installing the coil.

Overheating, risk of fire.
Connection of the coil without pre-assembled valve will result in overheating and destroy the coil.
▸ Connect the coil with assembled fitting only.

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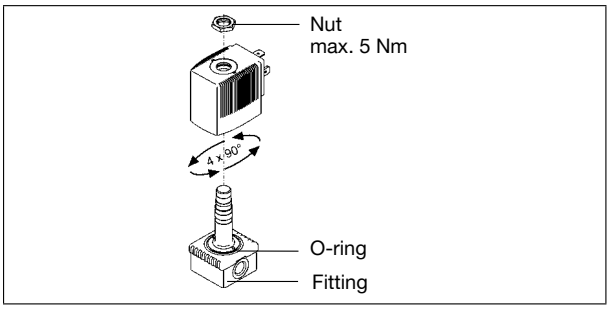


Fig. 5: Rotation of coil

The coil can be turned by 4 x 90° (for block installation only 2 x 180°).
→ Loosen nut.
→ Turn coil.
→ Tighten nut with suitable tool (open-end wrench, tightening torque: max. 5 Nm).

7 MAINTENANCE, TROUBLESHOOTING

DANGER!

Risk of injury from high pressure in the equipment/device.
▸ Before working on equipment or device, switch off the pressure and deaerate/drain lines.

Risk of electric shock.
▸ Before working on equipment or device, switch off the power supply and secure to prevent reactivation.
▸ Observe applicable accident prevention and safety regulations for electrical equipment.

Risk of burns/Risk of fire if used continuously through hot device surface.
▸ Keep the device away from highly flammable substances and media and do not touch with bare hands.

Risk of injury from improper maintenance.
▸ Maintenance may be carried out by authorized technicians only and with the appropriate tools.
▸ Secure system from unintentional activation.
▸ Following maintenance, ensure a controlled restart.

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7.1 Malfunctions

If malfunctions occur, check:

→ the line connectors,
→ the operating pressure,
→ the power supply and valve control.

If the valve still does not switch, please contact your Bürkert Service.

8 DISASSEMBLY

DANGER!

Risk of injury from high pressure in the equipment/device.
- Before working on equipment or device, switch off the pressure and deaerate/drain lines.

Risk of electric shock.
- Before working on equipment or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

Risk of injury from improper disassembly.
- Disassembly may be carried out by authorized technicians only and with the appropriate tools.

8.1 Disassembly

→ Turn off the pressure and vent the lines.
→ Switch off the power supply.
→ Loosen the cable plug.

Valve with threaded connection:
→ Hold the device with a suitable tool (Open-end wrench) on the body and screw off the pipeline.

Valve with flanged connection:
→ Loosen the nut on the coil and remove coil.
→ Loosen the body from the manifold

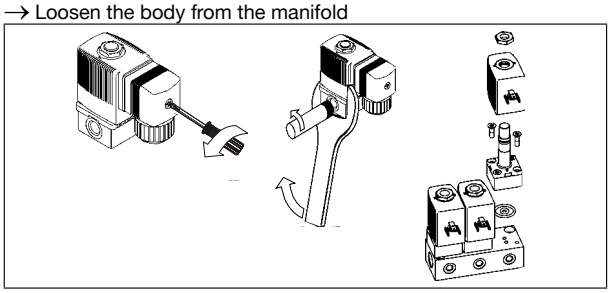


Fig. 6: Disassembly

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9 SPARE PARTS

CAUTION!

Risk of injury and/or damage by the use of incorrect parts!
Incorrect accessories and unsuitable spare parts may cause injuries and damage the device and the surrounding area.
- Use only original accessories and original spare parts from Bürkert.

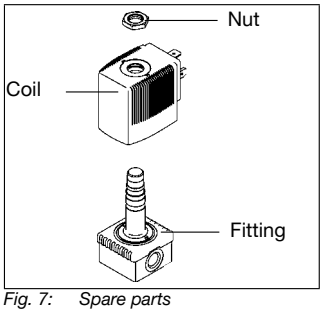


Fig. 7: Spare parts

Coil and fitting can be ordered complete by quoting the identification number of the device.
(see type label)

Wearing part set on request.

10 PACKAGING, TRANSPORT, STORAGE, DISPOSAL

NOTE!

Transport damages.
Inadequately protected equipment may be damaged during transport.
- During transportation protect the device against wet and dirt in shock-resistant packaging.
- Avoid exceeding or dropping below the allowable storage temperature.

Incorrect storage may damage the device.
- Store the device in a dry and dust-free location!

Storage temperature: -40 - 80 °C.

Environmentally friendly disposal



- Follow national regulations regarding disposal and the environment.
- Collect electrical and electronic devices separately and dispose of them as special waste.

Further information country.burkert.com.

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Please note:

Compressed air contains liquid and solid foreign particles that may have influence on the function of pneumatic control valves. A purification of the compressed air is an indispensable requirement.

Installation:

- Install maintenance unit into the horizontal air pipe with G 1/4"-screwed joint with straight up hand wheel
- Mind correct stream direction (arrows)
- Use PTFE-ribbon for tightening

Adjustment:

- Prior to operating the pressure reducer must be relieved by turning out the adjusting screw
- Turn the adjusting screw clockwise until the pressure gauge indicates the desired operating pressure

Remark: *The pressure reducer is equipped with a resetting control. The output pressure can be reduced by turning the adjusting screw without air consumption.*

Maintenance:

- Drain condensate daily
- Clean filter regularly:
  - Loosen screw connection
  - Remove container
  - Remove fastening nut from sinter filter
  - Take out filter
  - Clean filter in cleansing agent and dry well
  - Reinstall maintenance unit

Technical data:

Primary pressure:	max. 10 bar
Operating pressure:	adjustable 10...80% of the primary pressure
Pressure gauge range:	0...2,5 bar (type 394 150)
	0...6,0 bar (type 394 151)
	0...10,0 bar (type 394 152)
Filter pore size:	50...75 µm
Connection:	G 1/4" female thread
Operating temperature:	0...50°C

Installation:

Warning: *- Installation, operation and maintenance should be done only by qualified personnel.*
- Disconnect supply voltage before working on the valve and make sure, that it is impossible to switch the power on unintentionally (death and injury hazards)
- It is not permitted to work on the valve body and to exchange the actuator as long as the valve is subjected to pressure and temperature.
- Crushing and injury hazard because of rotating and moving parts

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position must be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.

Remove flange covers before the installation. Use suitable handling and lifting equipment for installing the valve (see corresponding data sheet for the weights).

Regard the permitted max. operating pressure and temperature as described in the corresponding valve data sheet.

Observe the ambient temperature limits (-15...+60°C)

For higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

When using valves outdoors, in environments with high temperature fluctuations or high humidity or by temperatures near or below the freezing point, we suggest a heating resistor be fitted to prevent the buildup of condensation within the enclosure.

If the valves are installed outdoors, check the correct assembly of the actuator hood, specially the gaskets.
By direct climatic influences an additional coverage or best-case a housing as protection for the actuator is necessary.

Retighten the screws of all flange connections (also cover and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Electrical connection:

Check supply voltage according to the rating plate, loosen screws on the actuator hood and remove hood.

Route signal and control lines separately from high-voltage lines, if necessary, run in screened cables.
Insert cables (1.5 mm²) through a twisting sleeve or cable gland.

Perform electrical connection with the supply voltage switched off according to the connection diagram (observe VDE, EVU and regional electrical regulations).

In the event of deviations, the connecting diagram in the actuator hood has precedense.

Maintance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also cover and connection piece flanges), the valve cone should be located in the centre.

Warning: *- Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean it in order to protect stuffing boxes and PTFE-V-rings against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with PTFE-V-rings or bellows.

Undertake maintenance on the actuator in accordance with the corresponding information in the separate operating instructions.

Attention:

- Adjustment of and work on the actuator may only be done by skilled labour
- Disconnect power supply before removing the cover
- Observe local instructions and terminal diagram

Actuator disassembly:

- disconnect supply
- loosen fixing screw (21) (see Fig.1)
- unscrew coupling nut (19)
- unscrew nuts (18)
- take off actuator from valve connection

Actuator assembly:

- lift actuator onto valve connection and secure nuts (18) (see Fig.1)
- tighten (19) coupling nut and fixing screw (21)
- connect lines acc.to wiring diagram
- if necessary, move actuator in both limit positions and adjust stroke indikators (17) on mounting rod

Maintenance: the spindle has to be kept cleen and lubricated, if necessary, lubricate the spindle with molykote including grease

Limit switches:

Attention! *The limit switches work load dependent and turn off automatically when the valve drives in end position, so that a readjustment, as for travel dependent limit switches, is not necessary and not allowed. Change of the factory adjustment endangers correct operation, no warranty will be given and no liability will be accepted in case of damage of the varnish sealing.*

If for extraordinary reasons, for instance by previous damages, a readjustment is exceptionally necessary, the actuator should preferably be sent in for new factory adjustment. Only if this is exceptionally not possible, a new coarse adjustment can be directly done, with our agreement and acc. to the following operating instruction.

Special information for actuators with integrated positioner:

No reaction of limit switch can occur when the positioner turns off the actuator to early, before the valve is in the end position. Don't readjust limit switch in this case, control at first adjustment of positioner and correct it if necessary.

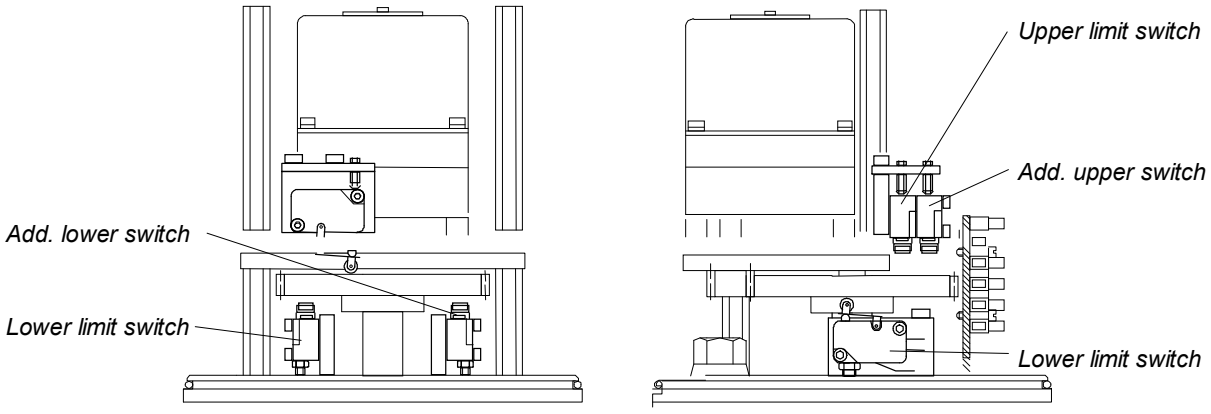


Fig.1

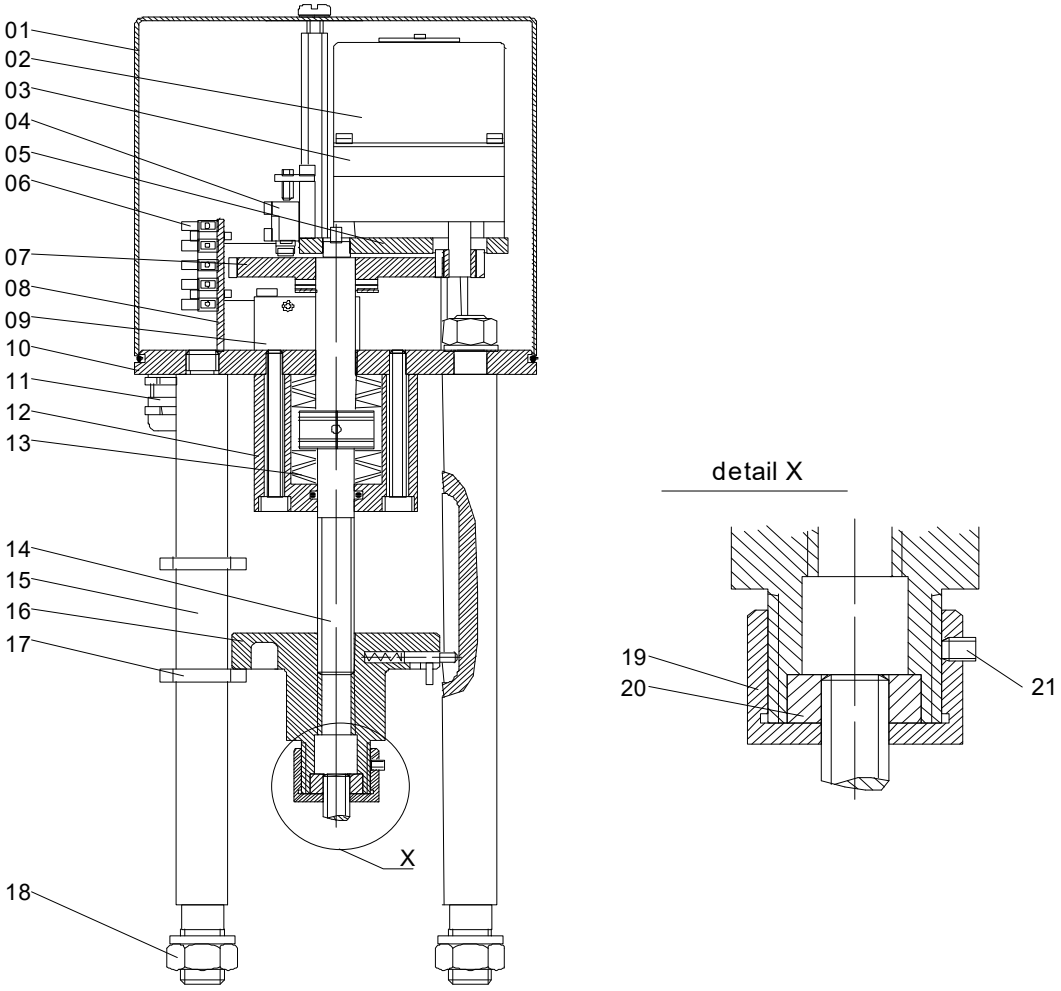
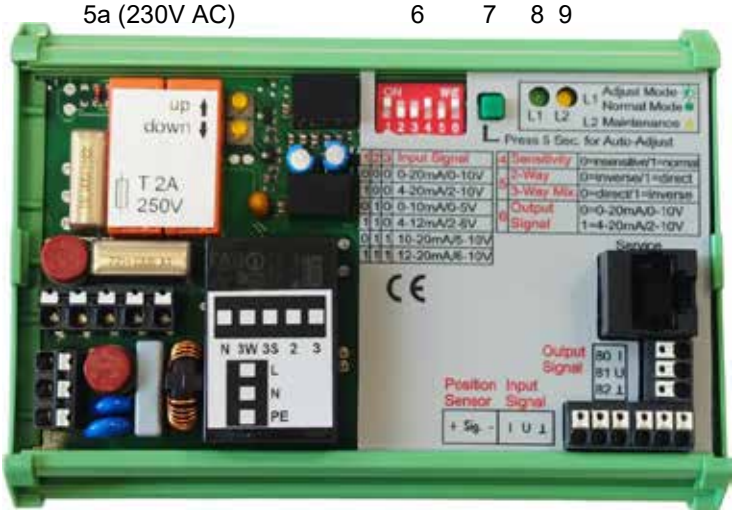


Fig.2

No.	Designation
01	Bonnet
02	Motor
02a	Capacitor
03	Gear
04	Limit switch for valve spindle position "down"
05	Mounting plate for motor
06	Terminal bar
07	Gear wheel
08	Mounting plate with wiring diagram
09	Limit switch for valve spindle position "up"
10	Base plate
11	Screw-type cable bushing
12	Spring housing
13	Set of disc springs
14	Spindle
15	Mounting rods
16	Hand wheel with blocking lever
17	Stroke indicator
18	Hexagonal nut M16
19	Coupling nut
20	Screw collar ring
21	Fixing screw





1 connection mains voltage*
2 fuses for electronics
3 connection limit switch and drive motor*
4 fuse for drive motor
5a relays with status LEDs
5b ditto, but changeable relays (24V DC only)
6 coding switch for input and output section, direction of action and sensitivity
7 button for start of automatic travel adjustment
8 status LED L1
9 maintenance LED L2
10 connection for service interface, external operating unit
11 connection signal output
12 connection for position signal *
13 connection drive signal*
* =internal wiring

Description

The positioner turns an incoming drive signal into the correct drive position by comparing the signal with the position feedback of a sensor which is installed in the drive and adjusting the drive with the up and down relays. There is a signal for travel feedback 0/4..20 mA / 0/2..10 V by default. Optionally, an additional contact relative to the actuator position is possible, e.g. to limit the valve stroke to a min. or max. opening degree.

The device is integrated in the actuator without operation and normally also maintenance-free. In case of special operating conditions (very frequent switching, unfavorable optimization), the relays can be replaced, e.g. in case of wear or stuck contacts (24V DC version only). All important basic settings for direction of action and sensitivity are specified by way of the coding switches. Communication with leading systems is also possible via bus adapter, e.g. for Profinet KFM item nr. 99spne.., for data acquisition or remote maintenance purposes as well as for the execution of digital positioning commands.

The commission (if necessary, please refer page 3) consists merely of a check of the settings and a single operation of the calibration key. After this LED L1 will show if the automatic adjustment of the final positions is finished. Subsequently the device is ready for use.

Predictive Maintenance:

For predictive maintenance of the actuator, a signal is output by LED L2 if the previous use of relays (switching operations) or of the spring assembly (approach of the end positions) requires a check of the drive.
The wear status of the actuator can be read with the PC software PKS at any time, as well as the history of setpoint, actual value and drive position which are saved in the integrated datalogger.

Type list	**Li.Nr.**
Basic model with non- contact transmitter	**49sr7..h**
Extras:	
Special voltage (1=115 V AC, 2=24V AC, 8=24V DC), others on request	**49sr7_ ..**
Additional contact (Relays, potential free NO contact 250V, 2A)	**49sr7..1**

Changeable relays (24V DC version only)

Notes on the change
- Have qualified personnel disconnect the valve from live parts on all sides.
- Loosen the two retaining screws from the hood cover and remove the hood.
- Flip both retaining clips sideways and pull off relays by hand (position 5, see photo on page 1).
- Plug the new relays onto the relay sockets (note the orientation of the pin contacts to the relay socket).
- Snap the retaining clips onto the center of the relays.
- Put on the hood and fix it with the two retaining screws.

Note: Proper function can only be guaranteed with relays that have been purchased or approved by KFM.

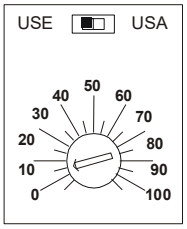
Option: additional contact

Description
The version with additional contact contains an additional relay with potential free NO contact. This can be used to limit the valve stroke or as a signal contact. Direction of action and switching point are adjustable, optionally factory pre-set and wired.

Commissioning
Before commissioning, the wiring (please refer below) as well as the required settings for direction of action and switching point have to be checked.
Hint: Before activating the automatic stroke compensation, set the switching point of the additional contact to 0% (US A) or 100% (US E), otherwise the full setting range will not be passed through!

Settings
Switching point:

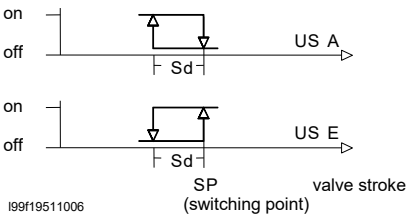
Adjustable 0 ... 100 %,
referring to valve stroke



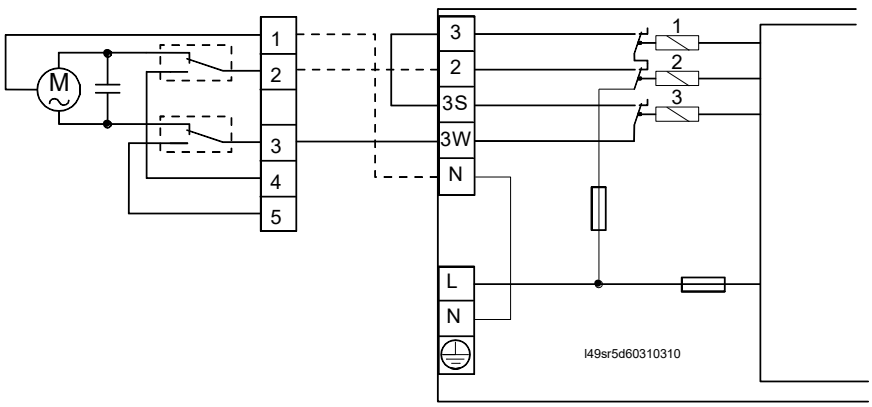
Direction of action:

Adjustable, alternative:
US A: relay turns off while increasing valve stroke

US E: relay turns on while increasing valve stroke



Wiring example for minimal stroke limitation of three-way valves
(straight passage closes at spindle in upper end position)



Commissioning

Hint: Motor control valves with positioner are configured at factory (and adjusted to the travel) according to the order specifications before delivery. If the parameterization is not changed, a new automatic adjustment is not necessary.

Check mechanical setting of the potentiometers in drive before commissioning !

The settings of coding switches for input/output signal, operating range and direction of action have to be checked before commissioning.

Afterwards press the button for automatic travel adjustment for 5 seconds. The drive will go one after another to both end positions and sets itself up.
Two LEDs show the actual status of the relays. The entire adjustment process takes about 5 minutes.

The status LED flashes in 3-second intervals during the adjustment. As soon as the adjustment is completed, the LED lights up continuously.

Fast flashing (1 sec- intervals) signals an error at the measuring inputs (power / voltage).
Details can be shown by an additional operating device or via external KFM software e.g. PKS.

Operating program PKS
With the KFM software PKS it is possible to read out the wear status of the actuator (switching cycles of the relays, number of operations up to the end position) and the memory of the integrated datalogger (history of actual values, set values and potentiometer positions. The datalogger information can be saved as *.csv-file which is editable with e.g. Microsoft Excel.

Operating display

Status – LED L1 (green):

Continuous	Normal operation
Flashing, 3s intervals	Adjustment in progress
Flashing, 1s intervals	Error at the measuring inputs

Maintenance – LED L2 (depending on version yellow or red):

Continous	Due to the previous use of the relays (switching cycles) or of the spring assembly (approach of the end positions), a revision is recommended.

Settings

Input range:	*Position code switch 1 to 3:*
0...20mA / 0...10V	000
4...20mA / 2...10V*	100
0...10mA / 0...5V	010
4...12mA / 2...6V	110
10...20mA / 5...10V	011
12...20mA / 6...10V	111

Response sensitivity :	*Position code switch 4*:
normal*	1
insensitive	0

Direction of action:	*Position code switch 5*:
direct*	0 for three-way mixing valves (close- position above) 1 for straight way valves or three-way diverting valves (close- position below)
inverse	1 for three-way mixing valves (close- position above) 0 for straight way valves or three-way diverting valves (close- position below)

direct: increasing input signal opens (straight) passage
inverse: increasing input signal closes (straight) passage.

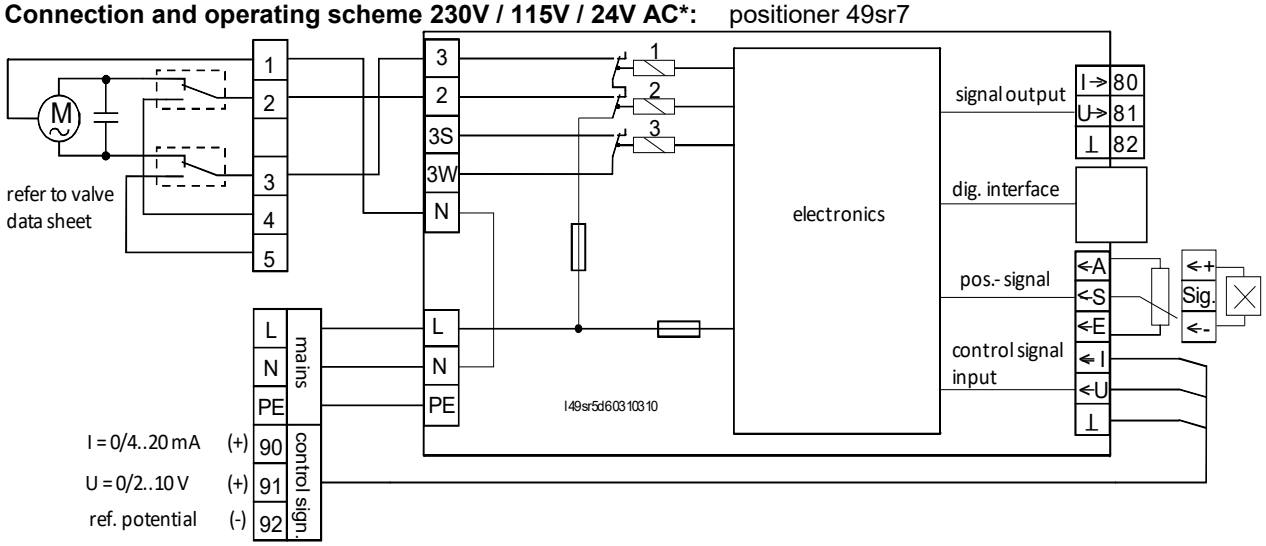
Output range:	*Position code switch 6*:
0...20mA / 0...10V	0
4...20mA / 2...10V*	1

* = *factory setting*

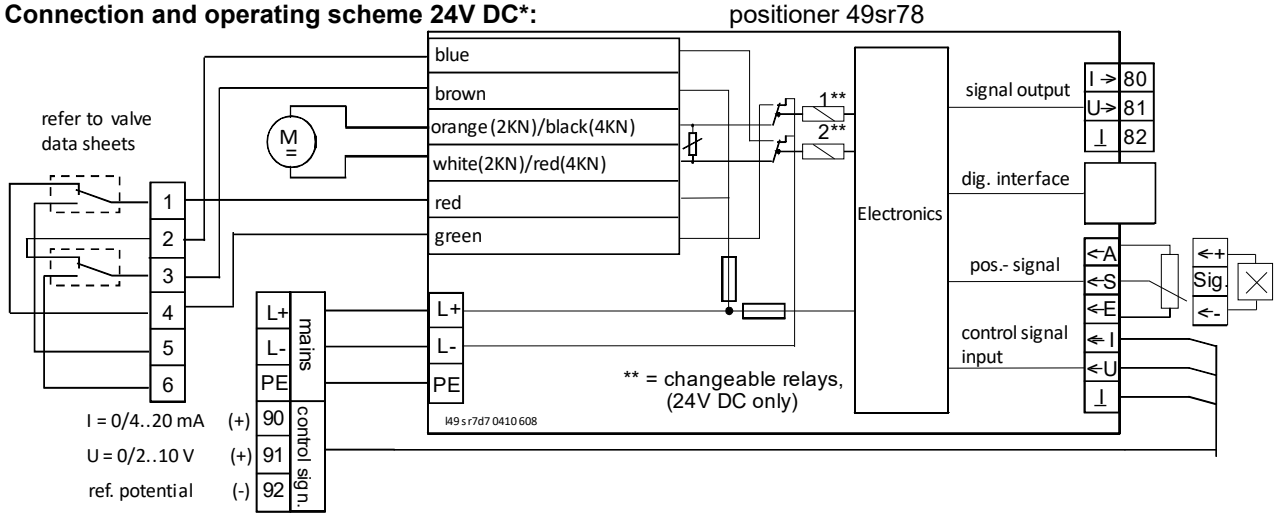
Technical data:

Input (adjustable):	0...20mA / 0...10V 4...20mA / 2...10V 0...10mA / 0...5V 4...12mA / 2...6V 10...20mA / 5...10V 12...20mA / 6...10V
Response sensitivity:	switchable normal / reduced
Output:	up to 3 relays, max. 250V , 2 A (Fuse protection 24V DC: T 1,6A) 0/4...20mA for position feedback, load < 500 Ohm, 0/2...10 V, load > 500 Ohm
Direction of action:	adjustable: *direct*: increasing input signal opens (straight) passage *inverse*: increasing input signal closes (straight) passage
Operating display:	2 status LEDs for adjustment, normal operation, error and maintenance 2 (3) LEDs for function display relays 1 and 2 (3)
Mains connection:	230V +/- 10 %, 48...62Hz, approx. 3VA alternative 115V/24V AC or 24V DC, other voltages on request
Interface:	service interface KFM 2.0 RJ45 (socket)
Allowed ambient temperature:	0...60°C, nominal temperature 20°C

Connection and operating scheme 230V / 115V / 24V AC*: positioner 49sr7



Connection and operating scheme 24V DC*: positioner 49sr78



* maximum version, some connections may not exist depending on version. Decisive for the delivered version is the connection diagram on the device.
Hint: Control signals must be shielded, maximum cable length 30 meters.

Installation:

Attention!: - *Installation, operation and maintenance should be done only by qualified personnel.*
- *Release the operating mechanism before working on the valve.*
- *It is not permitted to work on the valve body and to exchange the operating mechanism as long as the valves are subjected to pressure and temperature.*

The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel.
Provide suitable measures to absorb possible tensile and pressure forces.
The valve must not serve as a fixed point. It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).

Regard the permitted max. operating pressure and temperatur as described in the corresponding valve specification sheet.

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

For operating from a distance, a release cord (supplied by customer) should be fastened with the delivered spring hook on the toggle clamp lever.
Notice: The valves are delivered with unloaded spring, not ready for operation. For operation readiness after assembly, it is necessary to tighten the actuating spring as described below.

Operation:

Operation readiness: Hang out the spring hook with release cord and put the lengthening lever on the toggle clamp lever.

Push the toggle clamp lever acc. to tighten-direction arrow up to the snap point, to open the straightway (emergency stop valves) or to close the straightway (emergency outlet valves) and to tighten the actuating spring.

Attension: *Injury danger by emergency function release!*

Subsequent take off the lengthening lever and fasten the release cord with the delivered spring hook on the toggle clamp lever.

Emergency release: The actuating spring will open the straightway (emergency outlet valves) or close the straightway (emergency outlet valves) when the toggle clamp lever will be moved back from the snap point with the release cord.

After emergency release, it is necessary to tighten the actuating spring for operation readiness as described above.

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Occasionally lubricate the slide guide on the toggle clamp.

Description

The valve has the job of ensuring that a minimum flow is maintained in a system even when all other routes are essentially closed. In normal operation it is closed, and only opens when the preset overflow pressure is exceeded.

The valve is a single-seating, two-way valve with spring loading. To the outside, the spindle is sealed by a stainless steel bellow that can absorb the full stroke. The cone is implemented as a control cone with a equal percentage characteristic. This avoids a sudden drop in the pressure when the valve opens.

Function:

Flow reaches the cone from underneath, and the overflow pressure, which depends on the tension set by the spring, pushes it upwards, so opening the passage.
The desired overflow pressure is adjusted by using a spanner to set the initial tension in the spring; it can be read from the scale on the side which covers a range from 1…4 bar (the factory setting is 2 bar).
The pressure setting is not an absolute value, but is the differential pressure between the inlet and outlet of the valve.

Assembly:

Attention:

- *Installation, operation and maintenance should be done only by qualified personnel.*
- *Release the regulating device before working on the valve.*
- *It is not permitted to work on the valve body and to exchange the regulating device as long as the valves are subjected to pressure and temperature.*

Installation position should be vertical (preferable) to horizontal.
Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).
Regard the permitted max. operating pressure and temperatur as described in the corresponding valve specification sheet.
The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale.
If possible, provide a dirt trap in front of each control valve.

Retighten the screws of all flange connections (also lid and connection piece flanges) after initial heat-up and prior to commissioning / start-up.

Commissioning:

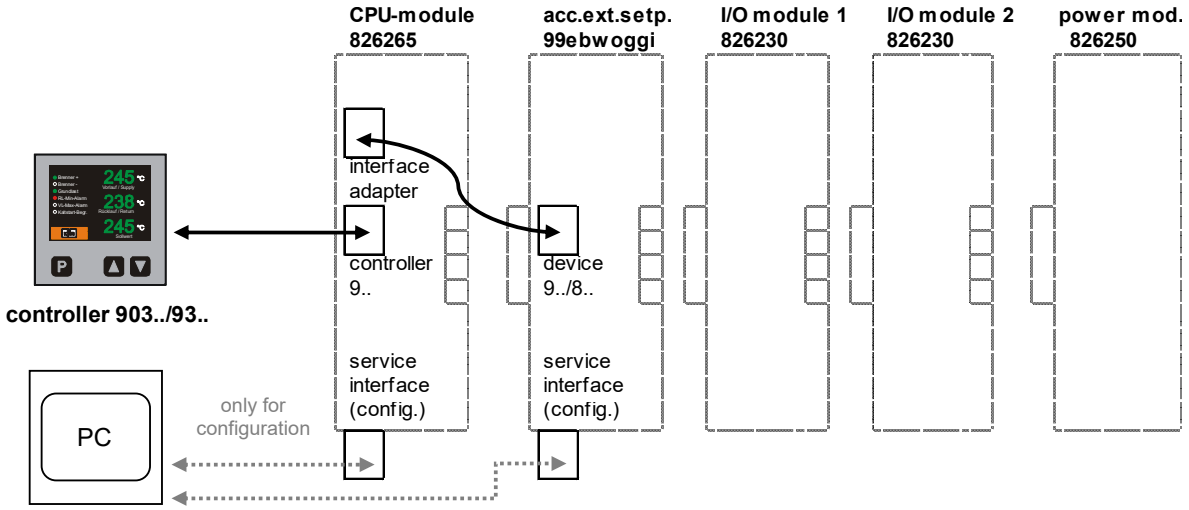
The valve was supplied with factory settings of either 2 bar or 1.5 bar. This setting must be checked in relation to the actual operating conditions found, and may need to be corrected.

The setting is changed using the adjusting screw. A size 17 spanner is required for this job. The adjusting screw causes the position of the upper spring plate to change, and so changes the initial spring tension. The setting can be read from the scale on the side (with a range from 1...4 bar). Turning to the left raises the trigger pressure, turning to the right lowers it.

The setting is correct when the valve is closed in normal operation (full rate of flow through the equipment), and only opens when the differential pressure exceeds the set value. If it is found that the factory setting is too low* (valve is continuously open), a higher value should be set. If the setting is too high (the valve either doesn't open, or opens too late as the differential pressure rises), a lower value must be set, although it must not be so low* that it remains open in normal operating conditions.
(* If the setting is too low, the flow can cause the cone to vibrate, and this can damage the valve!)

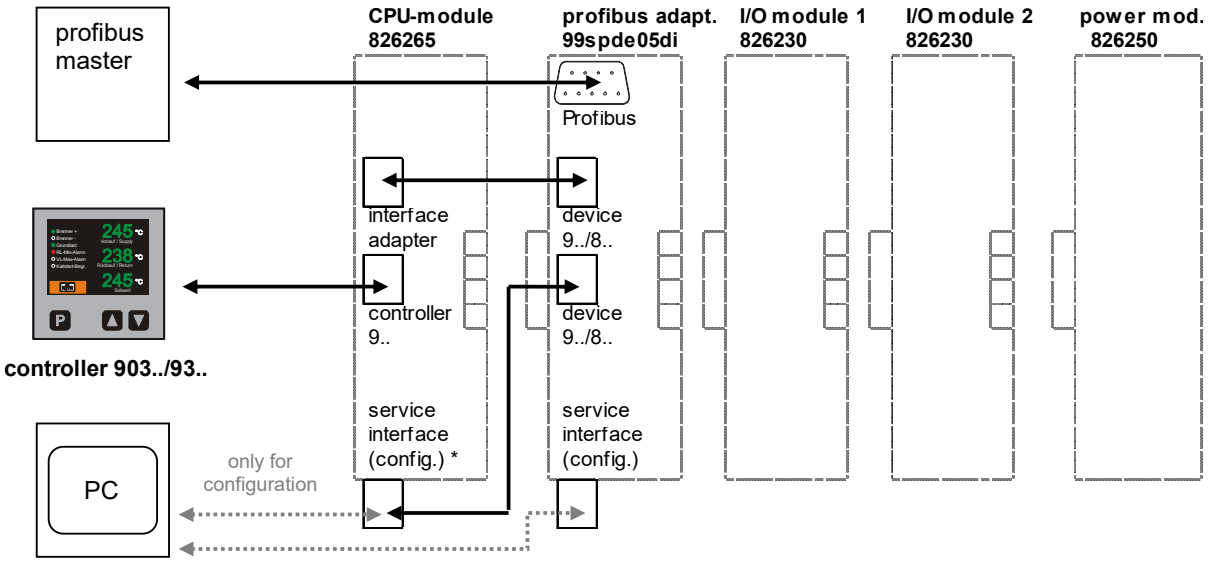
Example 1:

Fault detector (826265) with two I/O modules (826230) and plain text-messages and history on controller 903../93.., as well as accessory device for external setpoint and analogue signal outputs with power supply via internal bus connection (99ebwoggi).



Example 2:

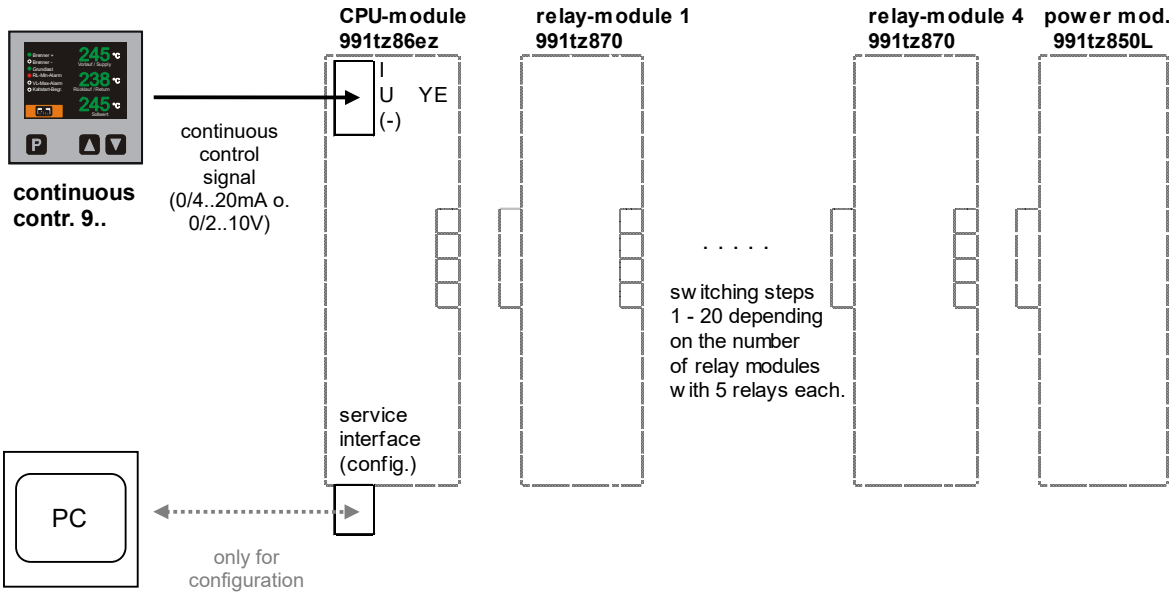
Identical as example 1- f**ault detector**, but instead of 99ebwoggi with profibus-adapter (99spde05di) for power supply via internal bus connection.



* The patch cable to the profibus adapter has to be removed prior configuration of the CPU-module.

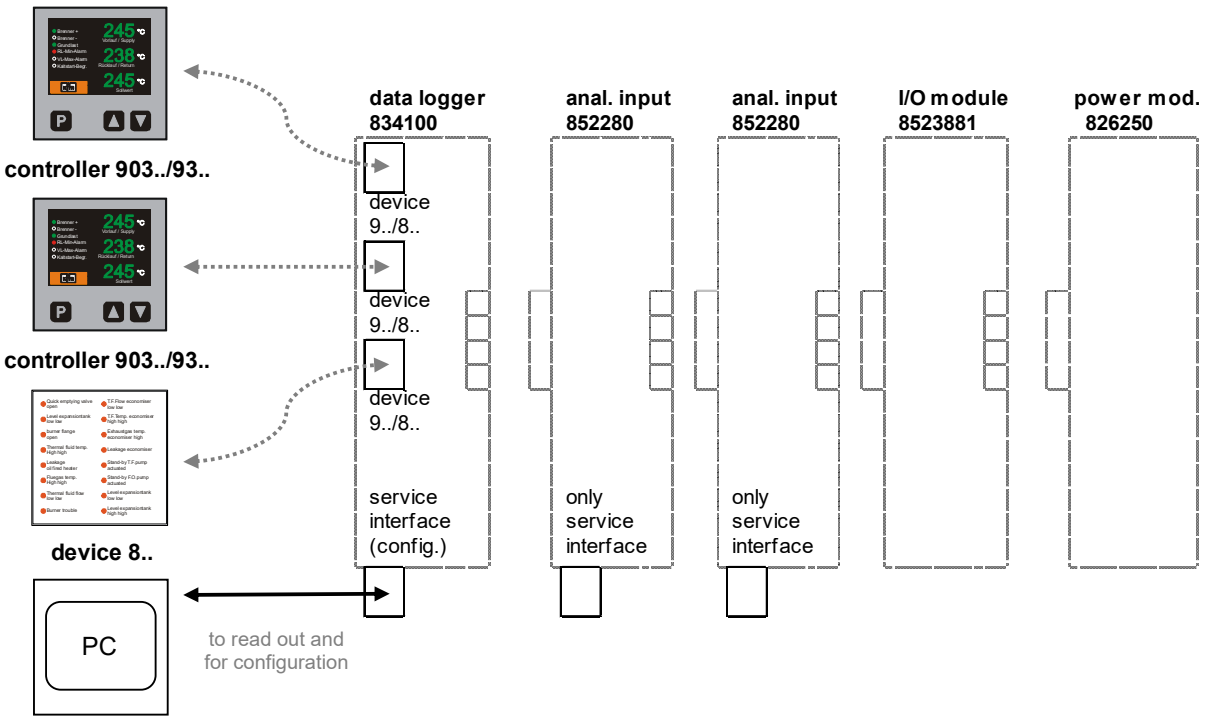
Example 3:

Modular **step controller** with CPU-module (991tz86ez) and max. 4 relay modules (991tz870) with 5 relays each. Depending on the version, there is optionally a cyclic switching output on the power supply module (991tz850L) available.



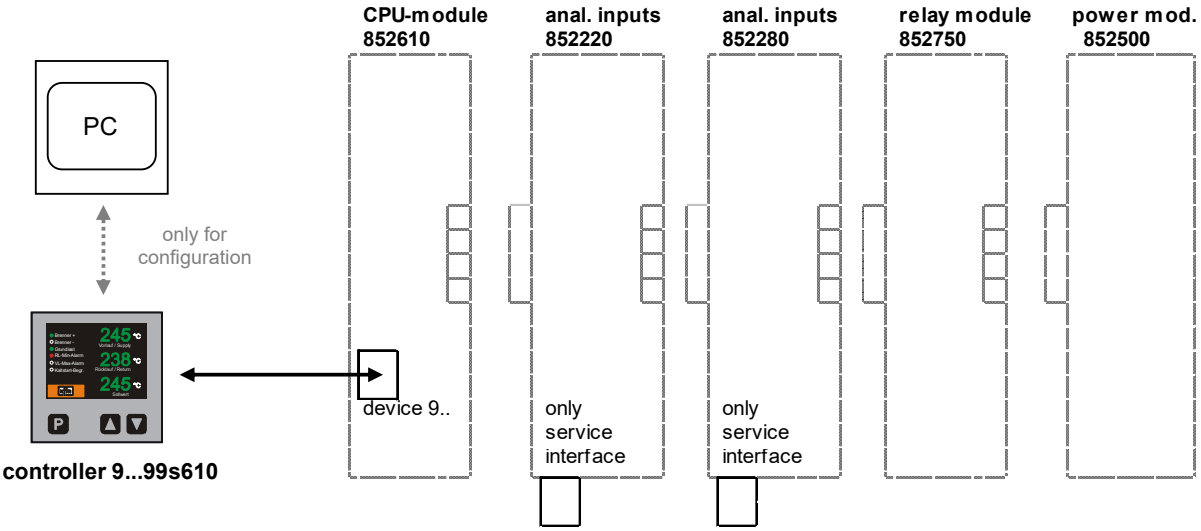
Example 4:

Data logger (834100) with two analogue input modules (852280) and one I/O module (8523881) for direct recording of analogue and binary data, independent from serial connected devices. In addition, data from 3 more devices can be recorded.



Example 5:

Modular **hardware-expansion modules** with hardware expansion adapter (852610) e.g. for additional analogue inputs (852220 / 852280) and relays (852750) etc., the optional hardware-expansion interface 99s610 is necessary at the controller-side.



1 Digital display of set value
2 Pushbuttons for adjusting the set values recessed and sealable
3 Internal reset pushbutton
4 LEDs for operating and error displays
5 Function check button



DIN assembly tests:

STB 1146 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0045	ref. rule 97/23/EG, modul B and D

General:

Two-channel self-monitoring safety temperature limiter, constructed to meet the requirements for increased safety (DIN EN 14597, SIL 2).

The electrical safety circuit is switched off, i.e. opened, if the set value is exceeded or if there is a fault at the measurement input or in the device. A fault signal is also provided at the terminals. The limiter can only be unlatched manually after the fault has been rectified.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and intermediate explosion arresters.

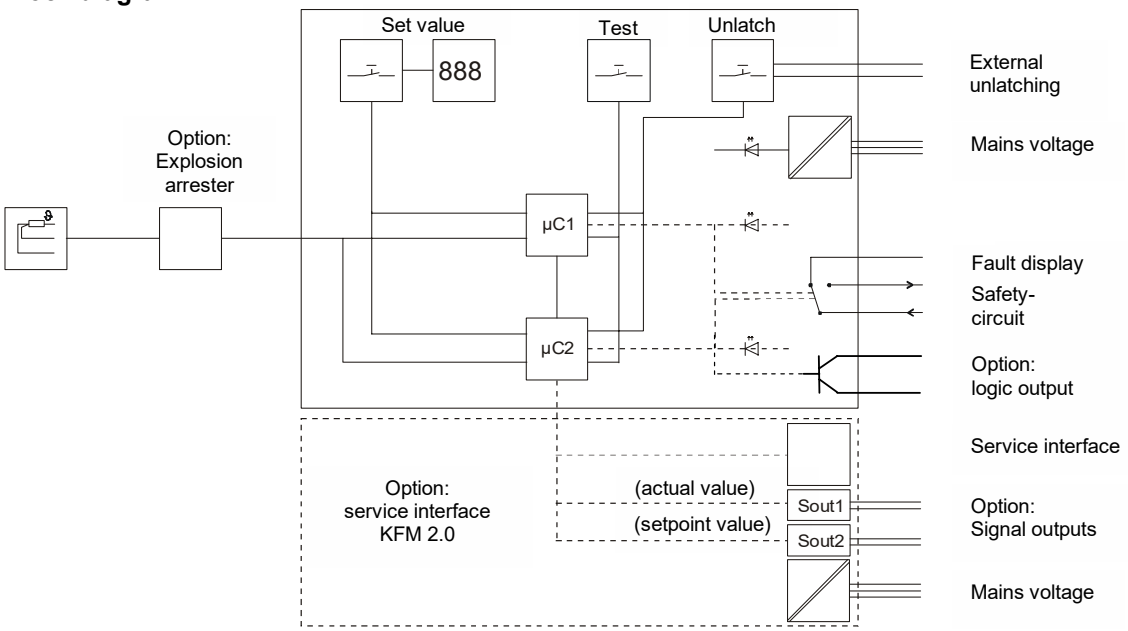
The device includes test buttons with which the specified annual function checks can be carried out very conveniently, without having to disturb the connected cables.

Actual- and setpoint value as well as the status of the relays can be transmitted by using the optional service interface (extra module), actual- and setpoint value can additionally be transmitted by optional signal outputs. In conjunction with external adapters also with Profibus, Modbus, Ethernet etc.

Models:

845 210	Model without display
845 220	Model with display
845 2 ⎵1	Model with additional logic output
845 2….-849s	Model with service interface, protocol KFM 2.0
845 2….-849og2	Model with 2 signal outputs 4..20mA
845 2….-849sog2	Model with service interface and 2 signal outputs 4..20mA
Suffix (also extra module)	without: 230V AC, 01 = 115V AC, 02 = 24V AC, 08 = 24V DC

Block diagram:



Installation: Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Lock the housing with its tightening groove on the mounting rail.

Electrical wiring:
Connect up the device following the wiring diagram
- wire cross section max. 1,5 mm^2
- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.
- Exclude hazards due to live parts using an appropriate installation ,e.g. in a control cabinet, to protect against unintentional contact.

Putting into operation:
Switch on power supply. Depending on the setpoint, control lamps and the display will light up after a few seconds. If nothing happens: Switch off power supply, check electrical connections and other adjustments.

Maintenance:
All electronic devices in the product range of the manufacturer are virtually maintenance-free. Provided that the device is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance mark and remove the connected leads .

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Parameter settings: (*existing for model with signal outputs ..og2 only, resp. depending on type*)
The device is delivered preadjusted, the start / end of range (-200 / 600) and the setting (4-20) of the signal outputs are non-adjustable. In case of changes, the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.39) using the configuration interface.

		factory setting	*notes*
Adr	Address KFM device 8..	5	___

Function:

After the mains voltage has been switched on, the operating indicator lights up. If the actual value is lower than the set value, both relays switch on, LEDs K1 and K2 light up, and the electrical output circuit is closed. If the actual value is higher than the set value, both relays are released and the LEDs go out. The electrical safety circuit is interrupted, and the normally closed contacts of the relays connect the voltage from terminal 16 to the fault signal output at terminal 14. Even if the actual value then falls again below the set value, or if the mains voltage is interrupted, the status remains unchanged. Only after the internal reset button, or an externally connected reset button, is pressed, and when the actual value is smaller than the set value (less the hysteresis), can the temperature limiter return to the operating state.

Adjusting the set values:

Type 845 210 (model without display of the set value):
Some appropriate means (a resistor decade box or similar simulator) is used to simulate the desired trigger temperature at the sensor input. This is entered as a new set value by pressing the "SET" button.
Note: Tolerance figures related to the components must be considered in relation to the set value range when using this version.

Type 845 220 (model with display of the set value):
The mode in which the set value is adjusted is activated by pressing the "SET" button, and the displayed value flashes. The new set value can now be adjusted using the arrow keys. The setting mode is deactivated by pressing the "SET" button again. The displayed value ceases to flash, and the adjusted value is adopted as the new set value.

For reasons of safety the set value should be adjusted on the Type 845 220 to a value 2K below the desired trigger value to allow for possible component tolerances. As an alternative, the determined trigger value can be noted on the safety label!

In accordance with DIN EN 14597, the set value must be secured against accidental or unauthorised modification. For this purpose, a safety label is applied over the "Set" button to seal it. In the case of devices of Type 845210 the set value must be recorded on the safety label.

Whenever the set value is adjusted, the function of the device is to be checked by simulating a corresponding temperature at the sensor input!

Function check:

In accordance with DIN EN 14597 the safety temperature limiter must be subjected to a function check once a year. To do this, the recessed test buttons are pressed in sequence, holding them down for about 3 seconds each. Pressing the first test button makes it possible to check that the associated relay releases, the corresponding LED goes out, the electrical safety circuit is interrupted and the external fault signal lamp lights up. The device must return to the normal condition by pressing the reset button. Both LEDs light up again, and the electrical safety circuit is closed. The second channel is then to be tested in the same way.

The annual function check specified by DIN EN 14597 is only carried out correctly if the two buttons are pressed independently, one after the other.

Faults:

There are a number of reasons why, after having been triggered in operation or after carrying out the function check, the device does not return again to the normal state despite the actual value being sufficiently low. The first step should be to check, e.g. by means of a resistance measurement, whether the sensor, including all the measurement cables, is OK.
Check also whether the actual value is indeed within the permissible measuring range. If the range is exceeded, the device switches off. When an attempt is made to reset the device, the relays close briefly but immediately open again, so that operation is not possible. Only when the actual value is within the acceptable range again is normal operation of the device possible following a reset.

If the possible sources of malfunction mentioned above had been ruled out, it can be assumed that there is an internal fault.
In that case, the device must be exchanged and returned to the factory for examination.

Acceptable sensors:
All temperature sensors demonstrably according to DIN EN 14597 are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet.

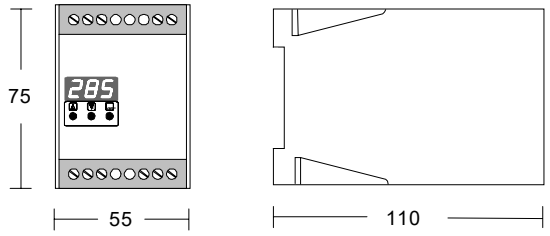
Type	Operating medium	Maximum switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

Characteristic values:

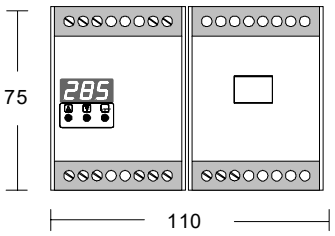
Input / Measuring range:	1 x Pt 100 DIN / -200 ... + 600 °C, others optional
Set value adjustable range:	*Note: Observe the sensor's switching point!* Type 845 210: -200 °C (+10K) ... 600 °C (-10K) Type 845 220: -99 ... 600 °C
Adjusting the set values:	Using recessed, sealable push-button
Output:	2 relays, max. 250 V 2 A*, Option: 1xLogic (open coll. max 24VDC/100mA) status display ch. 1 Option: 2 cont. outputs 4...20mA (Load<=500Ω) for actual-/ setpoint value
Switching hysteresis:	8 K +/- 1K, other values available on request (expressed as appendix to type identifier in plain text, e.g. 845 220 4K)
Process safety time (PST):	10 seconds
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz, alt. 115 VAC, 24 VAC, 24VDC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20, for mounting within a housing offering at least IP 40
Permissible ambient temperature:	0...60°C, Nominal temperature: 20°C
Storage and transport temperature:	-20 ... +80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional
Data transfer rate:	9600Bit/s

Installation dimensions:

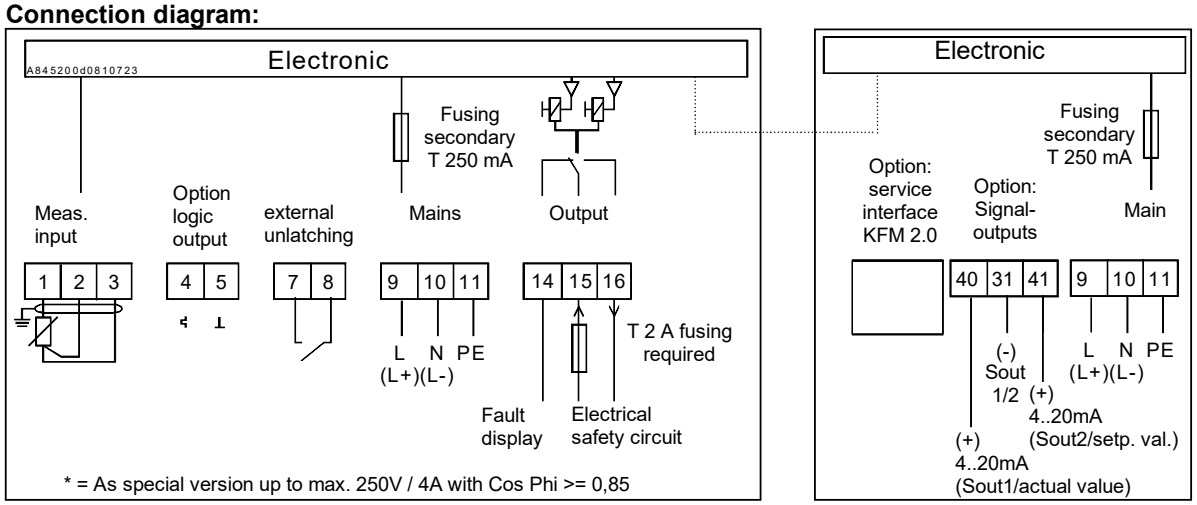
Only safety temperature limiter:



Safety temperature limiter incl. service interface / signal outputs



Connection diagram:



1 LEDs for operating and error displays
2 Pushbuttons for functional test, reset and adjusting the set values (recessed and sealable)
3 TFT display
4 Pushbuttons for operation and reset
5 Bus interface for KFM field bus adapter
6 USB service interface



type test approved:

STB / STW 1255 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0035	ref. rule 2014/68/EU

General:
Safety temperature limiter (STB) or monitor (STW) in two-channel and self-monitoring design in accordance with the requirements for extended safety (DIN EN 14597, SIL 2).

A switch-off, i.e. interruption of the safety circuit, occurs when the set limit value is exceeded (max function) or undercut (min function) as well as in case of errors in the measuring input or device. Unlocking is only possible manually and only after the fault has been eliminated (STB) or automatically (STW). Operating principle according to DIN EN 60730 Types 2B, 2H, 2K, 2P and 2V (only STB).

Depending on the version, PT100, stand. signal (4-20mA) or thermocouple are available as meas. inputs.

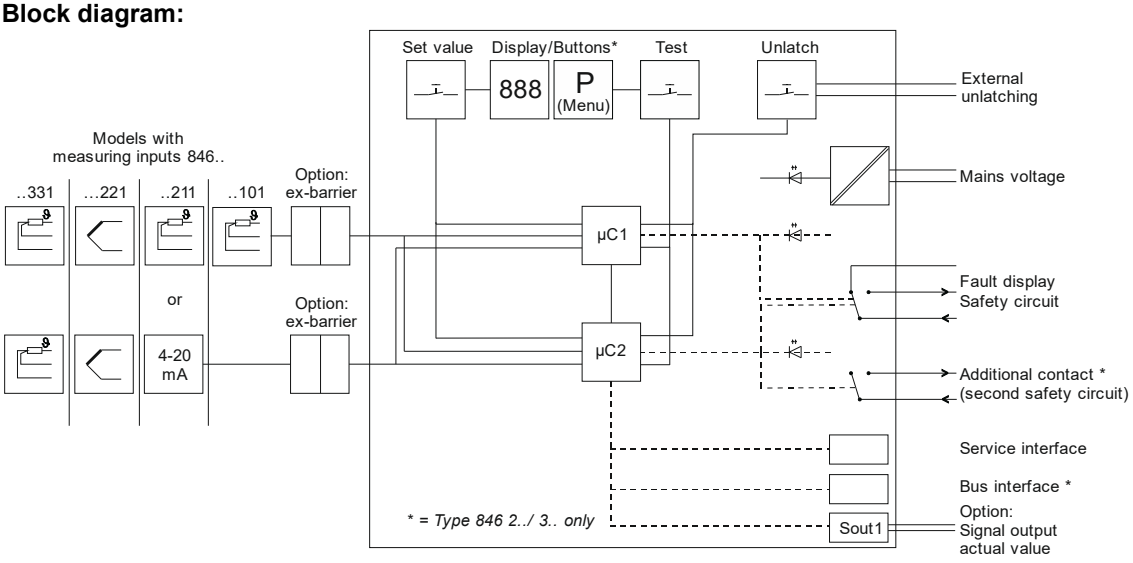
A potential-free safety-related additional contact is used for parallel output of the switching status.

The ix industrial bus interface allows the connection of KFM adapter modules, e.g. 99spne (Profinet), which allows the actual value, limit value and status of the device to be read out. When the bus interface is plugged in, safety operation is possible without any changes.
The service interface is used exclusively for parameterising the STB, e.g. during commissioning. Safety operation is not possible when the USB plug is plugged in.

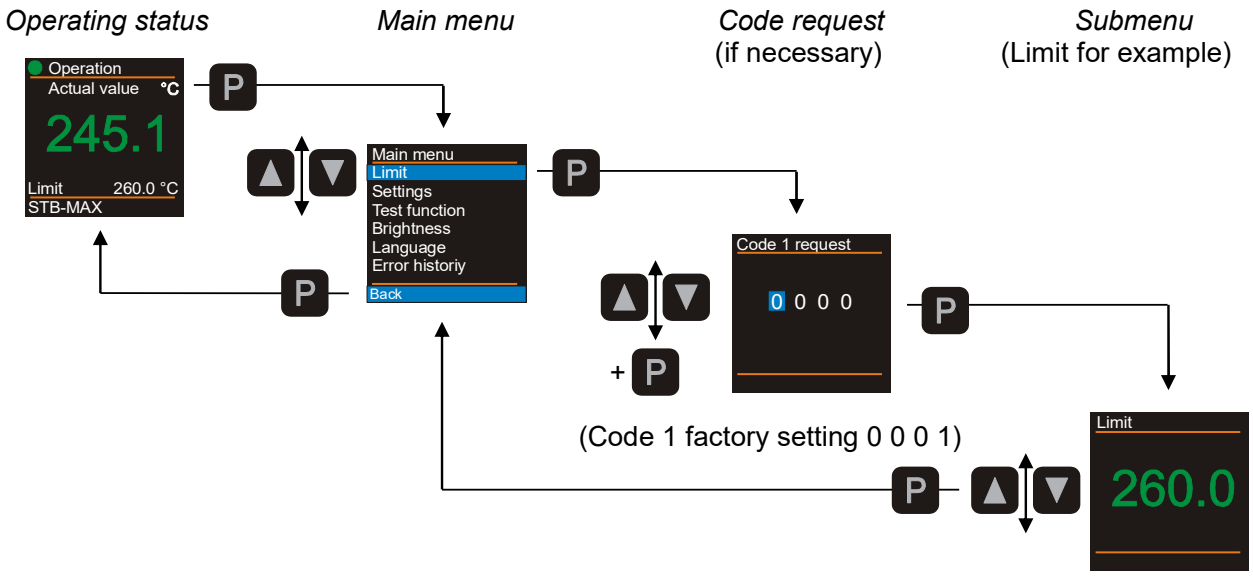
Models:

846 100	Basic version STW - max, input Pt100 without TFT display
846 101	Basic version STB - max, input Pt100 without TFT display
846 211	Basic version (STB/STW), input Pt100 / 4-20mA with TFT display
846 221	Version (STB/STW) with input 2 x thermocouple
846 331	Version (STB/STW) with input 2 x Pt100
Suffix	without: 100-250 V AC, 8 = 24V DC

Block diagram:



Operating scheme (type 8462.. only)



Note concerning the comfort- operation: The next parameter respectively the next submenu is marked blue after confirming an entry, limit is marked blue after the return from the submenu "Settings" to the main menu.

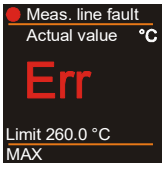
Short overview status messages (type 8462.. only)



Limit

Limit over- or below exceeded (error history recording)

→ *Safety circuit interrupted*



Measuring line fault

Error measuring input (error history recording)

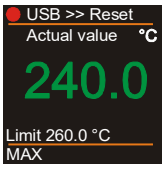
→ *Safety circuit interrupted*



USB active

Setup- Interface connected,
no operation is possible

→ *Safety circuit interrupted*



USB → Reset

Setup- Interface disconnected,
Reset required

→ *Safety circuit interrupted*

All status messages
see page 6

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Reference!
This symbol refers to further information in other sections, chapters or other manuals.

Intended use

The device is intended, in accordance to the technical data, for monitoring thermal processes in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments. When protecting pressure equipment, care must be taken when selecting the sensor to ensure that it meets the requirements of the Pressure Equipment Directive 2014/68/EU.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Inspect the device for any visible signs of damage caused during transport.
Check power supply according to name plate.
Fasten the housing in the mounting slots on the standard rail.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly or wrong set parameter values on the device (for example: device function) could affect the correct monitoring process. The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.
- Live parts (terminals, screws, etc.) are to protect against unintentional contact, for example by an appropriate control cabinet installation.

Electrical wiring

- Terminal blocks on the upper an lower surface; connect up the controller following the wiring diagram on the device.
- For connecting power supply phase wire and neutral wire must not be transposed.
- Wire cross section max. 1,5 mm^2. Maximum 0,75 mm^2 are permitted for the 5- pole terminal blocks when using ferrules with plastic sleeves. Stripping lenght 10mm.
- Lay input-, output and supply cabling physically seperated and not parallel to one another.
- Use shielded and twisted cables for the measuring-, control- and interface circuits to avoid interferences; Ground the shield properly. Do not lay close to components or cables through which current is flowing. The length of the cable must be max. 30m.
- Do not loop through ground wires, but connect to a common grounding point in the control cabinet; furthermore, a professional potential equalization must be noted and the lines must be kept as short as possible.
- The DIN VDE 0100 “construction of low-voltage systems” respectively the appropriate country specific regulations (for example on basis of IEC 60364) must be followed for the wiring material, the installation and the electrical wiring.

Putting into operation

When protecting pressure equipment, care must be taken when selecting the sensor to ensure that it meets the requirements of the Pressure Equipment Directive 2014/68/EU.
Switch on the mains supply. Digital displays and indicator lamps, if present, light up after a few seconds depending on the limit value setting. The signal output is available after approx. 5 seconds. Set the desired limit value. Check other settings.

Maintenance

All electronic devices in the product range of the manufacturer are virtually maintenance-free. Provided that the device is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair mark the leads and remove the terminal blocks.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

see chapter status messages on page 6

Displays:

After switching on the mains voltage, the "Status" LED (Type 8461...) or the operating status indicator lights up on the TFT display (Type 8462/3...).
If the actual value is below the limit value and no triggering has occurred before, both relays switch on and the safety circuit on the output side is closed. Depending on the version, this is indicated by the LEDs K1 and K2 (Type 8461...) or the green LED symbol with the indication "Operation" on the display (Type 8462/3...).
If the process value exceeds the limit value*, both relays drop out and the LEDs K1 and K2 go out (Type 8461..) or the LED symbol "Limit value" (Type 8462/3..) lights up red. The safety circuit is interrupted. The optional additional contact drops out. The status remains unchanged even if the actual value subsequently falls below the limit value again or the mains voltage is interrupted. In the safety temperature monitor function, the device is automatically reset to the operating state when the temperature falls below the limit value. The safety temperature limiter can only be reset to the operating state after the internal or the externally connected reset button has been pressed and the actual value is lower than the limit value (minus the hysteresis).
*= Example MAX- function

Status messages:

Type 8461.. *(version **without TFT- display**)*

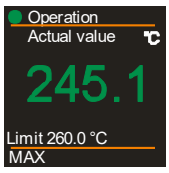
Status-LED	K1 LED	K2 LED	meaning
Off	Off		E.g., without power supply voltage, fuse defective
Green	Yellow		Proper operation
Green	Off		Limit over- or below exceeded/ test function K1 and K2
Green	Off	Yellow	Test function K1
Green	Yellow	Off	Test function K2
Red	Off		Error measuring input
Red flashing	Off		Internal error. No further operation possible. Remit device for repair

Type 8462/3.. *(version **with TFT- display**)*:

Status-LED	text display	actual val. display	meaning	error-history
Green	„Operation“	#	Proper operation	
Red	„Limit“	#	Limit over- or below exceeded	recording
Red	„test active“	#	Test function still active	
Red	„Meas. line fault“	Err	Error measuring input	recording
Red *	„Meas. line fault 1“	Err.1	Error measuring input 1	recording
Red *	„Meas. line fault 2“	Err.2	Error measuring input 2	recording
Red *	„Meas. line fault 1/2“	Err	Error measuring inputs 1 und 2	recording
Red *	„Meas. line.-diff.“	Err.D	Difference between measuring inputs 1 and 2	recording
Red	„USB active“	-	Setup- Interface connected, no operation is possible	
Red	„USB → Reset“	-	Setup- Interface disconnected, Reset required	
Red	„Internal error“	-	Internal error. No further operation is possible. Remit device for repair	recording

*= only for type 846 211 (2 x thermocouple) / 846 331 (2 x PT100)

Operating status:



Analogue values (type 8462/3.. only): Actual value (size 8mm) and limit (size 3mm) are displayed. A dedicated unit for each value can be configured if desired. The actual value- descriptive text is changeable by means of the PKS PC software. The status of the relays is shown at the upper- left side of the display by the colour of a circle icon and a plain text message. The device function is displayed at the bottom on the left side in plain text. If existing, the name is displayed at the bottom on the right side.

Setpoint value setting:

For reasons of safety the set value should be adjusted on the Type 845 220 to a value 2K below the desired trigger value to allow for possible component tolerances. As an alternative, the determined trigger value can be noted on the safety label!

Whenever the set value is adjusted, the function of the device is to be checked by simulating a corresponding temperature at the sensor input!

Type 8462/3.. *(version* ***with TFT- display****):*
Briefly press the P - button (do not *hold*)

The main menu is displayed, the sub menu “Limit” is marked blue.
Briefly press the P - button (do not *hold*)

Code 1 request, the first of four digits is marked blue and can be changed using the ▼ (lower)...▲ (higher) buttons, press the P -button *briefly* to continue.
(Code 1 factory setting: 0 0 0 1)

The limit can now been *changed* using the ▼ (lower)...▲ (higher) buttons.
Where appropriate, longer pressing causes faster changing.

A limit change is effective *immediately*, without any further operational steps.

return *to main menu:*
Briefly press the P - button (do not *hold*)

return to operating mode: by marking “back” and pressing the P -button *briefly, no automatic switchback*!

Type 8461.. *(version* ***without TFT- display*** *):*
Some appropriate means (a resistor decade box or similar simulator) is used to simulate the desired trigger temperature at the sensor input. This is entered as a new limit by pressing the "SET" button.

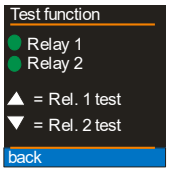
Note: Tolerance figures related to the components must be considered in relation to the set value range when using this version.

In accordance with DIN EN 14597, the set value must be secured against accidental or unauthorised modification. For this purpose, a safety label is applied over the "Set" button to seal it. In the case of devices of Type 845210 the set value must be recorded on the safety label.

Function check:

In accordance with DIN EN 14597 the safety temperature limiter must be subjected to a function check once a year.

To do this on type 8461.., the test- buttons are pressed in sequence, holding them down for about 3 seconds each: Pressing the first test button makes it possible to check that the associated relay releases, the corresponding LED goes out, the electrical safety circuit is interrupted and the external fault signal lamp lights up. The device must return to the normal condition by pressing the reset button. Both LEDs light up again, and the electrical safety circuit is closed. The second channel is then to be tested in the same way.



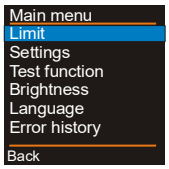
On type 8462/3.. the function check takes place in the main menu by selecting the sub menu “test function“.

For this purpose the arrow up-/ arrow down buttons are pressed in sequence: Pressing the arrow up- button makes it possible to check that the associated relay releases, the corresponding LED goes out, the electrical safety circuit is interrupted and the external fault signal lamp lights up. The device must return to the normal condition by pressing the reset button. Both LEDs light up again, and the electrical safety circuit is closed. Accordingly, the second channel is then to be tested.

The annual function check specified by DIN EN 14597 is only carried out correctly if the two buttons are pressed independently one after the other, respectively after completion of the test function.

After the expiration of 10 years the systems are not sufficient to meet the requirements in accordance to their SIL- certification.

Main menu



Access from the operating status

Call up: *briefly* press the P -button (do not hold)

The requested sub menu is marked blue using the ▼...▲ buttons, press the P -button *briefly* to continue.

return to operating mode: ***only*** with marking "Back" and entering P -button *briefly, no* automatic switching back!



Code 2 request before sub menu (if existing),
the first of four digits is marked blue and can be changed using the ▼ (lower)...▲ (higher) buttons, press the P -button *briefly* to continue.
(Code 2 factory setting: 0 0 0 1)

Sub menus in detail: *(existence depends on version and type):*

return to main menu / sub menu (depends on menu):
with marking "Back" and entering P - button *briefly,*
alternative when accepting parameter – value using the P -button *briefly.*
Note: no automatic switching back!

The parameter- values can be *changed* with the ▼ (lower / previous) and ▲ (higher / next) *-buttons*.
Where appropriate, longer pressing causes faster changing.

		Factory setting:
Limit	Adjustment limit safety temperature limiter	0
Settings:		
Measuring input	Input type measuring input: (RTD/ 4-20mA/ thermo. J/ thermo. K)	RTD /th.K
Start input range	(only) voltage / current input: start of display range	#
End input range	(only) voltage / current input: end of display range	#
Decimal point	Number of decimal places	1
Start out. range	(only) information signal output: start of range	#
End out range	(only) information signal output: end of range	#
Unit	Switching the display unit (°C / °F), only temp. measurement inputs	°C
Device function	Functions: limiter / monitor - maximum / minimum (STW MIN / STW MAX / STB MIN / STB MAX)	STB MAX
Hysteresis	Setting the switching difference	8
History delete	Delete history: (YES/NO)	NO
Change code 1/2	Change code 1 / 2: (0...9999)	0001 / 0001
Test function	⇨ **see page 7 function test**	
Brightness	Brightness adjustment Display: (0...100)	50
Language	Language selection (Deutsch/German, English)	Deutsch
Error history	Display of recorded messages with time stamp	
Desc.- text	Designation text for actual value display, (actual value) additionally a variable text *, input via PKS	Istwert
Name	e.g. marking of equipment, variable text, input via PKS	-
Date/Clock	Setting the date and time	
	# = corresponds to range	

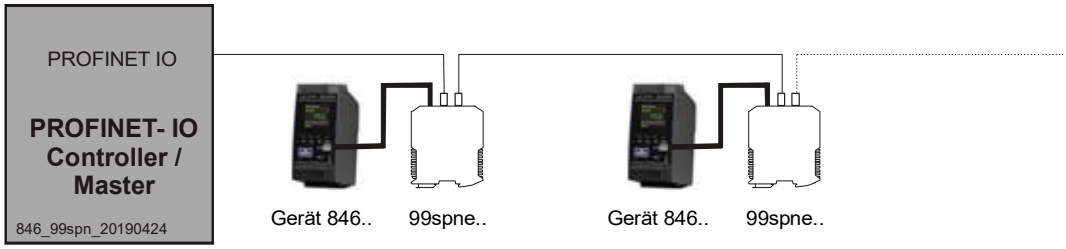
Interfaces

Bus

The bus interface ix industrial enables the connection of KFM adapter modules, e.g. 99spne (Profinet), whereby actual value, limit value and status of the device can be read out.
Safety operation is possible when the bus interface is plugged in.



Example Profinet:



READ

Actual value 1	Receive value 1 from address 5, STB 846..	(Parameter 1010)
Limit	Receive value 2 from address 5, STB 846..	(Parameter 1030)
Status	Status word 2 from address 5, STB 846..	(Parameter 1002)

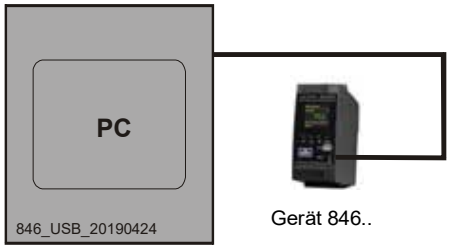
- Bit 1,2: Status relay 1,2
  0= relay off; 1= relay on
- Bit 3: Status STB
  0= operation; 1= limit value over/underrun
- Bit 4: Status measurement line error
  0= Measurement error-free; 1= Error at measuring input

Setup

The service interface- Micro USB is used to parameterise the STB during commissioning using the KFM Software PKS.
Safety operation is not possible when the service interface is plugged in, the STB is switched off and the relays have dropped out.



Example:



Software PKS

- Data transfer, processing and Archiving of parameter sets
- Logging
- Marking of operating equipment
- Reading the error history



see sheet 99pks

Characteristic values:
Input / Measuring range:
Pt100 / standard signal, -200..+600 °C / adj.,
thermoelement NiCr-Ni (K) 0..1200 °C,
thermoelement Fe-CuNi (J) 0..900 °C

Set limit value adjustable range:
Pt100 / standard signal, -200..+600 °C / adj.,
thermoelement NiCr-Ni (K) 0..1200 °C,
thermoelement Fe-CuNi (J) 0..900 °C
Note: Observe the sensor´s switching point!

Output: 1 relay, max 250 V 2 A,
optional 2nd relay (only normally open contact), 1 continuous output 4...20mA (load<=500Ω) for actual value

Switching hysteresis:
8461..: 8 K +/- 1K, other val. available on request
8462/3..: adjustable

Interfaces:
Service interface KFM 2.0 micro USB 2.0 type B
Bus interface KFM 2.0 ix Industrial type A

Mains connection: (without protective conductor connection) 100-250VAC +10% / -15%, 24VDC, ca. 3 VA

housing: mounting on 35mm standard rail
Mounting position: any
Weight 8461.. / 8462..: 170 gr. / 260 gr.

Type of protection acc. EN 60529:
IP 20, for mounting within a housing min. IP 40

Permissible ambient temperature: 0..60 °C,
Storage/transport temperature: -20..+80 °C
Nominal temperature: 20 °C,transport in carton

Climatic resistance: Rel. humidity <= 75 % annual average without condensation, maximum installation altitude 3000m

Electromagnetic compatibility:
According to EN 61326, industrial requirement

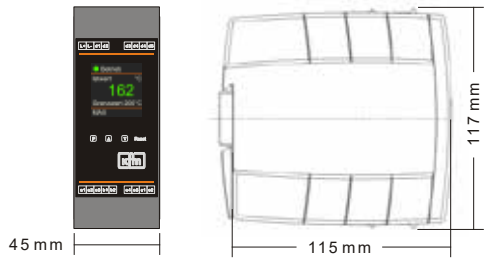
Acceptable sensors:
All temperature sensors demonstrably according to DIN EN 14597 resp. rule 2014/68/EU are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet. When protecting pressure equipment, care must be taken when selecting the sensor to ensure that it meets the requirements of the Pressure Equipment Directive 2014/68/EU.

Type	Operating medium	max. switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

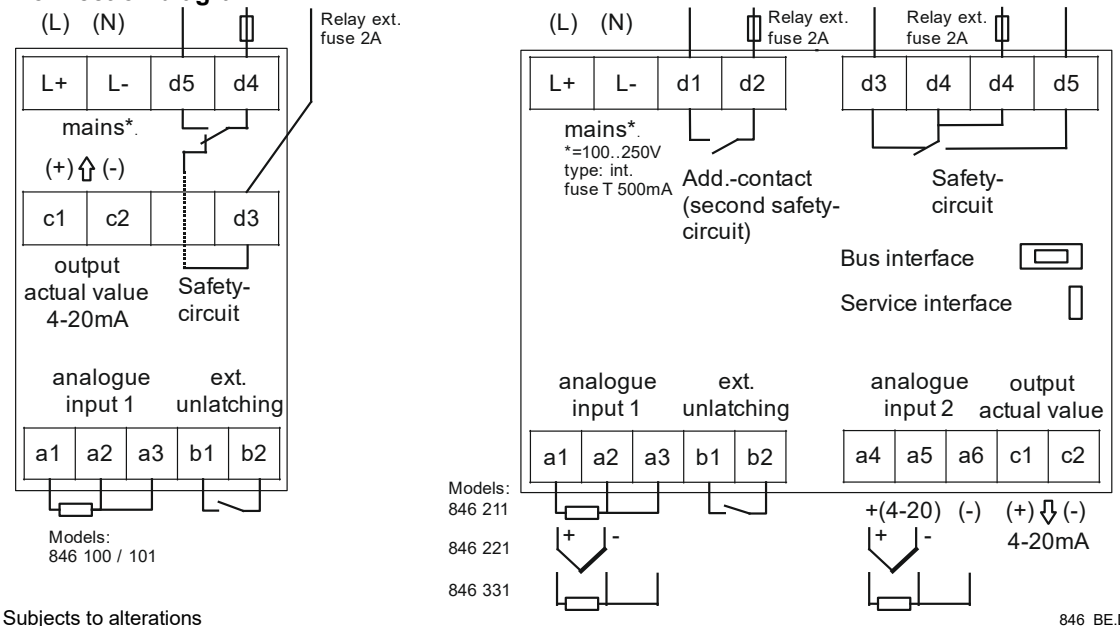
Installation dimensions: 846 1..:



846 2.. /3..



Connection diagram:



Other information according to DIN EN 14597 or DIN EN 60730

Process safety time (PST):	10 seconds
Number of operating cycles (M) for each manual action:	300
Type of switch-off / interruption for each circuit:	Micro switch-off, single pole
PTI value of the insulating materials (board material):	Insulating material group III
Type of coating of the printed circuit boards:	None, only protective coating
Limitation of operating time:	none
Duration of electrical stress on the insulating parts:	Long duration
Contamination situation (micro-environment creepage and clearance distance):	2
Rated surge voltage:	2500V
ELV limit values (measuring input, reset input, 24VDC power-voltage input, signal output):	<=24V DC
Glow wire test temperatures:	850°C / 750°C / 550°C
Ball indentation test temperature:	125°C
Min. rate of change of controlled variable (without sensor):	Electronics < 1 sec
Number of remote resets:	1000 cycles

The reset function must be evaluated with regard to the end use.

Safety-related parameters

Type	PFDavg	PFH
846100 / 101	$5{,}95 * 10^{-4}$	$1{,}36 * 10^{-7}$
846211	$2{,}13 * 10^{-4}$	$4{,}86 * 10^{-8}$
846221	$2{,}59 * 10^{-4}$	$5{,}91 * 10^{-8}$
846331	$2{,}09 * 10^{-4}$	$4{,}78 * 10^{-8}$

Regelungstechnik nach Maß

KFM-Regelungstechnik GmbH
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32052 Herford, Germany

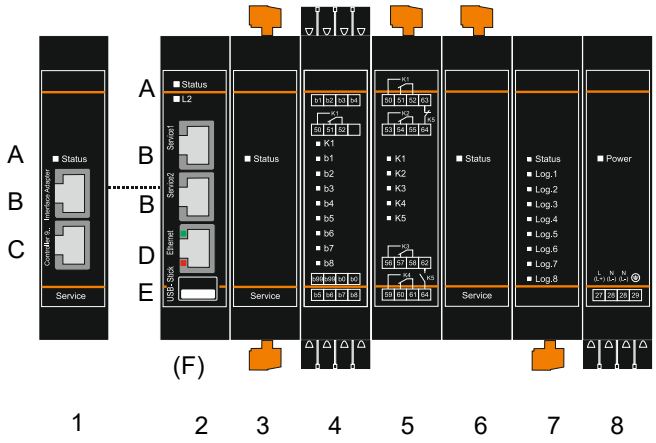
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A Status LEDs (depending on the module)
B Service interfaces
C Interface to KFM controller 9..
D Ethernet interface
E Internal USB stick interface
(F) Internal USB-C interface and T1 control button

1 Hardware expansion adapter (852610) or alternatively
2 CPU module (852622(E))
3 Analogue input module (8522..)
4 Binary input module with relays (8523..)
5 Relay output module (8527..)
6 Analogue output module (8528..)
7 Logic output module (8528..L)
8 Power supply module (8525..)



General description:
The modular hardware expansion modules are used to expand the hardware built into KFM devices with additional inputs and outputs.
To connect to external KFM devices, e.g. the 903K series controllers, the 852610 hardware expansion adapter is required on the module side; this establishes the connection to all other modules. Optionally, a fieldbus adapter can be connected to the hardware expansion adapter (the 'Interface Adapter' (B) port). Alternatively, expansion modules can be connected directly to stand-alone function modules, e.g. to module 852620 (data acquisition only), data processing modules 852621 and 852622(E), data loggers 834.. or fault indicators 826..

Module overview:

CPU modules:

852610	Hardware expansion adapter for KFM controllers
852620	Standalone data acquisition module
852621	Freely configurable data processing module *(old version)*
852622(E)	Freely configurable CPU module with USB interface for memory sticks (With Ethernet interface for e.g. Profinet or Modbus TCP/IP, 2x service interfaces)

Power supply modules:

852500	Power supply module 100–230 V AC
852508	Power supply module 24 V AC or DC

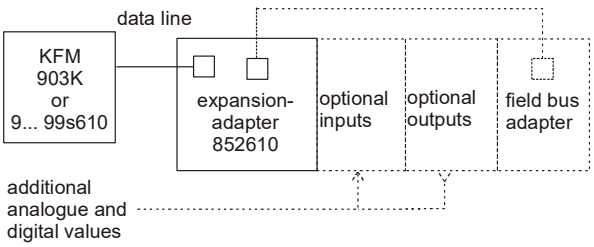
Additional analogue modules (+ logic outputs):

852220	Module with 2 analogue inputs for Pt100 / standard signal, range 0–400 / adjustable
85222w	Module with 2 analogue inp. for potentiom. 0...100/1000Ω / stand. signal, range adjustable
852280	Same as 852220, but range -200..+800 / adjustable
852820 (852850)	Module with 2 (5) analogue outputs 0/4...20 mA
852880L	Module with 8 logic outputs 0 / 24 V DC

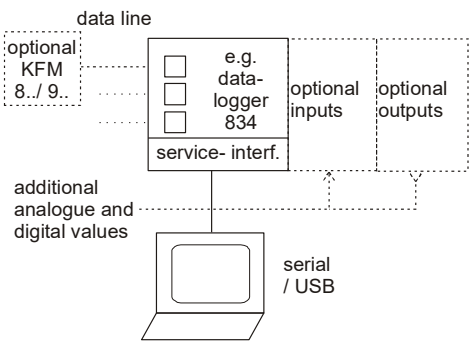
Additional digital modules:

8523801	Module with 8 binary inputs 230 V AC, 1 relay output (potential-free changeover contact)
8523881	Module with 8 binary inputs 24 V DC, 1 relay output (potential-free changeover contact)
852750	Module with 5 relay outputs (changeover contacts, max. 250V 2A)

Application: with hardware expansion adapter



with a standalone function module



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Status and error messages ... 5

Firmware- / Configuration- Update (for CPU- Modul 852622 only) ... 6
Error during update ... 6

Parameter ... 6

Technical data ... 7
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About KFM-Regelungstechnik GmbH ... 8

Intended use

The device is intended, in accordance to the technical data, for measuring- and control functions in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Check the appliance for externally visible transport damage.
Check the supply voltage against the rating plate.
Devices in modular design are supplied fully assembled on a mounting rail.
This can be mounted directly in the switch cabinet. Alternatively, after loosening the end pieces and sliding the module housings apart, the modules can be snapped individually and in the specified order onto the standard rail intended for use. The module housings must then be pushed together. The plug connectors then connect the individual modules together. Finally, the end pieces must be fitted on both sides of the module housings.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly (for example by self- adaption) or wrong set parameter values on the device could affect the correct process.
- Safety devices independently from the device should be provided always.
  The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.

Electrical wiring

- Pluggable terminal block; connection according to the connection diagram on the device.
- Only use the terminal blocks supplied in each case. Replace existing old terminal blocks.
- When connecting the power supply, do not mix up the phase and neutral conductors.
- Use cables with a wire cross-section of max. 1.5 mm2.
- Keep the input, output and supply lines separate from each other and do not lay them parallel to each other.
- Use shielded and twisted cables for the measuring, control and interface lines to avoid interference; ground the shielding properly. Do not run cables in the vicinity of live components or cables.
- Do not loop earthing cables through, but route them individually to a common earthing point in the switch cabinet; ensure that the cables are as short as possible and that potential equalization is carried out correctly.
- The regulations of DIN VDE 0100 “Installation of low-voltage systems” or the respective national regulations (e.g. based on IEC 60364) must be observed for the cable material, during installation and also for the electrical connection of the device.
- Depending on the version and application, install any enclosed RC combinations (external) or bridges (internal RC combinations) according to the circuit diagram.
- To protect the relays, e.g. in the event of a short circuit, fuse the output lines externally.
- Depending on the version, establish a connection between the modular device and the controller using the supplied patch cable

Putting into operation:

Switch on the mains supply. All indicator lamps light up for approx. 1-2 seconds. No further action is required on the appliance.

Maintenance:

All electronic devices in the KFM range are practically maintenance-free. If installed and commissioned correctly and protected against mechanical damage and impermissible operating conditions, years of trouble-free operation can be expected. In the event of malfunctions, interventions should only be limited to elements that are accessible outside the device or have been expressly approved for this purpose (connections, jumpers, fuses).

Any further tampering, especially inside the appliance, will invalidate the warranty, make it more difficult to check and rectify the fault at a later date and can cause considerable damage to the circuit if not carried out correctly.

To send in for repair, disconnect the patch cables and terminal blocks with the connected supply lines, release the mounting rail and remove with devices. Alternatively, the modules can be removed individually after loosening the end pieces and **sliding** the module housings **apart**.

In the interest of the quickest and most cost-effective repair possible, it is essential that the faults detected are specified as precisely as possible when the device is sent in.

See chapter error messages on page 5

Status and error messages:

Module	LED	Meaning
Hardware expansion adapter 852610 / CPU module 852621	green steady**	Normal operation
	green flashing **	Measurement line fault
	red steady	Internal fault *Contact KFM or send the unit in for inspection!*
	Red flashing	Connection fault to input and output modules*
	LED off	No operating voltage present *Check the mains connection for short circuits or breaks, and ensure the modules are properly seated!*
CPU module 852622E, Status LED	green steady	Normal operation
	green flashing	Start-up process (lasts approx. 4–5 seconds, then flashes for up to 15 seconds, followed by normal operation)
	red steady	Internal fault *Contact KFM or send the unit in for inspection!*
	Red Flashing	Connection error to input and output modules*
	yellow flashing	Hardware modules do not match the software configuration
	LED off	No operating voltage present *Check the mains connection for short circuits or breaks, and ensure the modules are correctly seated!*
Analogue input module (8522..)	green steady**	Normal operation
	green flashing**	Measurement line fault
	Red flashing	Connection fault to the hardware expansion adapter or data logger * *Does not apply to device variant .0i1 with a single-sided connection for internal bus connection*
	red steady	Internal error – *contact KFM or return the device for inspection!*
Binary input module with relay (8523..), status LED***	red flashing	Connection error to the hardware expansion adapter, data logger or fault indicator *
	red steady	Collector relay triggered; energised or de-energised depending on configuration
Binary input module with relay (8523..), message LEDs***	green steady**	Operational status
	red flashing	Unacknowledged fault signal
	red steady	Acknowledged fault message
Relay output module (8527..)***	green steady**	Relay triggered; energised or de-energised depending on configuration
	red flashing	Connection error to the hardware expansion adapter *
Analogue output module (8528..)	green steady**	Normal operation
	red flashing	Connection error to the hardware expansion adapter *
	red steady	Internal error – *contact KFM or return the device for inspection!*
Logic output module (8528..L), Status LED	green steady	Normal operation
	red flashing	Connection error to the hardware expansion adapter *
	red steady	Internal error – *contact KFM or return the device for inspection!*
Logic output module (8528..L), Logic 1..8 status LEDs	green steady	Operating status, flash depending on the output signal *To display the operational status, 24 V DC must be applied externally to terminals d99(+) and d0(-)!*
Power supply module (8525..)	green steady**	Supply voltage present, normal operation

** Briefly disconnect the unit from the mains supply and check that the modules are correctly seated!*

*** alternatively yellow, depending on the version*

**** **LED test**: After the power supply is applied, the LEDs light up orange for approx. 1 s as part of the LED test. The display then changes to reflect the operating status.*

Error message on the controller:
ERR 63 Data connection to external hardware disrupted; check cable and ExHW parameters

Firmware update (LED L2 blue) for CPU module 852622:

1. Copy the firmware file “MSW_852_...” to the root directory of the USB stick.
2. Insert the USB stick.
3. Briefly press the button (on the lower side) repeatedly until the lower **LED (L2) lights up blue**.
4. Then press and hold the button for 5 seconds until the blue LED starts to flash.
5. The update will be carried out; if successful, the system will restart automatically.

Update error: If the LED is not flashing blue but is lit red, see the ‘Error...’ section below:

Configuration update (LED L2 green) for CPU module 852622:

1. Copy the configuration file “ConfigurationUpdate.kfg” to the root directory of the USB stick.
2. Insert the USB stick.
3. Briefly press the button (on the lower side) repeatedly until the lower **LED (L2) lights up green**.
4. Then press and hold the button for 5 seconds until the green LED starts to flash.
5. The update will be carried out; if successful, the system will restart automatically.

Update error: If the LED is not flashing green but is lit red, see the ‘Errors...’ section below:

Update error (LED L2 red) for CPU module 852622:

If the lower LED is red, the update has failed or there is no configuration file stored on the USB stick. To acknowledge the error message, press the button briefly and the LED will go out. The device will continue to operate as normal using the original device software.

- Copy the correct firmware or configuration file to the root directory of the USB stick and run the update again; use a different USB stick if necessary.

CPU module 852622E, L2 LED	blue steady	Firmware update selected,
	blue flashing	Firmware update active
	green steady	Configuration update selected
	green flashing	Configuration update active
	red steady	Update failed or no configuration file saved on the USB stick.

Parameters: Settings can be adjusted via the controller menu (when connected via 852610) or via PKS / service interface (stand-alone function modules)

Operating indicator:

Controller display	Meaning	Value range	CODE (HEX)
-	Status/control words 2, 3 (direct query)	For structure, see instruction 99s	1002, 1005
	ditto, for indirect query via controller		1003, 1006
ACTUAL1 *	Actual value 1..16		1010..1F

Parameter level 2:

1..16bLo	Start of range for input 1..16	-999...bHi	5022..31
1..16bHi	End of range, input 1..16	blo...4000	5032..41
1..6SLo	Start of range for signal outputs 1..6	-999...9999	5332..37
1..6SHi	End of range for signal outputs 1..6	-999...9999	5364..69
1..16nst	Decimal places, inputs 1..16	0...2 (depending on range)	60C0..CF
ExHW**	Interface connection to external hardware	ON, OFF	

Configuration level:

Actual 1..16	Actual value correction value 1..16	blo...bHi (+/-)	6000..0F
Ain1..16	Input type for inputs 1..16	0=4–20, 1=2–10, 2=0–20, 3=0–10, 5=RTD, 20=N100	60D0..DF
Sou1..6	Signal output type 1..6	0...20, 4...20	5300..05

* (Parameters that can **only** be **sent** by the module)
** When transferring configurations to the controller, the external hardware must be connected and the ExHW parameter must be set to ON.

Interfaces:
1 x KFM unit 903k or 9.. 99s610 (hardware expansion adapter 852610 only), connection via the supplied connection cable,
1 x interface adapter

8522../ 8528.. only: 1 x TTL, KFM 2.0 protocol, for KFM service only

852622.. only: 1 x service interface for configuration (alternatively for interface adapters),
1 x USB stick, 1 x USB-C (internal), Ethernet interface depending on model

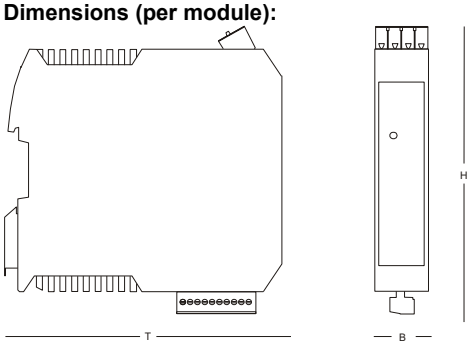
Technical specifications:

Mains connection:	100–250 VAC, approx. 12 VA, alternatively 24 VDC, approx. 12 VA
Optional: Binary inputs:	230 VAC, approx. 2 mA, alternatively 24 VDC, approx. 2 mA
Optional: Analogue inputs:	• Pt100/standard signal, range 0–400 or –200–+800 °C / adjustable • Potentiometer 0...100/1000 Ω / standard signal, range adjustable
Optional: Relay outputs:	230 V / max. 2 A
Optional: Analogue outputs:	0/4–20 mA (load ≤ 500 Ω) as control or signal output
Optional: Logic outputs:	Open-collector outputs, 24 V DC / max. 100 mA per output

Other operating data:

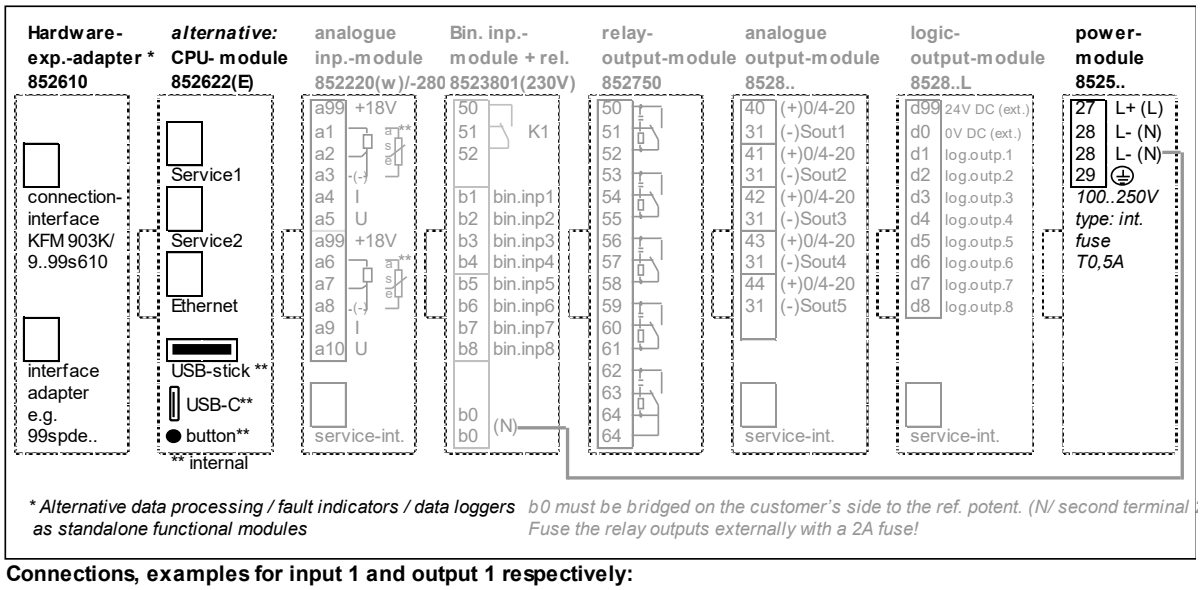
Housing: For DIN rail mounting
Mounting position: Vertical, with the release tab facing downwards
Protection class in accordance with EN 60529: IP20
Permissible ambient temperature: 0...60°C,
Rated temperature: 20°C
Permissible relative humidity: 75% annual average (KWF in accordance with EN 60529) without condensation
Interference emission/immunity: In accordance with EN 61326

Dimensions (per module):



H = 124 mm, W = 22.5 mm, D = 116 mm

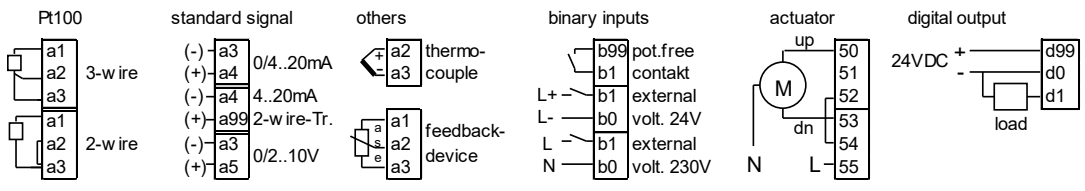
Connection diagram: (Example; the connection diagram on the unit itself is authoritative for the version supplied)



** Alternative data processing / fault indicators / data loggers as standalone functional modules*

b0 must be bridged on the customer's side to the ref. potent. (N/ second terminal). Fuse the relay outputs externally with a 2A fuse!

Connections, examples for input 1 and output 1 respectively:



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nach Maß

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1 Display of relay functions
2 Digital display of value with unit and label text
3 Digital display of setpoint with unit and label text
4 Display of binary input function
5 Digital display of value with fixed unit and label text
6 Buttons for device operation
7 RJ-45 KFM 2.0 bus interface
8 Setup interface: USB-C KFM 2.0



General:

The **Type 8521** compact controller is a modular industrial controller designed for **DIN rail mounting**. It features a **1.44-inch TFT display** and a compact **45-mm housing**, suitable for installation in distributed or centralised automation systems.

The controller **provides four relay outputs**, **three** of which are **pre-wired internally for specific applications**. Depending on the version, a **binary input** is used to switch an external setpoint, alternatively a secondary setpoint, or to control the start/stop of the control process. In addition, a **4–20 mA output** is available, which, depending on the configuration, can be used as a control output or as a pure signal output.

The control function can be flexibly selected as follows:

- **Two-stage** with **two** auxiliary contacts
- **Three-point step operation**, with **two** auxiliary contacts
- **Continuous** with **four** auxiliary contacts.

Various options are available for the measurement input: **PT100**, **4–20 mA standard signal** or **thermocouple**. This allows the 8521 to be adapted to different process variables and transmitters.

A **communication interface** enables connection to higher-level **control systems**. Furthermore, the controller can be operated as a standalone functional unit within the **852.. series of** modular **hardware extensions**.

The Type 8521 is therefore suitable for compact, modular and customisable control solutions in industrial applications.

Versions:

852 127 852 1278	Basic version, 1x Pt100 input (Ai1) / 4–20 mA (Ai2), mains 100–250 V AC as above, but 24 V DC mains supply
852 127x 852 1278x	2x Pt100 inputs, mains supply 100–250 V AC as above, but 24 V DC mains supply
852 127t 852 1278t	1x input: Type J/K thermocouple (Ai1) / 4–20 mA (Ai2), mains 100–250 V AC as above, but 24 V DC mains supply

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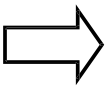
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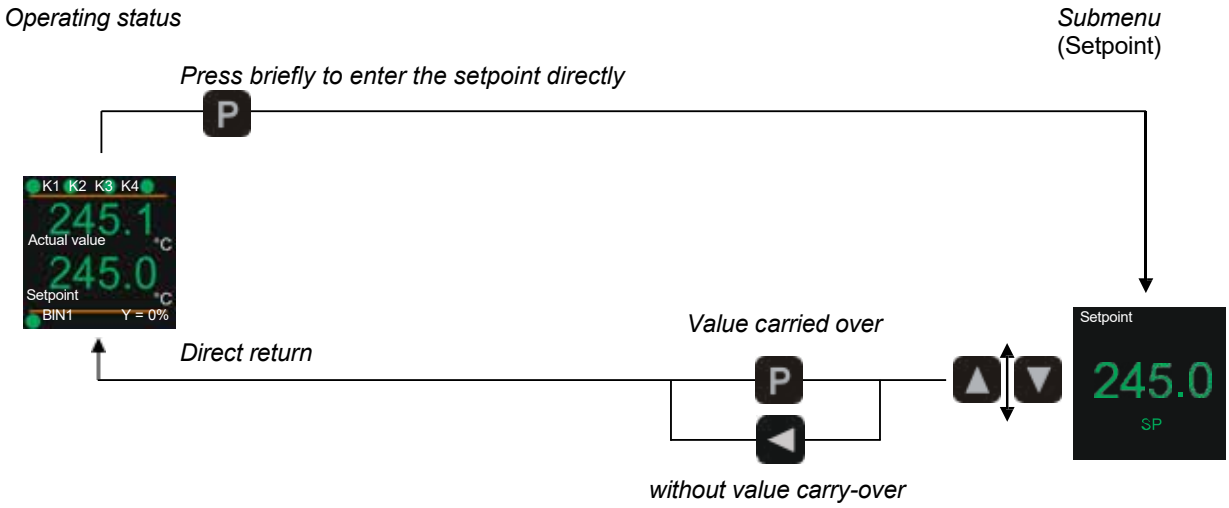
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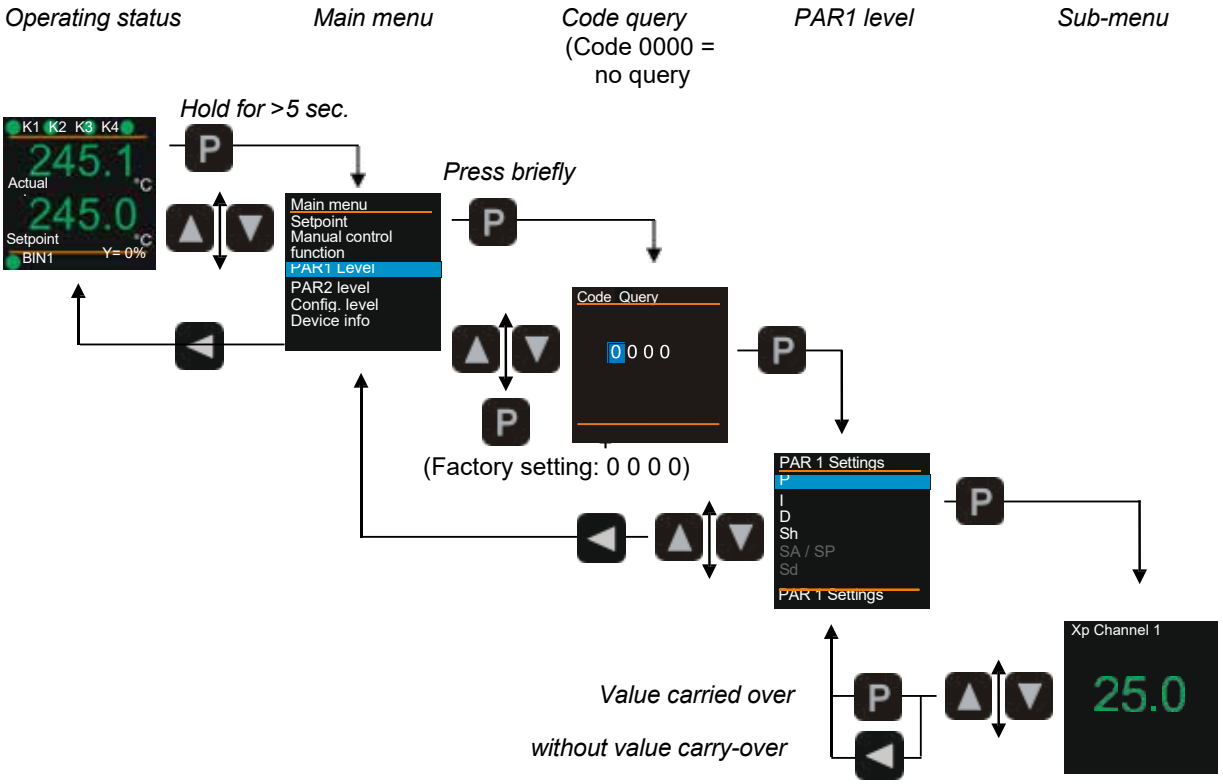


REFERENCE!
This symbol indicates further information in other sections, chapters or other manuals.

Operating diagram for *direct setpoint entry*



operation diagram *main menu*



Intended use

The device is intended for use in measurement and control applications in industrial environments in accordance with the technical specifications. Any other use or use beyond these specifications is considered improper.
The device is manufactured in accordance with the applicable standards, directives and safety regulations. Nevertheless, improper use may result in personal injury or damage to property.
To avoid hazards, the device must only be used for its intended purpose, in a condition that is technically sound from a safety perspective, and in accordance with the technical documentation supplied. Even when the device is used correctly or for its intended purpose, it may pose application-related hazards, e.g. due to incorrect settings.
In the event of electromagnetic interference, temporary deviations in the measured value display and the analogue output may occur. The relay outputs retain their switching state.
The device may switch off in the event of brief power interruptions. Once the supply voltage is restored, the device restarts automatically and returns to its previous operating state.

Staff qualifications

This document contains the information required for the intended use of the device described herein.
It is intended exclusively for technically qualified personnel who have undergone specialist training and possess relevant knowledge in the field of automation technology. Knowledge of, and correct application of, the information contained in the supplied documentation are prerequisites for safe installation, commissioning and safety during operation. Work on the device may only be carried out to the extent described herein and, in the same way as the electrical connection, exclusively by qualified personnel.

Installation

Before installation: Check the device for any externally visible transport damage. Check the supply voltage against the type plate.
Secure the housing in the mounting slots on the standard rail.

Electrical Safety

- All electrical connection cables must be disconnected during installation/removal, servicing and repair work.
- Load circuits must be fused to the maximum permissible current (see technical data).
- The device is not suitable for installation in potentially explosive atmospheres.
- In addition to incorrect installation, parameters set incorrectly or inappropriately (e.g. direction of action) on the device may also impair the proper functioning of the monitoring system. The relevant safety regulations must be observed.
- Before plugging in or unplugging connection cables, it must be ensured that the person carrying out the work is electrostatically discharged (e.g. by touching earthed metal parts).
- The device's factory settings may differ from those required for the intended application at the time of commissioning. The installer of the system is always responsible for commissioning.
- Live parts (terminals, screws, etc.) must be protected against accidental contact by suitable installation, e.g. in a control cabinet.

Electrical connection

- Pluggable spring-loaded terminal block, top/bottom; connect in accordance with the wiring diagram on the unit.
- When connecting the power supply, do not reverse the phase and neutral conductors.
- Use cables with a maximum cross-sectional area of 1.5 mm². For the 5-pole terminal blocks, a maximum of 0.75 mm² is permitted when using ferrule terminals with a plastic sleeve. Stripping length: 10 mm.
- The input, output and power supply cables must be spatially separated from one another and must not be routed in parallel.
- Use shielded and twisted-pair cable for measurement, control and interface cables to prevent interference; earth the shielding correctly. Do not route cables near live components or cables. Cables within a building that are longer than 30 m or that leave the building (including cables for outdoor installations) are not permitted.
- Do not loop earth leads; instead, route them individually to a common earth point in the control cabinet; ensure that the leads are as short as possible and that equipotential bonding is carried out correctly.
- The provisions of DIN VDE 0100 “Installation of Low-Voltage Installations” or the relevant regional regulations (e.g. based on IEC 60364) must be observed.

Commissioning

Switch on the mains supply. Digital displays and indicator lights, where fitted, will illuminate after a few seconds, depending on the limit setting. The signal output will be available after approx. 5 seconds. Set the desired limit value. Check other settings.

Maintenance

All electronic devices in the manufacturer’s range are virtually maintenance-free. Provided that installation and commissioning have been carried out correctly, and the device is protected against mechanical damage and unauthorised operating conditions, many years of trouble-free operation can be expected. In the event of faults, any intervention must be restricted to components accessible from outside the device or those expressly authorised for this purpose (connections, jumpers, fuses).

Any further intervention, particularly inside the device, will invalidate the warranty, complicate subsequent diagnosis and rectification of the fault, and may cause significant damage to the circuitry if carried out incorrectly.

When sending the unit in for repair, mark the supply cables and disconnect all terminal blocks.

To ensure the repair is carried out as quickly and cost-effectively as possible, it is essential that the faults and error messages identified are specified as precisely as possible when sending the unit in.

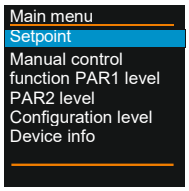
See the section on error messages on page 17

Operating status:



Analogue values: Depending on the configuration, up to two values can be displayed in 6 mm size. A separate unit can be configured for each value if required. The corresponding label texts can be selected. The status of the relays is indicated by coloured circular symbols appearing at the top of the display.
The status of the binary input is indicated by the appearance of a coloured circular symbol at the bottom of the display.
At the bottom of the display, a value in 3 mm font size with a fixed label and unit can be shown as an option (% for control variable Y /
mA for (S)ignal output actual value 1 / date or real-time clock).

Main menu:

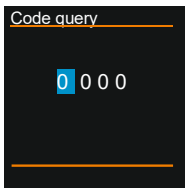


Access from operating mode: Press and

hold *the* '[P]' *button for >5 seconds*

The desired submenu is highlighted in blue using the...[▲] buttons; to confirm the selection, briefly press the[P] button

To return to the operating mode: ***simply*** press the 'Back' button *briefly* ([◄]*; there is no* automatic return!



Code prompt before submenu (if applicable),
the first of four digits is highlighted in blue and can be changed using the[▼] (smaller)...[▲](up) buttons,
press the[P] button *briefly* to confirm each entry. (Factory-set code: 0 0 0 0)

Submenus in detail: *(available depending on model and type):*

Return to the main menu / sub-menu (depending on the menu):
press the 'Back' button *briefly* ([◄]*),*
alternatively, to accept a parameter value, *briefly* press the[P] button. *Note: no* automatic reset!

Parameter values can be adjusted using the[▼] (decrease / previous) and [▲] (up / next) *buttons*.
If necessary, press and hold for faster adjustment.

Setpoint adjustment:



P - Press the button *briefly* (*do not* hold down) to enter the setpoint directly

The setpoint can now be *adjusted* using the '▼' (decrease) and '▲' (increase) *buttons. If necessary, press and hold for faster adjustment.* To confirm the entry, *briefly* press the 'P' button, to return directly to the operating mode. Alternatively, press the 'Back' button (◄) *briefly* to exit without saving.

Alternatively, via the main menu:

P - Hold the button down for *>5 seconds*

The main menu is displayed; the "Setpoint" submenu is highlighted in blue.
P - Press the button *briefly* (*do not* hold down)

See above for setpoint adjustment.

To return to operating mode:
Only by entering '◄' and *briefly* pressing the 'Back' button – *no* automatic return!

optional:
SP2 / 3 / ..

P - Press the button *briefly* again each time: further setpoints for the control loop External setpoint (display only);

Manual control function :
(if available):

P – press the button *briefly* (*do not* hold down)

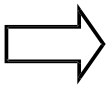


The main menu is displayed; highlight the "Manual control" sub-menu in blue using the▼ …▲ buttons.
P - Press the button *briefly* (*do not* hold down)

The upper text display shows "Manual control", along with the control variable, if applicable. The control function is deactivated.
Manual control is now possible using the▼ ...▲ buttons.

***To return** to the main menu:*
Press the '◄' button, then the 'Back' button *briefly*

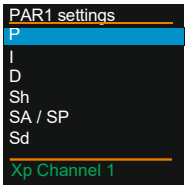
Return to operating mode:
only by pressing the '◄' 'Back' button *briefly; no* automatic return!



Optional: Self-optimisation (see page 11):
P Press and hold the button for >5 sec: the display switches to "-Ad"

Parameter level 1

Access from operating mode:



P - Hold the button down for *>5 seconds*

The main menu is displayed; select the 'PAR1 Level' sub-menu using ▼...▲ buttons highlight in blue.
P - Press the button *briefly* (*do not* hold down)

Code prompt (only if applicable); the first of four digits is highlighted in blue and can be changed using the '▼' (decrease)... '▲' (increase) buttons; to confirm each entry, *briefly* press the 'P' button.
(Factory-set code: 0 0 0 0 = no code prompt)

The upper text display shows "PAR1 Setting". Highlight the desired parameter using the▼ ...▲ buttons; the lower text display shows a description.
P - Press the button *briefly* (*do not* hold it down)



The upper text display shows the description; the lower display optionally shows the identifier if there are multiple inputs/outputs.

The value can now be *adjusted* using the '▼' (decrease) and '▲' (increase) *buttons. If necessary, press and hold for faster adjustment.* To confirm the entry, *briefly* press the 'P' button.

***Back** to the main menu:*
Press the '◄' 'Back' button *briefly*

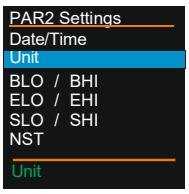
Return to operating mode:
Simply press the "◄" "Back" button *briefly;*
there is no automatic return!

Settings in detail *(Depending on the model and type, certain parameters are available: available parameters are displayed in white text, unavailable parameters appear in grey text.):*

		Factory setting:
CODE 1	Code number (password) for levels (1...9999; 0 = no prompt)	0
P	Proportional band Xp (%) (for further details, see 'Optimisation')	25.0
I	Settling time Tn (min) (for further details, see 'Optimisation')	7.0
D	Lead time Tv (min) (for further details, see 'Optimisation')	0.2
SH	Response sensitivity ('dead zone') Xsh (%)	0.1
SA.	Setpoint offset (absolute) for travelling switch contact no.	5.0*
SP.	Independent setpoint for switch contact no.	0.0
SD.	Hysteresis (on/off switching differential) for switch contact no.	3.0
	Only when configured as a time-dependent auxiliary contact:	
tSt.	Start time for switch contact no., (weekday, hour, minute)	daily/0/0
tL.	Switching duration for switching contact no. (days, hours, minutes)	0/0/0
		(..201,701/SA3 :10,0)*

Parameter level 2

Access from operating mode:



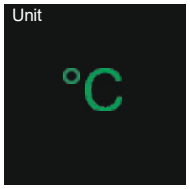
P - Press and hold the button for >*5 seconds*

The main menu is displayed; select the 'PAR2 Level' submenu using ▼...▲ buttons highlight in blue..
P - Press the button *briefly* (*do not* hold down)

Code prompt (if applicable only); the first of four digits is highlighted in blue and can be changed using the '▼' (decrease)... '▲' (increase) buttons; to confirm each entry, *briefly* press the 'P' button.
(Factory-set code: 0 0 0 0; 0 = no code prompt)

The upper text display shows "PAR2 setting". Highlight the desired parameter using the▼ ...▲ buttons; the lower text display shows a description.
P - Press the button *briefly* (*do not* hold it down)

The upper text display shows the description; the lower display optionally shows the identifier if there are multiple inputs/outputs.



The value can now be *adjusted* using the▼ (decrease) and▲ (increase) *buttons. If necessary, press and hold for faster adjustment.* To confirm the entry, *briefly* press the P button.

***Return** to the main menu:*
Press the '◄' 'Back' button *briefly*

Return to operating mode:
Only by entering◄ and *briefly* pressing the "Back" button*; no* automatic return!

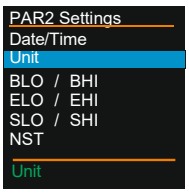
Settings in detail *(Depending on the model and type, certain parameters are available: available parameters are displayed in white text, unavailable parameters appear in grey text.):*

		Factory setting:
CODE 1	Code (password) for access levels (1–9999; 0 = no prompt)	0
Date/Time:	Day of the week, calendar day, month, year (current selection highlighted in white)	-
	Hour, minute, second (current selection highlighted in white)	-
Unit	Switching the display unit (°C / °F), temperature measurement inputs only	C
***BLO/*BHI**	(only) for voltage / current inputs: start / end of display range	#
***ELO/*EHI**	(only) for external setpoint: Start / end of setpoint range	#
***SLO/*SHI**	(only) for information signal output: range start / end	#
***NST**	Number of decimal places on the display (0 / 1 / 2, depending on the range)	0
Lo / HI	Setpoint adjustment range, lower / upper limit	#
BRGH	Display brightness setting (30 ... 100)	50
DSP1/2/3	Display lines 1 to 2 (6 mm) (OFF/ SP/ ACT*)	1=IST1/2=SP
	Display line 3 (3 mm) (OFF/ Time/ Date/ Sout/ 1 Y)	3=OFF
	(SP= setpoint, Actual*=actual value of measurement input*, Sout= (S)ignal output for actual value 1 (unit of measurement mA), 1 Y= control variable (unit of meas. %))	
EIN1/2	Unit of measurement for display lines 1 to 2 (Note: No conversion!) (°C/ °F/ %/ bar/ mbar/ mPas/ cSt/ Kgm³/ mm/ kPa/ L/ m³/h)	°C/°C
TEXT1/2	Label text for display lines 1 to 2: VALUE 1 Selection from list of fixed texts: (ACTUAL VALUE.., SETPOINT, Off),	1=ACTUAL 2=SETPOINT

* = Index number for multiple measurement inputs # = *corresponding range*

Configuration level

Access from operating mode:



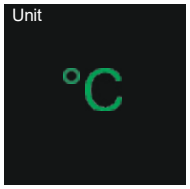
P - Press and hold the button for *>5 seconds*

The main menu is displayed; select the 'Configuration Level' submenu using ▼...▲ to highlight it in blue.
P - Press the button *briefly* (*do not* hold down)

Code prompt (only if applicable); the first of four digits is highlighted in blue and can be changed using the '▼' (decrease)... '▲' (increase) buttons; to confirm each entry, *briefly* press the 'P' button.
(Factory-set code: 0 0 0 0 = no code prompt)

The upper text display shows "Config. Level". Highlight the desired parameter using the▼ ...▲ buttons; the lower text display shows a description.
P - Press the button *briefly* (*do not* hold it down)

The upper text display shows the description; the lower display optionally shows the identifier if there are multiple inputs/outputs.



The value can now be *adjusted* using the '▼' (decrease) and '▲' (increase) *buttons*. *If necessary, press and hold for faster adjustment.* To confirm the entry, *briefly* press the 'P' button.

***Return** to the main menu:*
Press the '◄' 'Back' button *briefly*

Back to operating mode:
Simply press the 'Back' button *briefly* after entering ◄ – *there is no* automatic return!

Settings in detail *(Depending on the model and type, certain parameters are available: available parameters are shown in white text, unavailable parameters appear in grey text.):*

		Factory setting:
Code 1	Code (password) for configuration level (1...9999; 0 = no prompt),	0
Code	Option to set the code for the parameter/configuration level (optional). *(1...9999; 0 = no prompt)*	0
Reset	Select reset to factory settings (No / Yes) *After a reset to factory settings, all parameters must be checked!*	*No*
Lng	Language selection for menu texts (Deutsch / English)	*Deutsch*
Conf	Selection of the configured control function *(202 / 702 / 804)*	*202*
Bin	Function of the binary input: "OFF" / "SPE" (switchover to external setpoint via binary input) / "SP2" (switchover to secondary setpoint via binary input) / "Start/Stop" (start/stop of the automatic control function via binary input) *When the input is open (stop), the relays or control output are activated in accordance with the setting of parameter Y_S (see below, behaviour in the event of a measurement line fault).*	*SPE*
SPBF	Bus setpoint configuration: "BIN" (activation via binary input) / "MENU" (activation in the setpoint menu) / "BUS" (activation via status bit via external bus coupler, e.g. 99spde..) / "OFF"	*BUS*

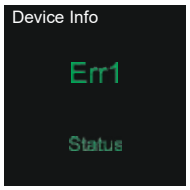
Parameter continuation

		Factory setting:
AIN*	Input type, measurement input no.*: “RTD / 0–20 / 4–20 (mA) / 0–10 / 2-10 (V) /OFF” (note different terminal connections I /U!)	*RTD*
ACTUAL*	Correction value for adjusting the controller display (+ / -)	*0.0*
SPE	Mode / External setpoint: "Add/ Sub/ AbS" (additive/subtractive/absolute value)	AbS
YM	Actuation time of the controlled drive "6...600" (sec.)	*60 sec.*
OUT	Actuator output signal “0…20 / 4…20” (mA) / 0…10 / 2…10 (V)” or	*4..20 mA*
	Actuator output characteristic: direct / inverse "di / in"	*in*
AP	Operating point of output signal (-100...+100)	*50*
Sout	Assignment of information output signal (actual/setpoint value, control variable, etc.)	*IST1*
	or Type of information output signal(s)* “0..20/4..20 (mA)/0..10/2..10 (V)”	*4..20 mA*
Y_S	Behaviour of the control output in the event of a measurement line fault:	
	Relay position: “rel1 / plus / rel2 / min. (minus) / OFF”	*rel2/min. (70.), rel1 (20.)*
	Continuous output: “0–100” (%)	*0*
REL*	Function type of auxiliary contact (relay no.)	*SoA(701), StA(201)*
	– measurement input / control loop assigned to the auxiliary contact,	*IST 1*
	or auxiliary contact – relay position in the event of a measurement line fault “SiE/SiA” (on/off)	*Si A*
Address	For interface configuration: bus address (digit)	*5*
BAUD	For interface configuration: baud rate (9600/19200/38400)	*38400*

* = Reference value for multiple inputs/outputs.

Device information

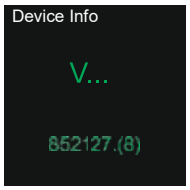
Access from operating mode:



P - Press and hold the button for *>5 seconds*

The main menu is displayed; use the ▼ ...▲ buttons to highlight the ‘Device Info’ submenu in blue.

P - Press the button *briefly* (*do not* hold down)

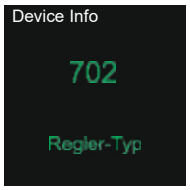


The top text display shows “Device Info”, along with any error messages, if present.

P – Press the button *briefly* (*do not* hold down) to view any further error messages.

The device’s current software version (Version, V…) and the device model 8521...(8) are then displayed.

The power supply type is not shown in the device model; the required supply voltage can only be found on the type plate on the side.



P - Press the button *briefly* (*do not* hold down)

The controller type currently in use is displayed (Parameter Conf):

- 202: Two-stage with two auxiliary contacts
- 702: Three-point step with two auxiliary contacts
- 804: Continuous with four auxiliary contacts



P - Press the button *briefly* (*do not* hold down)

‘Factory calibration’ – for internal use only – can be skipped

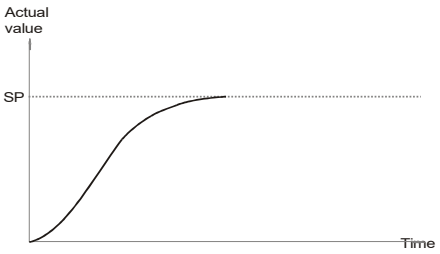
P - Press the button *briefly* again (*do not* hold down) to return to the main menu

Manual ‘ ’ optimisation

Optimal adjustment of the control parameters (P, I, D) ensures that any deviation that occurs is corrected as quickly, as smoothly and as accurately as is possible under the given operating conditions.

These settings normally require specialist knowledge and experience. The general information provided below cannot therefore serve as a sufficient guide on its own, but is intended merely as a guide:

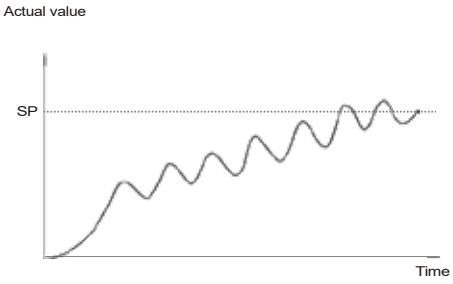
Optimal



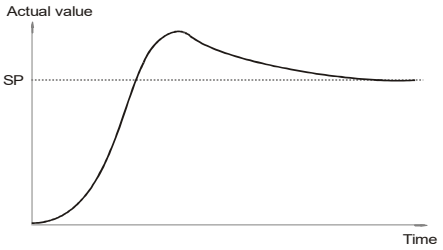
P = Proportional response Xp (%):
lower value = *longer* pulses (three-point step controller), more sensitive response; *higher* value = *shorter* pulses (three-point step controller), slower response.

Examples:

- Temperature oscillates without a significant initial overshoot: **P (Xp) too low**;



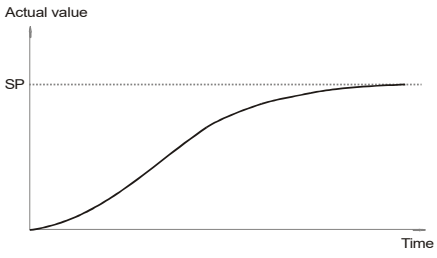
- after an initial overshoot, the setpoint is only reached slowly: **P (Xp) too high**.



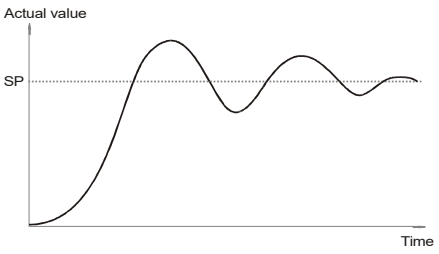
I = Settling time Tn (min):
A *lower* value = *shorter pulse intervals* (three-point stepper controller), faster stabilisation; a *higher* value = *longer* pulse intervals (three-point stepper controller), slower stabilisation.

Examples:

- for slow convergence to the setpoint without overshoot: **I (Tn) too high**;



in the case of a strong initial overshoot that then decays: **I (Tn) too small**.



D = Lead time Tv (min):
Increases the controller response to rapid changes in actual or setpoint values (only when required). A higher value results in greater gain

(optional)

Self-optimisation is an automatic process for determining and automatically setting the optimum control parameters Xp, Tn and Tv.

Operation, where included in the scope of supply:
(The parameter lock switch on the rear panel of the controller (if fitted) must be unlocked: U = unlocked.)

Check start-up conditions:
Actual value at least 20% below the set setpoint (e.g. during the heating phase); otherwise, first: reduce the actual value accordingly using the manual control function (actuator position) (for fast control loops) or, if permissible, increase the setpoint accordingly (faster response for slow control loops)

Access the manual control level: press the '▼' button, followed by the '▲' button (or the separate '↘' button). Check the control variable: it must not exceed 85%; reduce if necessary. Start self-optimisation: in the manual control level, hold down the 'P' button for longer than 5 seconds. Display in the lower screen during the process: '-Ad-',
whilst the upper display continues to show the current actual value at all times.

Procedure: The adaptation programme first waits until the actual value has stabilised on the basis of the given control variable (change in actual value < 0.1%/min), and then increases the output signal by 10%, or, in three-point step controller operation, issues a control pulse of 10% of the entered control time. The optimum parameters are calculated from the step response of the controlled system.

Cancel: Press the 'P' button for > 5 sec. = Return to manual control mode.

Once the procedure has been successfully completed, the system
automatically returns to the operating state.

Adaptation unsuccessful
(Error code is displayed; see the section on error messages on page 17)

P Press the button again: Return to the manual control level, rectify the displayed error
Restart adaptation: Press the P button for > 5 sec.
or return to operating mode: P – press the button briefly

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off))

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

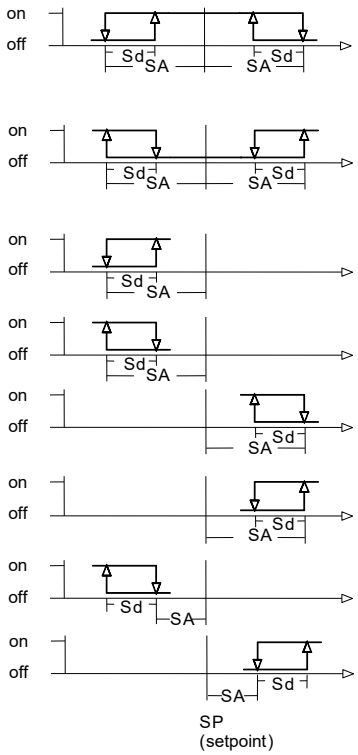
Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

St A Heating stage below setpoint. Relay drops out as actual value increases

STCA Stage above setpoint. Relay drops out as actual value decreases (**A**us = off)



Switching functions for independent contacts:
Hysteresis below:

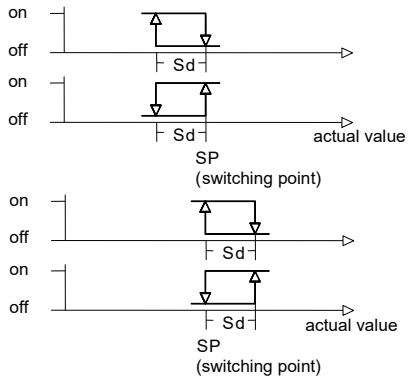
US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)

Hysteresis above:

USCA Relay picks up as actual value decreases

USCE Relay drops out with decreasing actual value



In each case additional settings follow under "rEL." after the selection is acknowledged (P - key):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH./.SP. .(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Auxiliary contact – special functions (depending on version)

Service function:

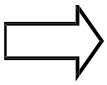
On/Off relay is permanently switched on or off

Special function:

SF6 As for SoA, but switching point at the setpoint, control output at SA. below

Interface function:

BUS Bus function; the relay is switched on or off depending on the control signal via the service interface, e.g. using the Profibus adapter 99spde..



See the operating instructions 99sp.. for the relevant adapter

Interface Bus

(Service)
The bus/service interface (RJ-45 socket) enables the connection of KFM adapter modules, e.g. 99spne (Profinet), allowing actual values, setpoints and statuses to be transmitted, as well as enabling the device to be parameterised using the KFM PKS software. An electronic KFM interface converter, type 99szks, is also required for parameterising the device.



Example: Profinet:



READ

Actual value 1	Received value 1 from address 5, 8521..	(Parameter 1010)
Actual value 2	Received value 2 from address 5, 8521..	(Parameter 1011)
Status	Status word 1 from address 5, 8521..	(Parameter 1001)

- Bits 1, 2: Status of measurement line fault on inputs 1 and 2
  0 = Measurement error-free; 1 = Error at measurement input

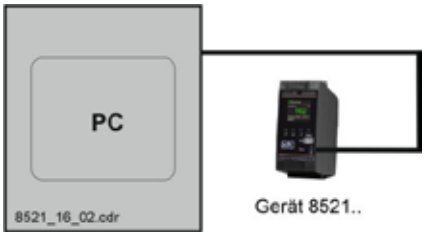
WRITE

Setpoint	Transmit value 1 for address 5, 8521..	(Parameter 1100)

Service
The service interface (USB-C) is used to configure the device using the KFM PKS software. A standard USB-C data cable (USB 2.0 or higher) with a maximum length of 2 m is required to configure the device. Charging-only cables are not suitable.



Example:



Interface baud rate: 38,400 bits/s

PKS software

- Data transfer, editing and archiving of parameter sets
- Logging
- Equipment labelling
- Reading out the error history



See sheet 99pks

Error messages

Err 1 (2...)	Fault at measurement input (No.*) Check the measurement lead for a short circuit or open circuit Check the measurement input against the transducer or test resistor * = Identifier when there are multiple inputs
Err 55	Error loading parameters, press any key; the controller will start in emergency mode; the parameter configuration must be checked.
Err 50 Err 52	Hardware fault in the programme area, Hardware fault in the data area, further operation not possible; send the unit in for repair
Err 57	Circuit board fault, further operation not possible; send the unit in for repair
Err 58	Binary inputs not functioning (status = 0), send device in for repair
Err 59	Digital outputs not functioning (switched off), Send the unit in for repair
Err 60	Relay outputs not functioning (switched off), send the unit in for repair
Err 61	Analogue outputs not functioning (0%), send unit in for repair
Err 63	Data connection to the hardware expansion unit is faulty; check the cable

Error messages during self-optimisation (see the section on self-optimisation on page 13):

Err 202	Conditions not suitable for self-optimisation; Set parameters manually (see the 'Manual optimisation' section on page 12)
Err 205	Setpoint for self-optimisation is not sufficiently above the actual value; reduce the actual value further and restart the adaptation process
Err 206	Fault at the measurement input during self-optimisation; check the measurement input and restart self-optimisation

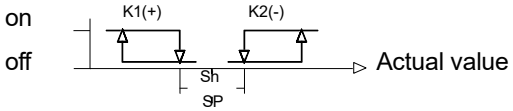
Technical data

(depending on type and version)

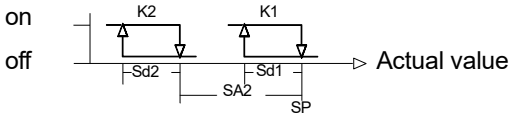
Characteristic values

Parameter level, lockable via code number.
Preset at the factory on request.
Proportional band Xp: 0.1...999.9 %
Settling time Tn: 0.0...999.9 min
Lead time Tv: 0.0...99.9 min
Response sensitivity Xsh: 0.1...1.0 %
Motor running time Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Characteristic curve switching: direct / inverse
Switching point spacing SA: 0..100.0 K
(auxiliary contacts)
Switching differential Sd: 0.1...100.0 K

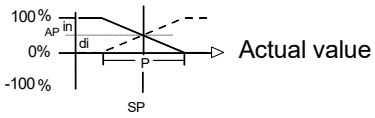
Three-point step controller (inverse)



Step controller (inverse)



Continuous controller
with 1 output



Function of the auxiliary contacts:

as a switching margin above and below the setpoint, or independently with its own setpoint setting and measurement input selection; switching mode configurable

Other operating data:

Mains connection: (without earth connection) 100–250 V AC +10% / –15%, alternatively 24 V DC, approx. 3 VA

Housing: Mounting on 35 mm standard rail
Mounting position: any

Protection class according to EN 60529:
IP 20, for installation in enclosures with a minimum rating of IP 40

Permissible ambient temperature: 0–60 °C, storage/transport temperature: -20–+80 °C
Rated temperature: 20 °C, transport in carton

Climatic resistance: Relative humidity ≤ 75% as an annual average without condensation,

Maximum installation altitude 3000 m

Electromagnetic compatibility (EMC):

The device complies with the requirements of DIN EN IEC 61326-1:2022-11.

Emitted interference: DIN EN 55011:2022-05, Group 1, Industrial requirements
Immunity: Requirements for industrial electromagnetic environments

Technical data (continued)

Input / measurement range:

Pt100 -200 to +600 °C,
standard signal 0/4–20 mA / 0/2–10 V, range adjustable, NiCr-Ni (K) thermocouple 0–1200 °C, Fe-CuNi (J) thermocouple 0–900 °C

Output:

1 potential-free relay, max. 250 V, 2 A;
3 potential-connected relays, max. 250 V, 2 A;
1 continuous output 4...20 mA (load <= 500 Ω)

Binary input:

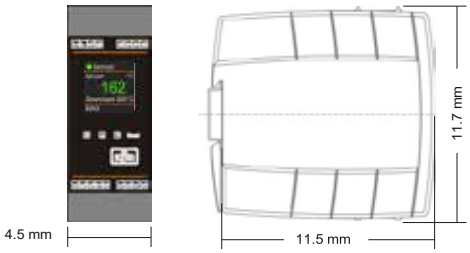
for potential-free contact

Interfaces:

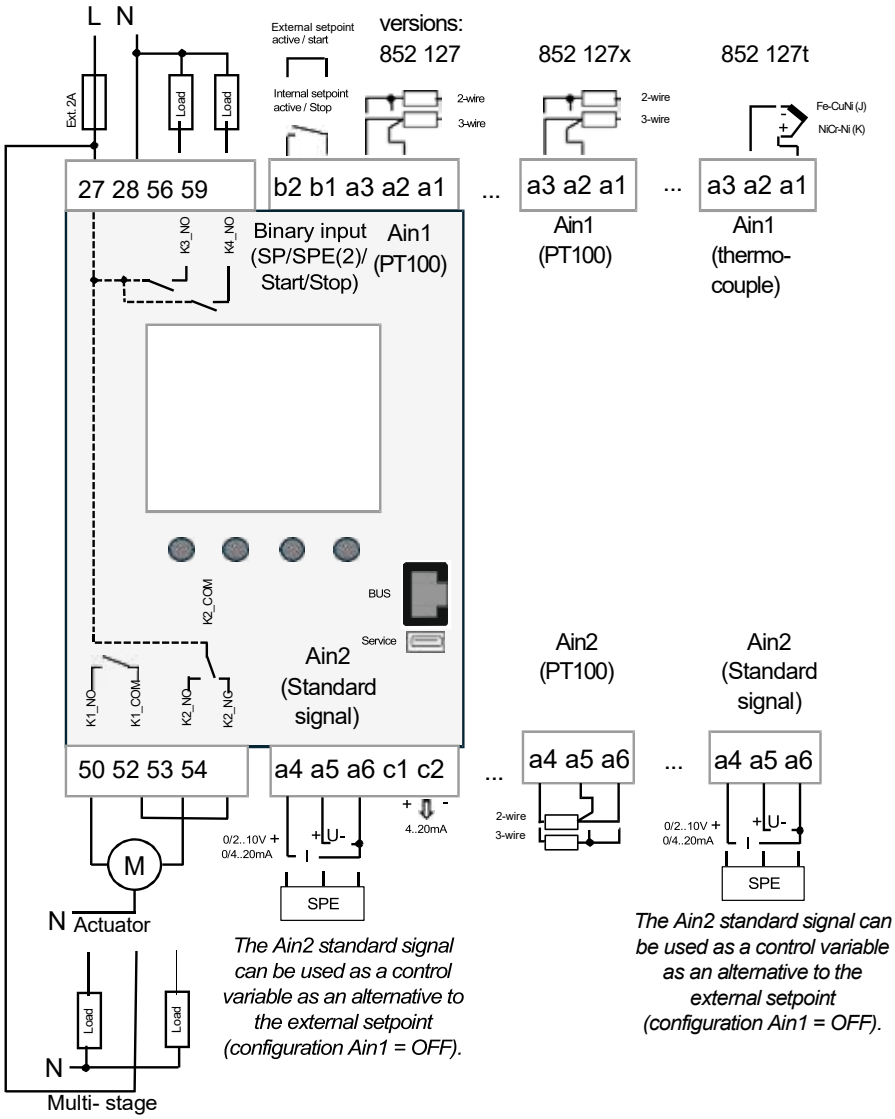
Service interface KFM 2.0 RJ-45 (female),

Setup interface KFM 2.0 USB-C (female)

Installation dimensions:



Wiring diagram:



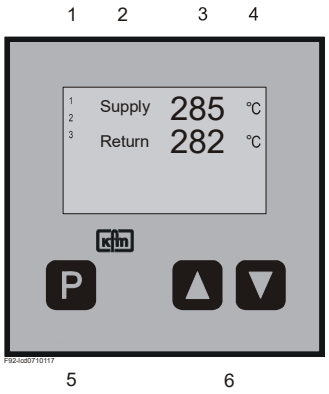
Regelungstechnik nach Maß

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1 LCD display for relay function
2 Descriptive text for displayed values
3 Digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 902 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 8 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K3 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

The transflective LCD indication with white background lighting is easy to read in both light and dark environments. In operating mode up to 4 values (actual values, setpoint values, control settings, ..) can be displayed including freely adjustable description text and unit of display. Additional displays for operating and malfunction messages, including the corresponding hardware or custom display masks are optionally available.

Stage controllers and three-point step controllers with auxiliary contact (e.g. burner controller) are fitted as standard with a 2nd measuring input, continuous controllers have an extended measuring input range.

Types *(depending on configuration):*	*Type*
Indicator	9020..
Single-stage controller	9021..
Two-stage controller	9022..
Three-point controller	9023..
Positioner / follow-up controller	9024..
Two-point PID controller	9025..
Three-point PID controller	9026..
Three-point step controller	9027..
Continuous controller	9028..
Continuous controller with 2 outputs	9029..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 additional contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
Interface by external module for Profibus, Modbus, Ethernet, ..	(99) s..

*See also data sheets 99.. !
subject to alterations

Measuring inputs: (max. 4, depending on version)	Type suffix
Pt100/standard signal, 0...400°C/adj.	without (or 0)
Pt100/standard signal, -200...+800°C/adj.	99mb14b
Thermal element NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint: Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: 0..400°C (switching controllers), -200..+800°C (continuous controllers), switchable to °F,
standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts, custom display masks, up to 8 displays for relay functions.

Outputs:
Up to 8 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference all low voltage measuring lines and pilot wires must be encased in a shielded cable (the shielding must be earthed one-sided).
- The control leads must be fused externally to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse (if available) on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

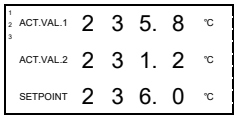
For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

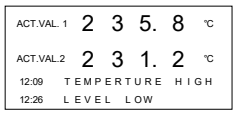
Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
Err 58 Err 59 Err 60 Err 61	Binary inputs out of function (status = 0), remit controller for repair Digital outputs out of function (switched off), remit controller for repair Relay outputs out of function (switched off), remit controller for repair Analogue outputs out of function (0 %), remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

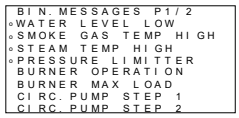
Operating status:



Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.
Depending on equipment, the status of the relays is shown at the left side of the display via the respective number (K) 1, 2, ..



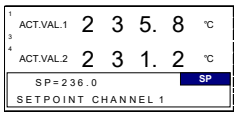
In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.



Message list: Briefly press the ▲ - button (do not hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence. Additionally, messages which are configured to the collective relay are marked with a circle symbol. This flashes until the message has been confirmed by means of binary input 1.

Setpoint value setting:

Briefly press the P - button (do not hold)



A flashing frame with the description SP shows the activated setpoint level.
The upper text display shows the parameter name “SP=” and the adjusted value, the lower text display optionally shows a description text.

The displayed value can now be changed using the ▼ (smaller) and ▲ (larger) buttons.
A setpoint change is effective immediately, without any further operational steps.

‘Arrow’ button acceleration effect:
longer pressing causes faster changing.

return to operating mode:
briefly press the P - button (or automatic after > 30 sec)

optional:

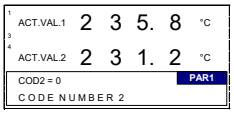
***SPB** Briefly press the P - button again each time:
***SP** Bus setpoint, forced by an external bus adapter (e.g. 99spde..)
SP2 / 3 / .. setpoints of additional control loops (*=no)
SPE additional setpoints for the control loops
external setpoint (display only);
flashing description signifies for this version:
SP-F value is presently not active.
Switch over menu SP / SPE (only in case of adjustment SP-F=MENU (Conf-level))

Manual operation: (optional)

Press and hold the ▼ -button, then additionally press the ▲ - button, then release both. (Option: Switch on and off using the extra button ⎋)
(For multi-channel controllers, first select the channel number CH..
using the ▼...▲. buttons and continue with the P -button, after which:)

MAN. The upper text display shows “MAN. *", plus the setting variable, if it exists.
The control function is switched off.
Manual control is now possible using the ▼...▲. buttons
return to operating mode: only with P -button (or. ⎋),
no automatic switching back from manual operation!

Optional: Start self-optimisation (see chapter Optimisation):
press the P -button >5 sec whilst in manual control function;
the lower display jumps to "-Ad-".
Abort: press the P -button again >5 sec



Access from the operating level

After *polling* (see instructions for level PARA 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.
The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail:
(existence depends on version and type):

PARA 1

Polling: press and hold the P - button >5 sec,
release it after the display reacts.

		Factory setting	*Notes*
COD2	Code number 2 (password) for parameter levels (1…9999)	1	___
CH..	(only) for multi-channel controllers: Selection of desired channel (no.)		
P	Proportional range Xp (%) (for more details, see “Optimisation”)	25.0	___
I	Integral action time Tn (min) (for more details, see “Optimisation”)	7.0	___
D	Rate time Tv (min) (for more details, see “Optimisation”)	0.2	___
SH	Response sensitivity (“dead zone”) Xsh (%)	0.1	___
SA.	Setpoint distance (absolute) for following switching contact no.	5.0*	___
SP.	Independent setpoint for switching contact no.	0.0	___
SD.	Hysteresis (switching difference on/off) for switching contact no.	3.0	___
		(..201,701/SA3 :10.0)*	

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

PARA 2

Polling: *press and hold the P - button, additionally press the ▼ - button,*
hold both buttons *for >5 sec, release them after the display reacts:*

COD2	Code number 2 (password) for parameter levels (1…9999)	1	___
Unit	Switches the unit of display (°C / °F)	C	___
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#	___
***ELO/*EHI**	(only) for external setpoint: start / end of setpoint range	#	___
***SLO/*SHI**	(only) for information signal output: start / end of range	#	___
NST	Number of decimal places of the display (0 / 1 / 2, depending on range)	0	___
***Lo / *HI**	Setpoint setting range, lower / upper limit	#	___
CRST	Contrast setting for display (0…20)	32	___
DSP1	Variable shown in first display line (10mm) (OFF / SP / Y / IST..)	IST1	___
DSP2	Variable shown in second display line (10mm) (OFF / SP / Y / IST..)	IST2	___
DSP3	Variable shown in third display line (10mm if DSP4=OFF, otherwise 3mm) (OFF / SP / Y / IST..)	SP	___
DSP4	Variable shown in fourth display line (3mm) (OFF / SP / Y / IST..)	OFF	___
	(SP = setpoint, Y=setting variable, Ist * = Actual value channel / measuring input*)		
EIN1..4	Unit of measurement for corresponding display line(°C / °F / % / bar / mbar / mPas / cSt / Kgm3 / mm / KPa / L / m3/h) Note: no conversion!	C	___
Text1/2/3/4	Desription text for corresponding display line1..4: choose from a predefined list (ACT.VAL..,SETPOINT, SUPPLY,RETURN), resp. 1 additionally editable text..*;changeable by PKS-software	1= ACT.VAL1 2= ACT.VAL1 3= SETPOINT	___ ___ ___

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = longer impulses, more sensitive reaction
higher value = shorter impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= shorter impulse gaps, faster balancing
higher value= longer impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

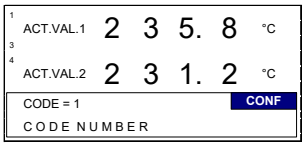
Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts:*
A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail:

	(existence depends on version and type):	*Factory setting*	*Notes*
CODE	Code number for configuration level (1…9999),	1	___
	Alternatively: Hold the P button for more than 10 sec after code entry:		
COD1	Possibility of setting the code number for the configuration level(option).	1	___
COD2	Possibility of setting the code number for the parameter levels(option).	1	___
LNG	Language selection of the menu text(Deutsch,English,User def, Off)	Deutsch	___
CONF	Selection of the configured controller function (*if existent*)		
	return to operating mode: *Briefly* press the P - button		
	or: **continue** to the following settings: press the P -button and *hold it* > 5 sec:		
	Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place		
SPEF	Configuration external/second setpoint “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “SP2” / “AUS”=OFF	MENU	___
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*	___
IST*	Correction value for changing the controller display (+/-)	*0.0*	___
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS	___
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec*	___
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec*	___
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*	___
***OUT**	Setting output characteristic: direct / inverse "di / in"	*in*	___
	(with 2 outputs: "in in / in di / di in / di di")	*inin*	___
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*	___
***AP**	Output signal working point (-100…+100)	*50*	___
FG A/E	Automatic adjustment of remote transmitter input (see extra sheet 99ar)		
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*	___
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= Signal 1; Sou2 = Signal 2)	*4...20 mA*	___
***Y_S**	Behaviour of the setting output in the event of measurement line error:		
	Relay position: "rel1 / rel2 / OFF"	*rel2(70.),rel1(20.)*	___
	Continuous output: "0...100" (%)	*0*	___
bin. Eing	Sub-menu for binary input configurations		
	Polling: press the P -button and *hold it* > 5 sec:		
BIN*	Direction of control action binary input* direct / inverse (di/in)	di	___
BIN*	Assignment of collective relay: Stat=none, SREL= collective relay	stat	___
BIN*	Switch-on delay (0…300 sec)	0	___
REL*	Function mode of additional contact (relay no.)	So*A(701),StA(201)*	___
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*	___
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*	___
Adr	if equipped with interface: bus address (number)	*5*	___
BAUD	if equipped with interface: baudrate (9600/19200/38400)	38400	___
	return to operating mode: briefly press the P - button *again*		

* = ID number in case of several inputs / outputs or control loops.
**= Rtd input of ain2 is additionally usable if equipped with ext. setpoint and activation using SP-F.

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

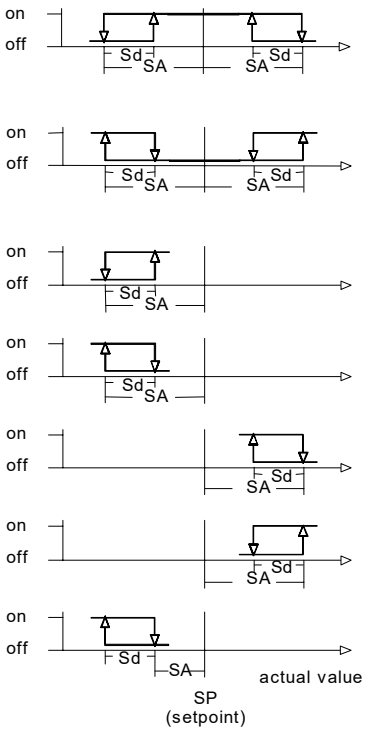
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

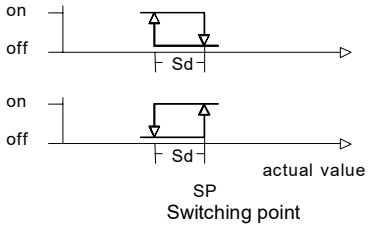
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):

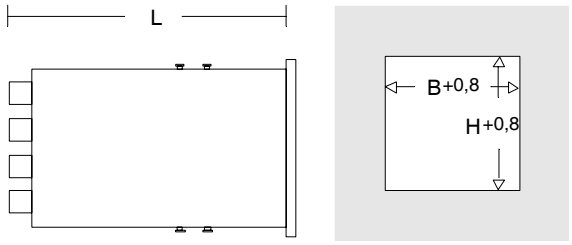
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**

SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

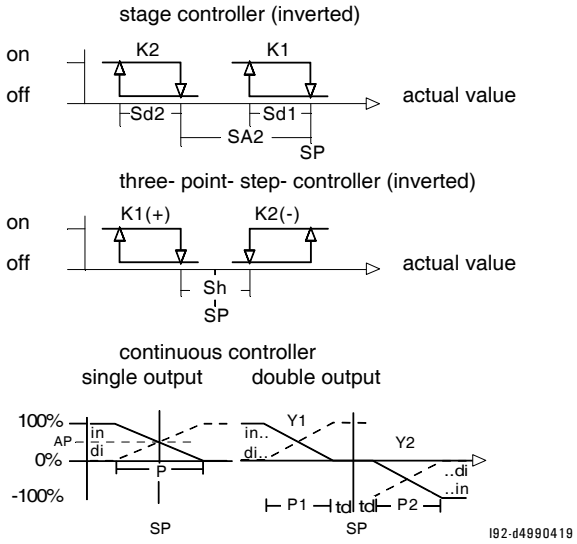
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

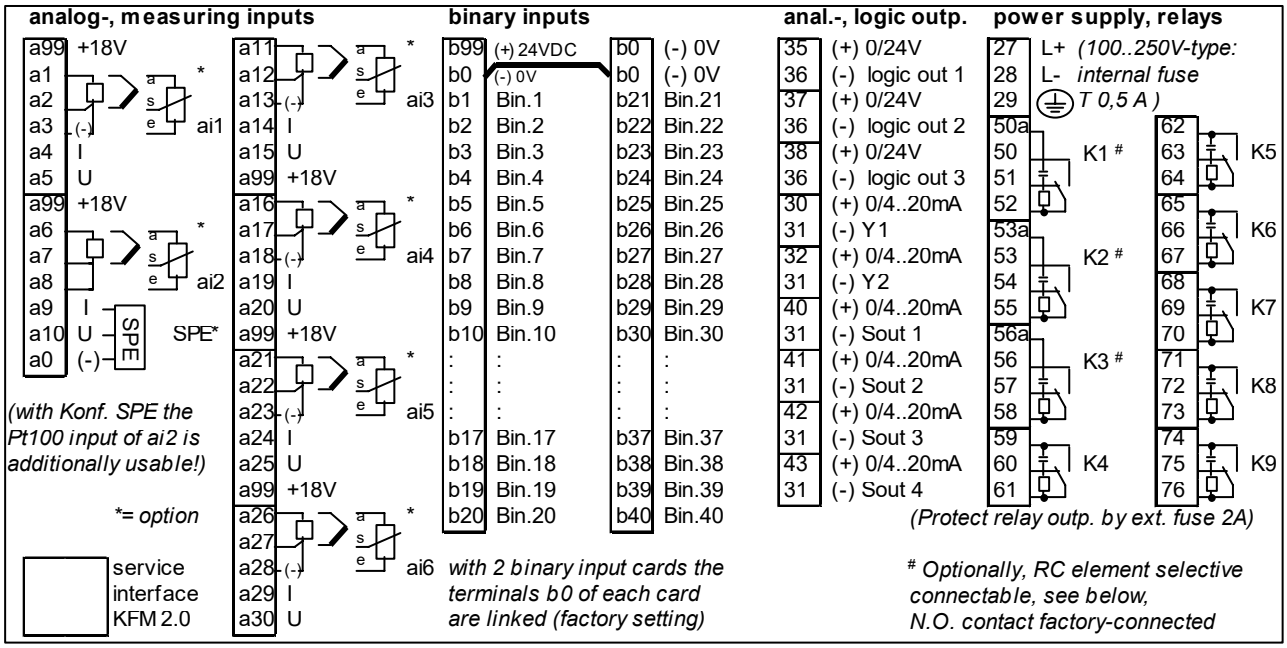


Form 96x96: L=150mm, B=92mm, H=92mm

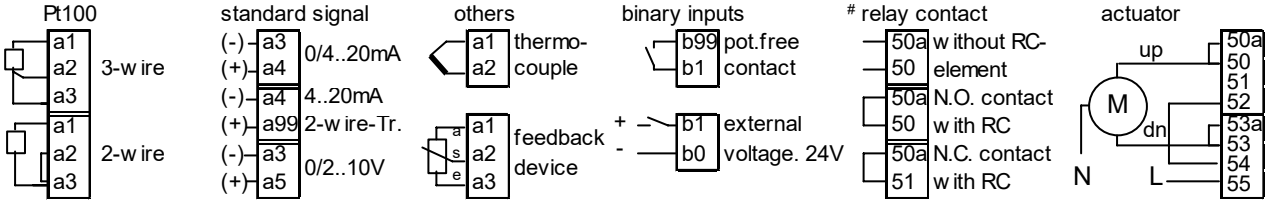


Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)

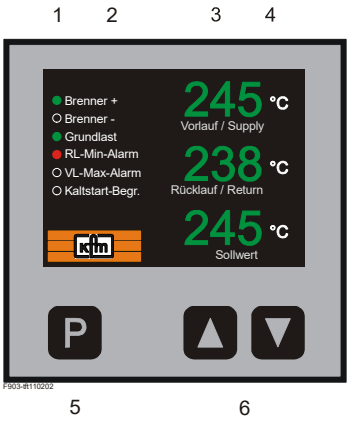


Wiring, examples for input 1 and output 1 respectively:



1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV



General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Depending on the version, external RC combinations are enclosed or internal RC combinations for optional connection led on terminals (bridged to NO contacts at the factory). The scope of delivery includes plugable terminal blocks.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

Stage- and three-point step controllers with auxiliary contact (e.g. burner contr.) are fitted as standard with a 2nd measuring input. Additional contacts can be switched time dependent using the integrated real time clock.

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Types:

Types *(depending on configuration):*	*Type*
Text-indicator	903000
Indicator	90301.
Single-stage controller	9031..
Two-stage controller	9032..
Three-point controller	9033..
Positioner / follow-up controller	9034..
Two-point PID controller	9035..
Three-point PID controller	9036..
Three-point step controller	9037..
Continuous controller	9038..
Continuous controller with 2 outputs	9039..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 add. contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V (version open coll.)	..L(O)

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
external module for Profibus, Modbus, Ethernet..	(99) s..

* see also data sheets 99..

Measuring inputs:	*Type suffix*
(max. 8, depending on version)	
Pt100 / standard signal, -200...+800°C / adjustable	without (or 0)
Thermal element	
NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C,	
PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter	
0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint:
Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts with time stamp, custom display masks also with real-time graphical representation, up to 9 displays for relay functions incl. freely adjustable description texts.

Outputs:
Up to 9 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A
incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 2 logic outputs 0/24V max. 40 mA,
alternatively 16 outputs open collector,
24 V / max. 500 mA

External malfunction alarm display: see sheet 826..

Intended use

The device is intended, in accordance to the technical data, for measuring- and control functions in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Inspect the controller for any visible signs of damage caused during transport.
Check power supply according to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly (for example by self- adaption) or wrong set parameter values on the device could affect the correct process.
- Safety devices independently from the device should be provided always.
  The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.

Electrical wiring

- Plug bar on the back face of the controller; connect up the controller following the wiring diagram on the device.
- Only the terminal blocks supplied are to be used. Replace existing old terminal blocks.
- For connecting power supply phase wire and neutral wire must not be transposed.
- Wire cross section max. 1,5 mm^2
- Lay input-, output and supply cabling physically seperated and not parallel to one another.
- Use shielded and twisted cables for the measuring-, control- and interface circuits to avoid interferences; Ground the shield properly. Do not lay close to components or cables through which current is flowing.
- Do not loop through ground wires, but connect to a common grounding point in the control cabinet; furthermore, a professional potential equalization must be noted and the lines must be kept as short as possible.
- The DIN VDE 0100 “construction of low-voltage systems” respectively the appropriate country specific regulations (for example on basis of IEC 60364) must be followed for the wiring material, the installation and the electrical wiring.
- Depending on version and application, possibly mount the enclosed RC-elements (external) or the jumper (internal RC-elements) in accordance to the wiring diagram.

See chapter RC-elements on page 19

Putting into operation

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. Adjust set value and check other adjustments.

Maintenance

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

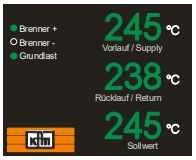
All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

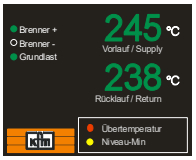
In case of remittance please give precise details of the fault to reduce time and cost of repair.

see chapter error messages on page 17

Operating status:



Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.Depending on equipment, the status of the relays is shown at the left side of the display via a coloured circle icon.



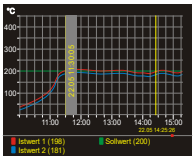
In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.



Message list#: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence with date and time. Operating messages are displayed by a circle icon coloured green.Pre- alarm messages are displayed by a circle icon coloured yellow. Messages which are configured to the collective relay are marked with a circle icon coloured red. This flashes until the message has been confirmed by means of binary input 1 (reset).

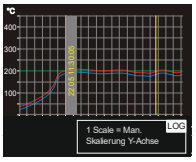


History# : *Briefly* press the ▲ - button (*do not* hold)
As message list, but the display shows a list of optionally saved messages (max. 40, oldest one will be overwritten). Furthermore, gone pre- alarms and malfunction messages are marked with a yellow respectively with a red check mark.



Graphical representation#: - *Briefly* press the ▲ - button (*do not* hold)
Selected values (actual value, setpoint, manipulated variable...) of the controller are displayed as a continuous diagram. A maximum of 2 pages of 4 values each with different scales and recording times is possible. The actual recording cycle is signalised by an ongoing red dot. Vertical yellow lines with grey background for date and time represent recording interruptions.

optional: To switch on the cursor press P -button *briefly*:
The cursor is moved along the time axis with the ▼ (earlier) / ▲ (later)-*buttons*, the values of the cursor position are shown in accordance to the date and time.
- *briefly* press the P - button to switch off the cursor



Only for configuration of the graphical display:
Data logger setting (LOG), to call up – press P key >5 sec:

⇨ *Data logger setting see page 10*

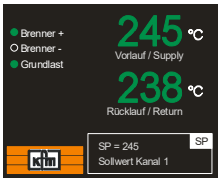
Custom specific representations# : briefly press the ▲ - button each (*do not* hold)

if existing

⇨ *Note*: The configuration of the custom specific display is possible with the pc- software PKS only, see manual 99pks respectively chapter software on page 16.

Note: **The parameters are shown partially, for full listing see sheet 99pkm_m (module overview).**

Setpoint value setting: - *Briefly* press the P - button (*do not* hold)



A flashing frame with the description SP shows the activated setpoint level and the parameter name “SP=”, the adjusted value as well as an description text optionally.

The displayed value can now be changed using the ▼ (lower) and ▲ (higher) *buttons*.

A setpoint change is effective *immediately*.

‘Arrow’ button *acceleration effect: longer* pressing *causes faster* changing.

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

optional:

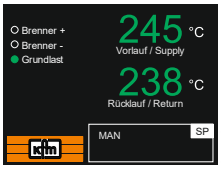
***SPB**
Briefly press the P - button again each time:
Bus setpoint, forced by an external bus adapter (e.g. 99spde..)

***SP**
SP2 / 3 / ..
setpoints of additional control loops (*=no)
additional setpoints for the control loop

SPE
external setpoint (display only);
flashing description signifies: value is presently *not* active.

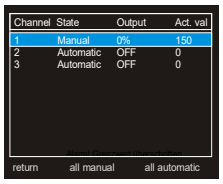
SP-F
Switch over menu SP / SPE
(only in case of adjustment SPEF=MENU (Conf-level))

Manual operation :
(if existing) :



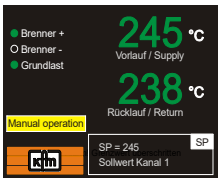
Press and hold the ▼ -button, then additionally press the ▲ - button, then release both.
The upper text display shows "Man." and, if available, the manipulated variable. The control function is switched off.
With the ▼...▲ buttons, manual control is now possible.

return to operating mode: ***only*** with entering P - button *briefly*



Alternatively, manual function- overview menu for multi-channel devices:
A summary of the existing controller channels and their manual state is displayed.
The requested channel is marked blue using the ▼...▲ buttons,
press the P - button *briefly* to continue.
Then, select the status "manual" or "automatic" with the ▼...▲ buttons,
press the P - button *briefly* to continue.

The status "manual" provides now a manual control using the ▼...▲ buttons, the control function is deactivated.
The control function is activated in the status "automatic".
Press the P - button *briefly* to select a channel again.
Note: Marking "all manual" respectively "all automatic" and pressing the P - button briefly choose for all channels in common.

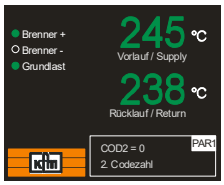


The corrective signal and the actual value are displayed for each channel.

return to operating mode: ***only*** with marking "return" and entering P - button *briefly, no* automatic switching back!
Note: The deactivated control function is signalised on the operation display by the display "Manual operation" on yellow background.

optional: Self- optimisation (see on page 11):
Marked channel P -button >5 sec: the display switches to "-Ad-

Parameter level 1



Access from the operating level

After *polling* (see instructions for level PAR 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.

The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail: *(existence depends on version and type):*

PAR1 Polling: press and hold the P - button >5 sec, release it after the display reacts.

Factory setting:

COD2	Code number 2 (password) for parameter levels (1...9999)	1
USB Stick	Menu (only) with equipment USB-host and inserted USB stick: Functions for data transmission	
	The requested function is marked blue with the ▼...▲ buttons, briefly press the P -button to confirm	
	"Load parameter only", **"Load TFT-project"**, **"Load complete configuration"** *Parameter set, TFT-project or the complete configuration will be transferred from the USB stick into the device, mark the desired file and confirm with the P -button.*	
	"Save parameter only", **"Save TFT-project"**, **"Save complete configuration"** *Parameter set, TFT-project or the complete configuration will be transferred from the device into the USB stick.*	
	"Cancel" To exit the menu	
CH..	(only) for multi-channel controllers: Selection of desired channel (no.)	
P	Proportional range Xp (%) (for more details, see "Optimisation")	25,0
I	Integral action time Tn (min) (for more details, see "Optimisation")	7,0
D	Rate time Tv (min) (for more details, see "Optimisation")	0,2
SH	Response sensitivity ("dead zone") Xsh (%)	0,1
SA. (ZA.)**	Setpoint distance (absolute) for following switching contact no.	5,0*
SP.	Independent setpoint for switching contact no.	0,0
SD. (ZD.)**	Hysteresis (switching difference on/off) for switching contact no.	3,0
	Only with configuration time dependent additional contacts:	
tSt.	Start time for switching contact no.., (weekday, hour, minute)	daily/0/0
tL.	Switching time for switching contact no.., (days, hours, minutes)	0/0/0
		(..201,701/SA3 :10,0)*

**= Je nach Ausführung

return *to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

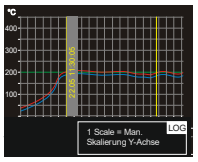
Parameter level 2

PAR2	Polling: *press and hold the* P *- button, additionally press the* ▼ *- button, hold* both buttons *for >5 sec, release them after the display reacts*.	
		Factory setting:
COD2	Code number 2 (password) for parameter levels (1...9999)	1
Time adj.	*Submenu* time adjustment, Polling: press and hold the P - button >5 sec.	
Date	Weekday, calendar day, month, year (actual selection marked white)	-
Time	Hour, minute, second (actual selection marked white)	-
Unit	Switch over of the display unit (cSt / mPas)	C
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#
***ELO/*EHI**	(only) for external setpoint: start / end of display range	#
***SLO/*SHI**	(only) for information signal output: start / end of range	#
***NST**	Number of decimal places of the display (0 / 1 / 2, depending on range)	0
***Lo / *HI**	Setpoint setting range, lower / upper limit	#
BRGH	Brightness Display (30 ... 100)	50
DSP1/2/3/4	Variable shown in display line 1-4 (10mm) (OFF/SP/Y/IST*/text**/time**) Note: display line 1 to 3: 10mm, if DSP4 = "OFF" otherwise display line 1 and 2: 10mm, display line 3 and 4: 3mm (SP = setpoint,Y=setting var.,Ist*=actual value channel*/meas. input*)	1=IST1 2=IST2 3=SP 4=AUS
EIN1/2/3/4	Unit of measurement for display line 1-4 (°C/ °F/ %/ bar/ mbar/ mPas/ cSt/ Kgm3/ mm/ Kpa/ L/ m3/h/ " ") Note: no conversion!	°C /°C/°C
TEXT1/2/3/4	Desription text for corresponding display line1..4: choose from a predefined list: (ACT.VAL..,SETPOINT, SUPPLY,RETURN), resp. 1 additionally editable text.*,changeable by PKS-software	1= ACT.VAL1 2= ACT.VAL2 3=SETPOINT 4=OFF
DSPT	Configuration message text Txi (internal messages in lines 3 and 4, value indication is deactivated), Txil (internal messages list only), Txt (external messages in lines 3 and 4, value indication is deactivated), Txtl (external messages list only), OFF	OFF
Hist.	*Submenu* delete history, Polling: press and hold the P - button >5 sec.	
Del	Delete history (NO / YES)	NO

***return** to operating mode: briefly press the* P *- button*
(or automatic after > 30 sec)

*= ID number in case of several meas. inputs/ control loops. # = *corresp. range*
**= display line 4 only

Setting data logger



Access from the graphical representation, Press P - key >5 sec.,

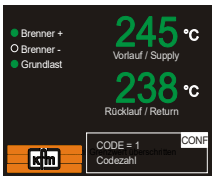
see also page 6.

Settings (available depending on version and type)**:**

		Factory setting
***Scale**	Y-axis scaling (Man. / Auto) Page 1/2	Auto
***LBLo / *LBHi**	Start / end (-999...9999), display range Y-axis Page 1/2	-200/ 400
***L-CY**	Cycle time- Data recording (15/ 30(sec.)/ 1/ 2/ 4(min.)) Page 1/2	1/ 1 Minute
***LWert1/2/3/4**	Selection of recording values 1-4 (AUS(off)/ IST*/ *SP/ ASP/ Y)	1=Ist1
	(IST*= actual value measurement input*, *SP= setpoint channel*,	2=SP
	ASP= active setpoint, Y= manipulated variable)	3/4=AUS
***LTxt1/2/3/4**	Designation text for recording values 1-4	1=act.val.1
	Selection of fixed texts: (actual value*, setpoint, flow, return, act. sig.)	2=setpoint
***LUnit1/2/3/4**	Unit of measurement to record values 1-4 (°C, °F, %, bar,…)	1/ 2=°C

* = referende number for multiple data logger pages

Configuration level



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts.*

A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail *(existence depends on version and type):*

		Factory setting
CODE	Code number for configuration level (1...9999),	1
	Alternatively: Hold the P button for more than 10 sec after code entry:	
COD1	Possibility of setting the code number for the configuration level(option).	1
COD2	Possibility of setting the code number for the parameter levels(option).	1
LNG	Language selection of the menu texts (Deutsch,English,User def, Off)	*Deutsch*
CONF	Selection of the configured controller function (*if existent*)	

Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place

return to operating mode: *Briefly* press the P - button

or: **continue** to the following settings:
press the P -button and *hold it* > 5 sec

		Factory setting
SPEF	Configuration external setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SP2F	Configuration second setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SPBF	Configuration bus setpoint: ”BIN” (activation by a binary input) / “MENU” (activation in the setpoint level) / “BUS” (activation by a status bit via bus-interface adapter, such as 99spde)	*BUS*
SPOV	Take over external-/ bus setpoint value: “OVER” (the last valid external-/ bus setpoint value is taken over to the internal setpoint value) / “AUS”=OFF (setpoint value unaffected)	*AUS*
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*
AiSP	Input type for input external setpoint: "0-20 / 4-20(mA) / 0-10 / 2-10(V)" (note different terminals for I/U!)	*4-20*
IST*	Correction value for changing the controller display (+/-)	*0.0*
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec.*
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec.*
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*
***OUT**	Setting output characteristic: direct / inverse "di / in" (with 2 outputs: "in in / in di / di in / di di")	*in* *inin*
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*
***AP**	Output signal working point (-100…+100)	*50*
FG A/E	⇨ Automatic adaption for position feedback input (see sheet 99ar)	
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= signal 1; Sou2 = signal 2)	*4...20 mA*
***Y_S**	Behaviour of the setting output in the event of measurement line error: Relay position: "rel1 / plus / rel2 / min. (minus) / OFF"	*rel2/min.(70.),rel1(20.)*
	Continuous output: "0...100" (%)	*0*
bin. Eing	Sub-menu for binary input configurations Polling: press the P -button and *hold it* > 5 sec:	
[#] Di* Dir	Characteristic binary input * direct / inverse / disable (di/in/dis)	di
[#] Di* Func	Function binary input * (Alrm (alarm) / AloR (alarm without reset) / AloS (alarm without collective message) / PrAl (pre alarm)/ PAoR (pre alarm without reset) / PAoS (pre alarm without collective message) / STAT (without))	Alrm
[#] Di* Tdel	Switch-on delay binary input * (0...300 sec)	0
[#] Di* Hist	Save in history binary input * (on/off) #= Number of the module	on
REL*	Function mode of additional contact (relay no.)	*SoA(701),StA(201)*
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*
Adr	if equipped with interface: bus address (number)	*5*
BAUD	if equipped with interface: baudrate (9600/19200/38400)	*38400*

return to operating mode: briefly press the P - button *again*

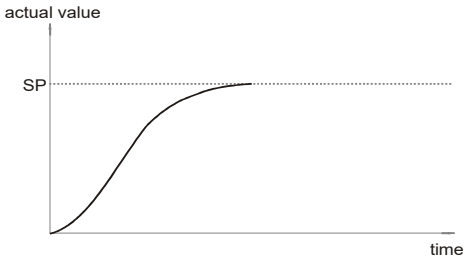
***** = ID number in case of several inputs / outputs or control loops.
******= Rtd input of ain2 is usable only if equipped with ext. setpoint and activation using SPEF.

manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information. The following informations are for help purpose only:

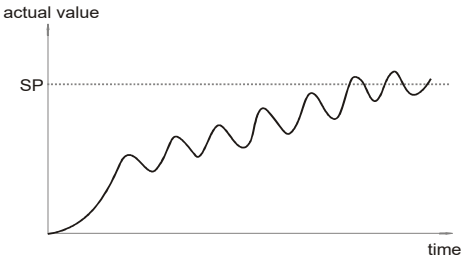
Optimal



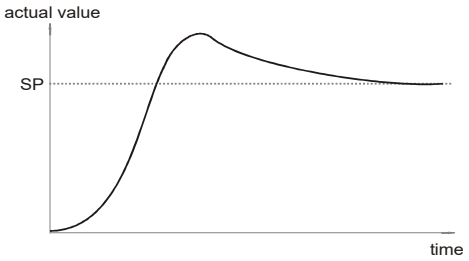
P = proportional band Xp (%):
lower value = *longer* impulses (three-point step control), more sensitive reaction,
higher value = *shorter* impulses (three-point step control), less sensitive reaction.

Examples:

- Oscillating temperature without distinct initial overshot: **P (Xp) too low**;



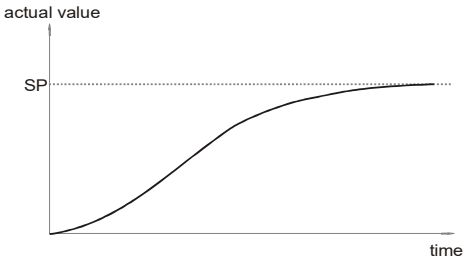
- The setpoint is reached very slowly after initial overshooting: **P (Xp) too high**.



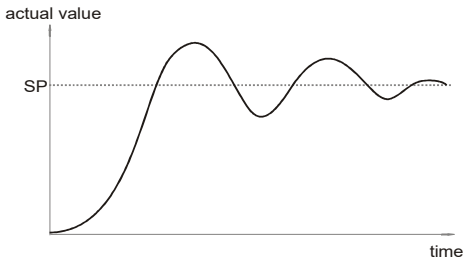
I = integral action time Tn (min):
lower value= *shorter* impulse gaps (three-point step control), faster balancing,
higher value= *longer* impulse gaps (three-point step control), slower balancing.

Examples:

- the set value is reached very slowly without overshooting: **I (Tn) too high**;



- high initial overshot followed by fading oscillation: **I (Tn) too low**.



D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

Self-adaptation (optional)

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first: Lower actual value adequately by manual operation (position of final control element) (quick circuits)or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min),then it increases the output signal about 10% or, in case of three- point- step controller operation,it triggers an output impulse with about 10% of the adjusted regulating time.The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation
(Display shows error code, ref.to chapter error messages on page 17)

Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off))

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

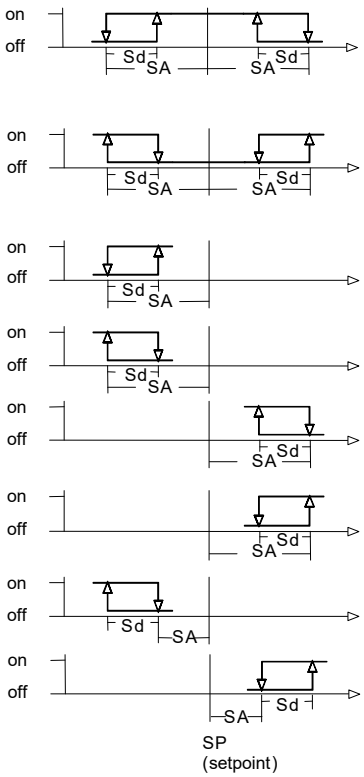
Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

St A Heating stage below setpoint. Relay drops out as actual value increases

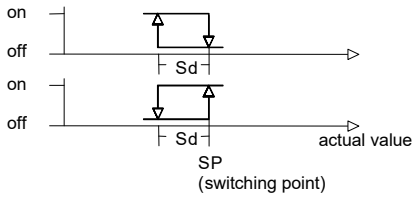
STCA Stage above setpoint. Relay drops out as actual value decreases (**A**us = off)



Switching functions for independent contacts:
Hysteresis below:

US A Relay drops out with increasing actual value (**A**us = off)

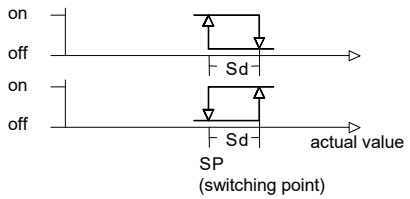
US E Relay picks up with increasing actual value (**E**in = on)



Hysteresis above:

USCA Relay picks up as actual value decreases

USCE Relay drops out with decreasing actual value



In each case additional settings follow under "rEL." after the selection is acknowledged (P - key):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH./.SP. .(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Additional contact – special functions (depending on version)

Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

Interface function:

BUS Bus function, relay is switched on/off depending on control via service- interface, for example using the profibus- adapter 99spde..

See manual 99sp.. for each adapter

Malfunction message function (when using the internal malfunction alarm display):

SR A /E Collective message function, relay is de-energised / energised if there is an alarm message.

NW A /E New value message, relay is de-energised / energised if a new alarm message appears that has not yet been confirmed with reset.

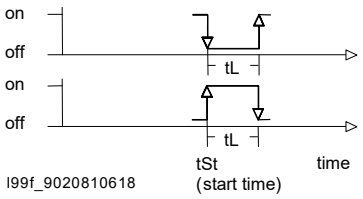
IP A /E New value pulse, relay is de-energised / energised for 3 sec if a new alarm message appears.

SRIA /E Collective message function with new value pulse, relay is de-energised / energised if there is an alarm message. If a further (new) alarm message appears, the relay is energised for 3 sec.

Switching functions for <u>time dependent</u> contacts:

RTCA time dependent switch-off contact(**A**us=off)

RTCE time dependent switch-on contact (**E**in=on)



Message measuring line error:

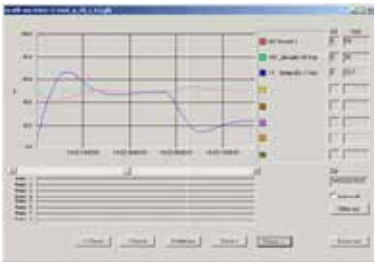
ErrA /E Relay is permanently switched off (**A**us=off) or on (**E**in=on) if a measuring line error is present

Software

PKS

- Data fransfer, editing and archiving of parameter sets
- Online remote operation
- Graphical display (line recorder)
- Data recording (logger)

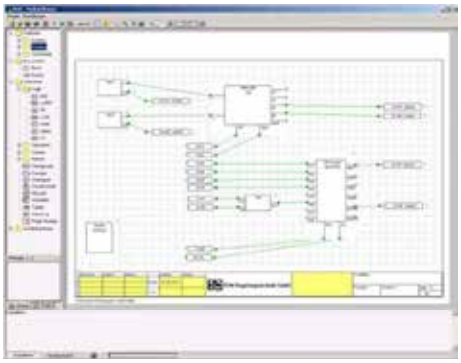




See sheet 99pks

PKM *(component of PKS)*

- Module software for graphical programming
- Regulation and control

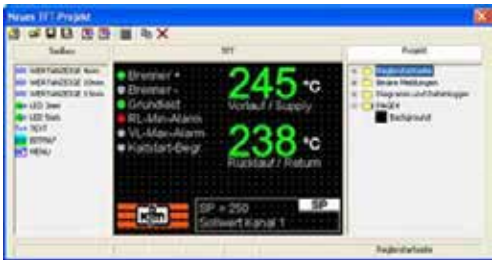


See sheet 99pkm

See sheet 99pkm_m (module overview)

PKD *(component of PKS)*

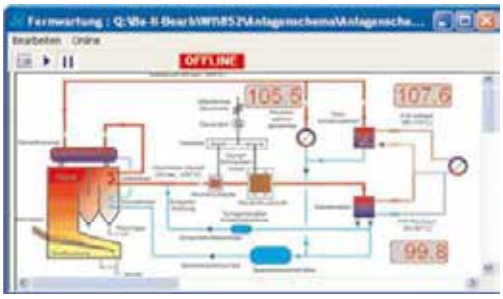
- Configuration of the controller display
- Data logger, binary message lists and custom specific logos



See sheet 99pkd

PCS

- Visualization of custom specific system- and process schemes
- Remote maintenance



See sheet 99pcs

Error messages

Err 1...8	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
Err 57	Circuit board error no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
Err 63	Data connection to the hardware expansion modules interrupted, check cables
Err 64 / 68	Analogue inputs out of function, remit controller for repair

Error messages during self adaptation (see chapter self- adaption on page 13):

Err 202	Ambient conditions are not suitable for self adaptation; adjust parameters manually (see chapter manual optimization on page 12)
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Technical data
(depending on type and version)

Characteristics
Parameter-level, code locked.
pre adjusted on customer´s demand.

Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA(add. contacts):0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent(daily-/ weekly switch. function), switching function adjustable

Measuring inputs:
Pt100/standard signal, -200..+800°C/adjust.

Thermal element * NiCr-Ni (K) 0..1200°C
Fe-CuNi (J) 0..900°C, PtRh-Pt (S) 0..1700°C

Remote resistance transmitter * 0...100/1000Ω
* = *option*

Ranges:
Pt 100: -200..+800°C, switchable to °F, standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

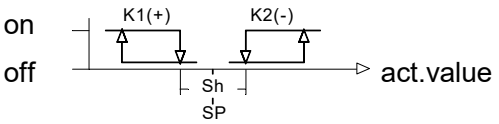
Binary inputs:
Alternative for potential-free contacts or for external voltage 0 / 24V

Outputs:
Relay with potential-free changeover contacts, switching power: 250V 2A incl. spark extinction (on the N.O. contact)

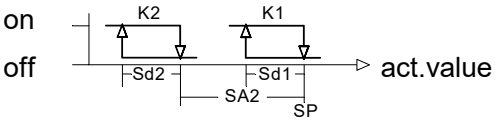
Continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω),

Logic outputs 0/24V max. 40 mA, alternatively outputs with open-collector,
24 V / max 500 mA

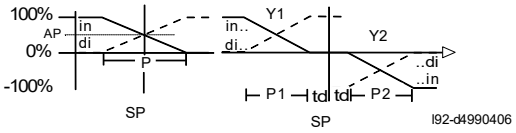
three- point step controller (inverted)



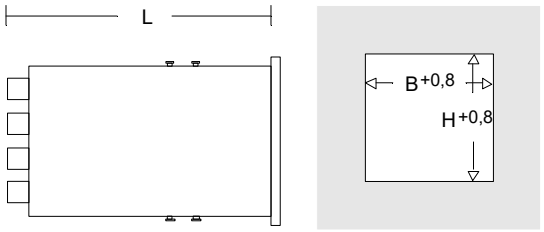
stage controller (inverted)



continuous controller
single output double output



Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system DIN EN60529: IP54 resp. IP6
(flat seal + 4 mounting elements),
terminals IP20
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

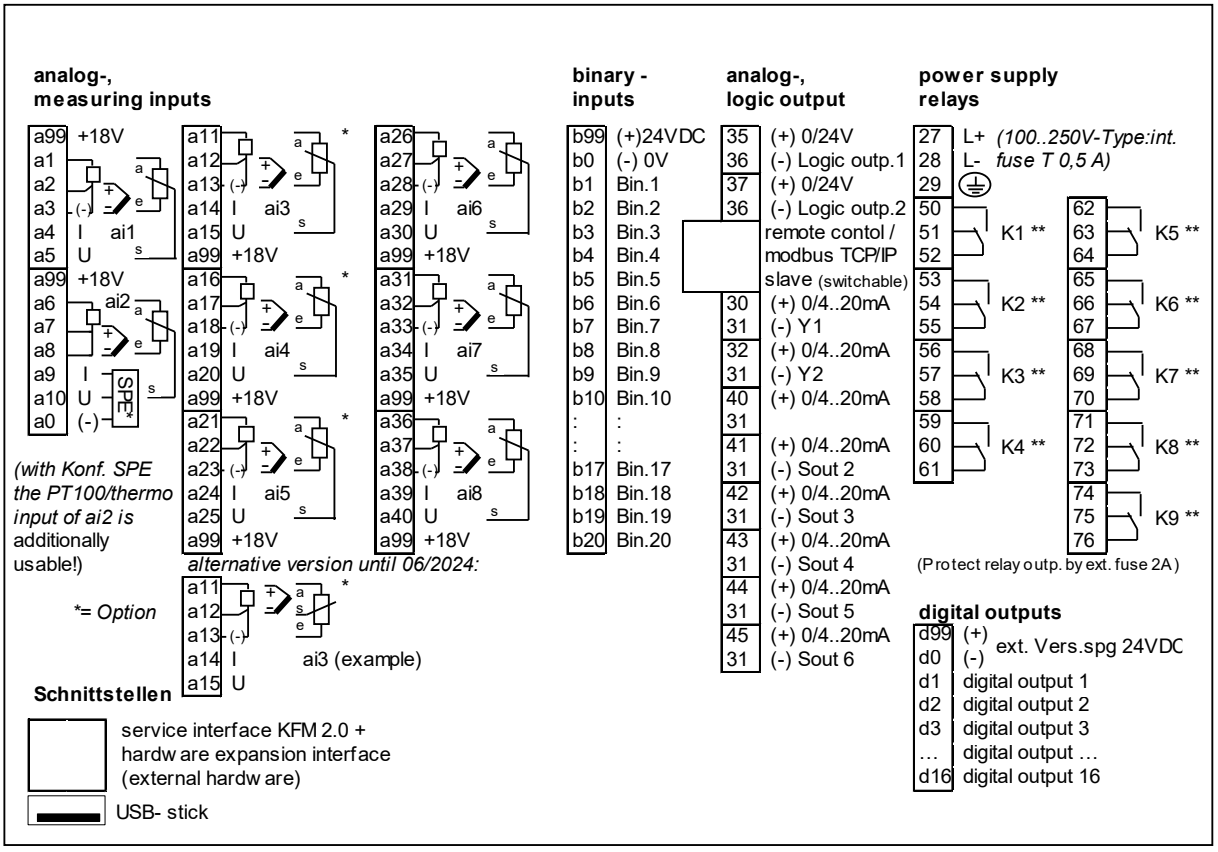
Interfaces:
RJ45 (socket) service interface KFM 2.0 / external hardware

RJ45 (socket) remote controller unit switchable Modbus TCP/IP slave

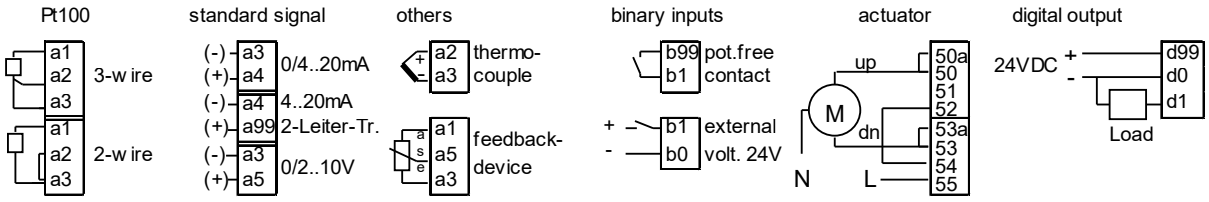
USB- 2.0 Host plug type A (socket) für USB-memory stick, max. 100 mA

Wiring diagram:

Example, valid for each delivered controller is the wiring diagram on its casing only



Wiring, examples for input 1 and output 1 respectively:



**** RC- element**:
Depending on version, RC elements for external mounting are enclosed for the selective connection.

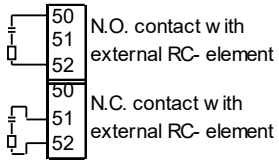




Connection without external RC- element
The RC- elements must not be used with small loads, for example auxiliary relays (depending on capacity) or electronic burner managers (note the manufacturer´s instructions).

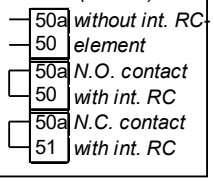
Connection with external RC- element
The RC- elements are used to protect the relay contacts in case of higher loads, for example electrical control valves or contactors.

relay contact (RC external)



relay contact (RC int.)

alternative version with internal RC- elements, wired on terminal for the selective connection (factory set N.O. contact with RC element):



Regelungstechnik nach Maß

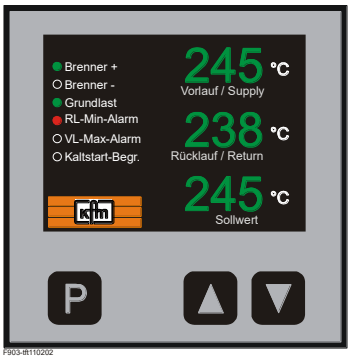
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1 2 3 4



5 6

1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs (changeover), various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible. Additional contacts can be switched time dependent using the integrated real time clock.

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

The belonging module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules, an external malfunction alarm unit or a second freely programmable controller 903K can be added to it by using the standard interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

The touch operation of the TFT- display is optionally available.

Depending on version, the industrial controller can configured and read out via USB stick.

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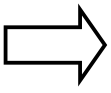
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REFERENCE!
This symbol refers to further information in other sections, chapters or other manuals.

Hardware- types (unprogrammed)**:**

Type	Measuring inputs	Binary inputs	Analogue outputs	Relays
903K2223	2	2	2	3
903K2C46	2	12	4	6
903K5828	5	8	2	8
903K5K28	5	20	2	8
903K5K64L	5	20	6	4 (+2 Logik outputs)
903K8264L	8	2	6	4 (+2 Logik outputs)

Depending on version, RC elements for external mounting are enclosed, only in exceptional cases internal RC elements are wired on terminals for the selective connection.

Special versions depending on quantities possible.

Hardware- expansion modules: see sheet 852..

External malfunction alarm display: see sheet 826..

Intended use

The device is intended, in accordance to the technical data, for measuring- and control functions in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Inspect the controller for any visible signs of damage caused during transport.
Check power supply according to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly (for example by self- adaption) or wrong set parameter values on the device could affect the correct process.
- Safety devices independently from the device should be provided always.
  The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.

Electrical wiring

- Plug bar on the back face of the controller; connect up the controller following the wiring diagram on the device.
- Only the terminal blocks supplied are to be used. Replace existing old terminal blocks.
- For connecting power supply phase wire and neutral wire must not be transposed.
- Wire cross section max. 1,5 mm^2
- Lay input-, output and supply cabling physically seperated and not parallel to one another.
- Use shielded and twisted cables for the measuring-, control- and interface circuits to avoid interferences; Ground the shield properly. Do not lay close to components or cables through which current is flowing.
- Do not loop through ground wires, but connect to a common grounding point in the control cabinet; furthermore, a professional potential equalization must be noted and the lines must be kept as short as possible.
- The DIN VDE 0100 “construction of low-voltage systems” respectively the appropriate country specific regulations (for example on basis of IEC 60364) must be followed for the wiring material, the installation and the electrical wiring.
- Depending on version and application, possibly mount the enclosed RC-elements (external) or the jumper (internal RC-elements) in accordance to the wiring diagram.

See chapter RC-elements on page 19

Putting into operation

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. Adjust set value and check other adjustments.

Maintenance

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

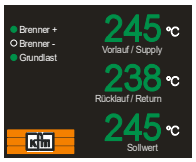
All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

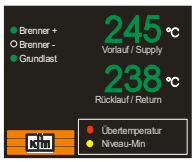
In case of remittance please give precise details of the fault to reduce time and cost of repair.

see chapter error messages on page 17

Operating status:



Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.Depending on equipment, the status of the relays is shown at the left side of the display via a coloured circle icon.



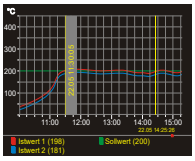
In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.



Message list#: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence with date and time. Operating messages are displayed by a circle icon coloured green.Pre- alarm messages are displayed by a circle icon coloured yellow. Messages which are configured to the collective relay are marked with a circle icon coloured red. This flashes until the message has been confirmed by means of binary input 1 (reset).

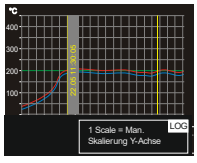


History# : *Briefly* press the ▲ - button (*do not* hold)
As message list, but the display shows a list of optionally saved messages (max. 40, oldest one will be overwritten). Furthermore, gone pre- alarms and malfunction messages are marked with a yellow respectively with a red check mark.



Graphical representation#: - *Briefly* press the ▲ - button (*do not* hold)
Selected values (actual value, setpoint, manipulated variable...) of the controller are displayed as a continuous diagram. A maximum of 2 pages of 4 values each with different scales and recording times is possible. The actual recording cycle is signalised by an ongoing red dot. Vertical yellow lines with grey background for date and time represent recording interruptions.

optional: To switch on the cursor press P -button *briefly*:
The cursor is moved along the time axis with the ▼ (earlier) / ▲ (later)-*buttons*, the values of the cursor position are shown in accordance to the date and time.
- *briefly* press the P - button to switch off the cursor



Only for configuration of the graphical display:
Data logger setting (LOG), to call up – press P key >5 sec:

⇨ *Data logger setting see page 10*

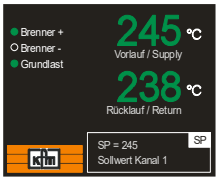
Custom specific representations# : briefly press the ▲ - button each (*do not* hold)

if existing

⇨ *Note*: The configuration of the custom specific display is possible with the pc- software PKS only, see manual 99pks respectively chapter software on page 16.

Note: The parameters are shown partially, for full listing see sheet 99pkm_m (module overview).

Setpoint value setting: - *Briefly* press the P - button (*do not* hold)



A flashing frame with the description SP shows the activated setpoint level and the parameter name “SP=”, the adjusted value as well as an description text optionally.

The displayed value can now be changed using the ▼ (lower) and ▲ (higher) *buttons*.

A setpoint change is effective *immediately*.

‘Arrow’ button *acceleration effect: longer* pressing *causes faster* changing.

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

optional:

***SPB**
Bus setpoint, forced by an external bus adapter (e.g. 99spde..)

***SP**
setpoints of additional control loops (*=no)

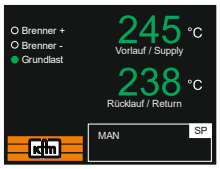
SP2 / 3 / ..
additional setpoints for the control loop

SPE
external setpoint (display only);
flashing description signifies: value is presently *not* active.

Briefly press the P - button again each time:

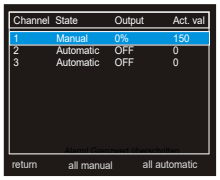
SP-F
Switch over menu SP / SPE
(only in case of adjustment SPEF=MENU (Conf-level))

Manual operation :
(if existing) :



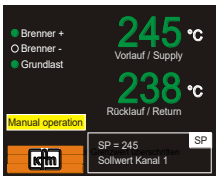
Press and hold the ▼ -button, then additionally press the ▲ - button, then release both.
The upper text display shows "Man." and, if available, the manipulated variable. The control function is switched off.
With the ▼...▲ buttons, manual control is now possible.

return to operating mode: ***only*** with entering P - button *briefly*



Alternatively, manual function- overview menu for multi-channel devices:
A summary of the existing controller channels and their manual state is displayed.
The requested channel is marked blue using the ▼...▲ buttons,
press the P - button *briefly* to continue.
Then, select the status "manual" or "automatic" with the ▼...▲ buttons,
press the P - button *briefly* to continue.

The status "manual" provides now a manual control using the ▼...▲ buttons, the control function is deactivated.
The control function is activated in the status "automatic".
Press the P - button *briefly* to select a channel again.
Note: Marking "all manual" respectively "all automatic" and pressing the P - button briefly choose for all channels in common.

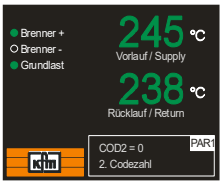


The corrective signal and the actual value are displayed for each channel.

return to operating mode: ***only*** with marking "return" and entering P - button *briefly, no* automatic switching back!
Note: The deactivated control function is signalised on the operation display by the display "Manual operation" on yellow background.

optional: Self- optimisation (see on page 11):
Marked channel P -button >5 sec: the display switches to "-Ad-

Parameter level 1



Access from the operating level

After *polling* (see instructions for level PAR 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.

The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail: *(existence depends on version and type):*

PAR1 Polling: press and hold the P - button >5 sec, release it after the display reacts.

Factory setting:

COD2	Code number 2 (password) for parameter levels (1...9999)	1
USB Stick	Menu (only) with equipment USB-host and inserted USB stick: Functions for data transmission	

The requested function is marked blue with the ▼...▲ buttons, briefly press the P -button to confirm

"Load parameter only", **"Load TFT-project"**, **"Load complete configuration"**
Parameter set, TFT-project or the complete configuration will be transferred from the USB stick into the device, mark the desired file and confirm with the P -button.

"Save parameter only", **"Save TFT-project"**, **"Save complete configuration"**
Parameter set, TFT-project or the complete configuration will be transferred from the device into the USB stick.

"Cancel" To exit the menu

CH..	(only) for multi-channel controllers: Selection of desired channel (no.)	
P	Proportional range Xp (%) (for more details, see “Optimisation”)	25,0
I	Integral action time Tn (min) (for more details, see “Optimisation”)	7,0
D	Rate time Tv (min) (for more details, see “Optimisation”)	0,2
SH	Response sensitivity (“dead zone”) Xsh (%)	0,1
SA. (ZA.)**	Setpoint distance (absolute) for following switching contact no.	5,0*
SP.	Independent setpoint for switching contact no.	0,0
SD. (ZD.)**	Hysteresis (switching difference on/off) for switching contact no.	3,0
	Only with configuration time dependent additional contacts:	
tSt.	Start time for switching contact no.., (weekday, hour, minute)	daily/0/0
tL.	Switching time for switching contact no.., (days, hours, minutes)	0/0/0

(..201,701/SA3 :10,0)*

**= Je nach Ausführung

return *to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

Parameter level 2

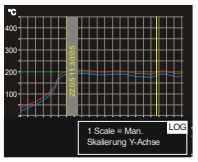
PAR2 Polling: *press and hold the* P *- button, additionally press the* ▼ *- button, hold* both buttons *for >5 sec, release them after the display reacts.*

		Factory setting:
COD2	Code number 2 (password) for parameter levels (1...9999)	1
Time adj.	*Submenu* time adjustment, Polling: press and hold the P - button >5 sec.	
Date	Weekday, calendar day, month, year (actual selection marked white)	-
Time	Hour, minute, second (actual selection marked white)	-
Unit	Switch over of the display unit (cSt / mPas)	C
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#
***ELO/*EHI**	(only) for external setpoint: start / end of display range	#
***SLO/*SHI**	(only) for information signal output: start / end of range	#
***NST**	Number of decimal places of the display (0 / 1 / 2, depending on range)	0
***Lo / *HI**	Setpoint setting range, lower / upper limit	#
BRGH	Brightness Display (30 ... 100)	50
DSP1/2/3/4	Variable shown in display line 1-4 (10mm) (OFF/SP/Y/IST*/text**/time**)	1=IST1
	Note: display line 1 to 3: 10mm, if DSP4 = "OFF"	2=IST2
	otherwise display line 1 and 2: 10mm, display line 3 and 4: 3mm	3=SP
	(SP = setpoint,Y=setting var.,Ist*=actual value channel*/meas. input*)	4=AUS
EIN1/2/3/4	Unit of measurement for display line 1-4	
	(°C/ °F/ %/ bar/ mbar/ mPas/ cSt/ Kgm3/ mm/ Kpa/ L/ m3/h/ " ")	
	Note: no conversion!	°C /°C/°C
TEXT1/2/3/4	Desription text for corresponding display line1..4:	1= ACT.VAL1
	choose from a predefined list:	2= ACT.VAL2
	(ACT.VAL..,SETPOINT, SUPPLY,RETURN),	3=SETPOINT
	resp. 1 additionally editable text.*,changeable by PKS-software	4=OFF
DSPT	Configuration message text	OFF
	Txi (internal messages in lines 3 and 4, value indication is deactivated),	
	Txil (internal messages list only),	
	Txt (external messages in lines 3 and 4, value indication is deactivated),	
	Txtl (external messages list only),	
	OFF	
Hist.	*Submenu* delete history,	
	Polling: press and hold the P - button >5 sec.	
Del	Delete history (NO / YES)	NO

***return** to operating mode: briefly press the* P *- button*
(or automatic after > 30 sec)

*= ID number in case of several meas. inputs/ control loops. # = *corresp. range*
**= display line 4 only

Setting data logger



Access from the graphical representation, Press P - key >5 sec.,

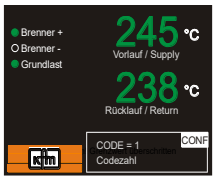
see also page 6.

Settings (available depending on version and type)**:**

		Factory setting
***Scale**	Y-axis scaling (Man. / Auto) Page 1/2	Auto
***LBLo / *LBHi**	Start / end (-999...9999), display range Y-axis Page 1/2	-200/ 400
***L-CY**	Cycle time- Data recording (15/ 30(sec.)/ 1/ 2/ 4(min.)) Page 1/2	1/ 1 Minute
***LWert1/2/3/4**	Selection of recording values 1-4 (AUS(off)/ IST*/ *SP/ ASP/ Y)	1=Ist1
	(IST*= actual value measurement input*, *SP= setpoint channel*,	2=SP
	ASP= active setpoint, Y= manipulated variable)	3/4=AUS
***LTxt1/2/3/4**	Designation text for recording values 1-4	1=act.val.1
	Selection of fixed texts: (actual value*, setpoint, flow, return, act. sig.)	2=setpoint
***LUnit1/2/3/4**	Unit of measurement to record values 1-4 (°C, °F, %, bar,…)	1/ 2=°C

* = referende number for multiple data logger pages

Configuration level



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts.*

A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail *(existence depends on version and type):*

		Factory setting
CODE	Code number for configuration level (1...9999),	1
	Alternatively: Hold the P button for more than 10 sec after code entry:	
COD1	Possibility of setting the code number for the configuration level(option).	1
COD2	Possibility of setting the code number for the parameter levels(option).	1
LNG	Language selection of the menu texts (Deutsch,English,User def, Off)	*Deutsch*
CONF	Selection of the configured controller function (*if existent*)	

Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place

return to operating mode: *Briefly* press the P - button

or: **continue** to the following settings:
press the P -button and *hold it* > 5 sec

		Factory setting
SPEF	Configuration external setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SP2F	Configuration second setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SPBF	Configuration bus setpoint: ”BIN” (activation by a binary input) / “MENU” (activation in the setpoint level) / “BUS” (activation by a status bit via bus-interface adapter, such as 99spde)	*BUS*
SPOV	Take over external-/ bus setpoint value: “OVER” (the last valid external-/ bus setpoint value is taken over to the internal setpoint value) / “AUS”=OFF (setpoint value unaffected)	*AUS*
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*
AiSP	Input type for input external setpoint: "0-20 / 4-20(mA) / 0-10 / 2-10(V)" (note different terminals for I/U!)	*4-20*
IST*	Correction value for changing the controller display (+/-)	*0.0*
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec.*
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec.*
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*
***OUT**	Setting output characteristic: direct / inverse "di / in" (with 2 outputs: "in in / in di / di in / di di")	*in* *inin*
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*
***AP**	Output signal working point (-100…+100)	*50*
FG A/E	⇨ Automatic adaption for position feedback input (see sheet 99ar)	
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= signal 1; Sou2 = signal 2)	*4...20 mA*
***Y_S**	Behaviour of the setting output in the event of measurement line error: Relay position: "rel1 / plus / rel2 / min. (minus) / OFF"	*rel2/min.(70.),rel1(20.)*
	Continuous output: "0...100" (%)	*0*
bin. Eing	Sub-menu for binary input configurations Polling: press the P -button and *hold it* > 5 sec:	
[#] **Di* Dir**	Characteristic binary input * direct / inverse / disable (di/in/dis)	di
[#] **Di* Func**	Function binary input * (Alrm (alarm) / AloR (alarm without reset) / AloS (alarm without collective message) / PrAl (pre alarm)/ PAoR (pre alarm without reset) / PAoS (pre alarm without collective message) / STAT (without))	Alrm
[#] **Di* Tdel**	Switch-on delay binary input * (0...300 sec)	0
[#] **Di* Hist**	Save in history binary input * (on/off) #= Number of the module	on
REL*	Function mode of additional contact (relay no.)	*SoA(701),StA(201)*
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*
Adr	if equipped with interface: bus address (number)	*5*
BAUD	if equipped with interface: baudrate (9600/19200/38400)	*38400*

return to operating mode: briefly press the P - button *again*

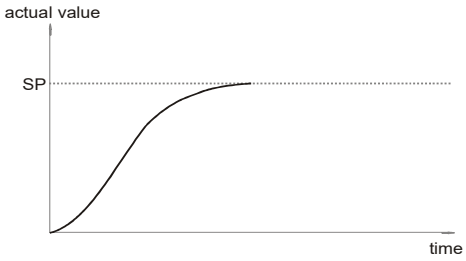
* = ID number in case of several inputs / outputs or control loops.
**= Rtd input of ain2 is usable only if equipped with ext. setpoint and activation using SPEF.

manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information. The following informations are for help purpose only:

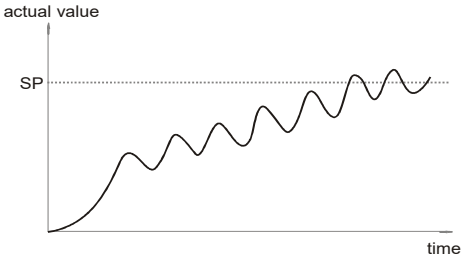
Optimal



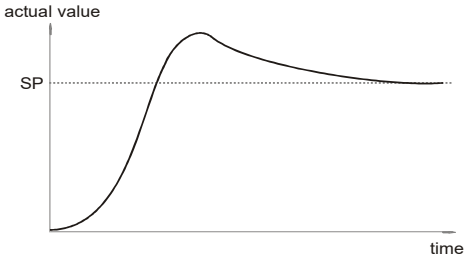
P = proportional band Xp (%):
lower value = *longer* impulses (three-point step control), more sensitive reaction,
higher value = *shorter* impulses (three-point step control), less sensitive reaction.

Examples:

- Oscillating temperature without distinct initial overshot: **P (Xp) too low**;



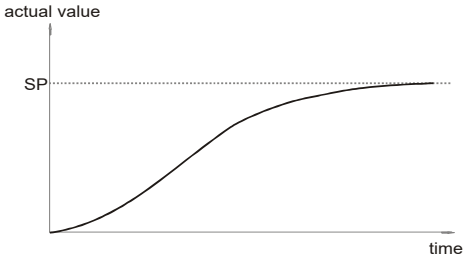
- The setpoint is reached very slowly after initial overshooting: **P (Xp) too high**.



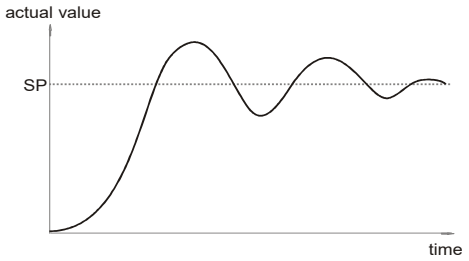
I = integral action time Tn (min):
lower value= *shorter* impulse gaps (three-point step control), faster balancing,
higher value= *longer* impulse gaps (three-point step control), slower balancing.

Examples:

- the set value is reached very slowly without overshooting: **I (Tn) too high**;



- high initial overshot followed by fading oscillation: **I (Tn) too low**.



D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

Self-adaptation (optional)

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first: Lower actual value adequately by manual operation (position of final control element) (quick circuits)or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min),then it increases the output signal about 10% or, in case of three- point- step controller operation,it triggers an output impulse with about 10% of the adjusted regulating time.The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation
(Display shows error code, ref.to chapter error messages on page 17)

Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off))

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

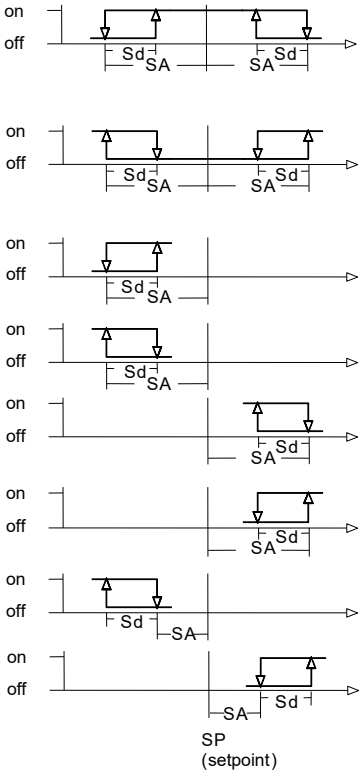
Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

St A Heating stage below setpoint. Relay drops out as actual value increases

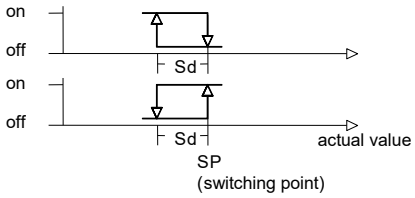
STCA Stage above setpoint. Relay drops out as actual value decreases (**A**us = off)



Switching functions for independent contacts:
Hysteresis below:

US A Relay drops out with increasing actual value (**A**us = off)

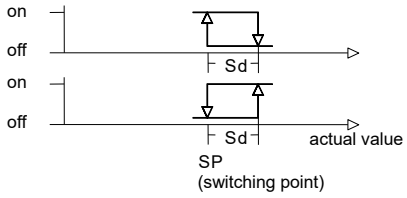
US E Relay picks up with increasing actual value (**E**in = on)



Hysteresis above:

USCA Relay picks up as actual value decreases

USCE Relay drops out with decreasing actual value



In each case additional settings follow under "rEL." after the selection is acknowledged (P - key):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH./.SP. .(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Additional contact – special functions (depending on version)

Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

Interface function:

BUS Bus function, relay is switched on/off depending on control via service- interface, for example using the profibus- adapter 99spde..

See manual 99sp.. for each adapter

Malfunction message function (when using the internal malfunction alarm display):

SR A /E Collective message function, relay is de-energised / energised if there is an alarm message.

NW A /E New value message, relay is de-energised / energised if a new alarm message appears that has not yet been confirmed with reset.

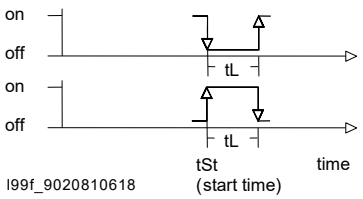
IP A /E New value pulse, relay is de-energised / energised for 3 sec if a new alarm message appears.

SRIA /E Collective message function with new value pulse, relay is de-energised / energised if there is an alarm message. If a further (new) alarm message appears, the relay is energised for 3 sec.

Switching functions for time dependent contacts:

RTCA time dependent switch-off contact(**A**us=off)

RTCE time dependent switch-on contact (**E**in=on)



Message measuring line error:

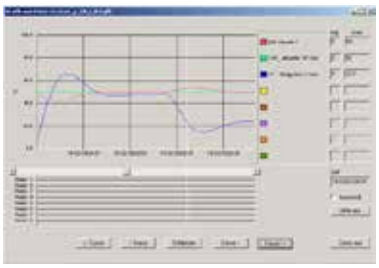
ErrA /E Relay is permanently switched off (**A**us=off) or on (**E**in=on) if a measuring line error is present

Software

PKS

- Data fransfer, editing and archiving of parameter sets
- Online remote operation
- Graphical display (line recorder)
- Data recording (logger)

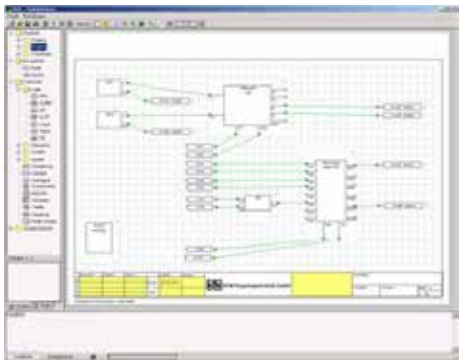




See sheet 99pks

PKM *(component of PKS)*

- Module software for graphical programming
- Regulation and control

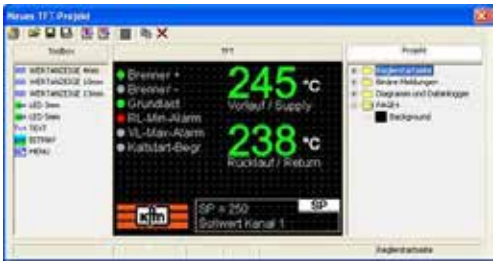


See sheet 99pkm

See sheet 99pkm_m (module overview)

PKD *(component of PKS)*

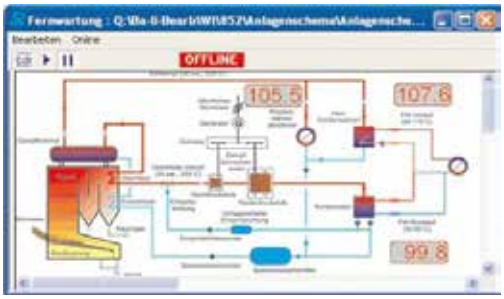
- Configuration of the controller display
- Data logger, binary message lists and custom specific logos



See sheet 99pkd

PCS

- Visualization of custom specific system- and process schemes
- Remote maintenance



See sheet 99pcs

Error messages

Err 1...8	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
Err 57	Circuit board error no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
Err 63	Data connection to the hardware expansion modules interrupted, check cables
Err 64 / 68	Analogue inputs out of function, remit controller for repair

Error messages during self adaptation (see chapter self- adaption on page 13):

Err 202	Ambient conditions are not suitable for self adaptation; adjust parameters manually (see chapter manual optimization on page 12)
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Technical data
(depending on type and version)

Characteristics
Parameter-level, code locked.
pre adjusted on customer´s demand.

Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA(add. contacts):0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent(daily-/ weekly switch. function), switching function adjustable

Measuring inputs:
Pt100/standard signal, -200..+800°C/adjust.

Thermal element * NiCr-Ni (K) 0..1200°C
Fe-CuNi (J) 0..900°C, PtRh-Pt (S) 0..1700°C

Remote resistance transmitter * 0...100/1000Ω
** = option*

Ranges:
Pt 100: -200..+800°C, switchable to °F, standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

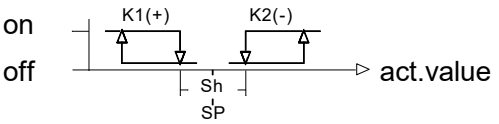
Binary inputs:
Alternative for potential-free contacts or for external voltage 0 / 24V

Outputs:
Relay with potential-free changeover contacts, switching power: 250V 2A incl. spark extinction (on the N.O. contact)

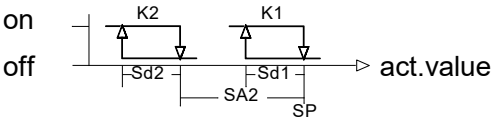
Continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω),

Logic outputs 0/24V max. 40 mA, alternatively outputs with open-collector, max 24 V/100 mA

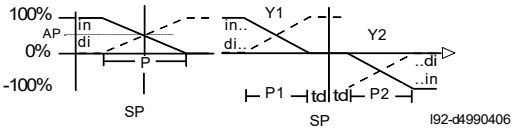
three- point step controller (inverted)



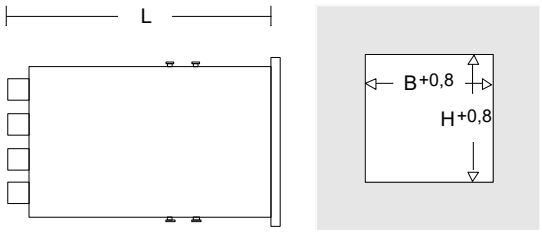
stage controller (inverted)



continuous controller
single output double output



Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529:
IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average, no condensation
EMC: referring to EN 61326

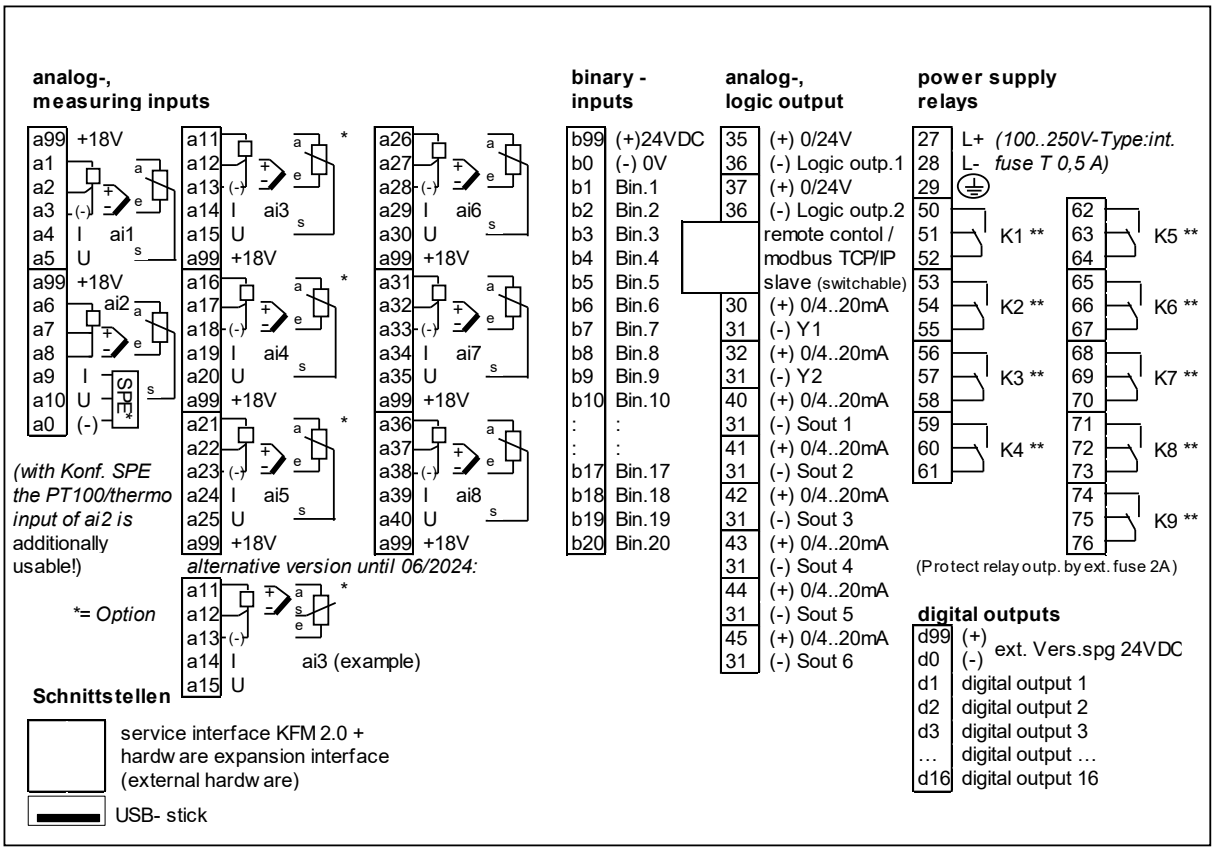
Interfaces:
Service interface KFM 2.0 RJ45 (socket)

USB- 2.0 Host plug type A (socket) für USB-memory stick, max. 100 mA

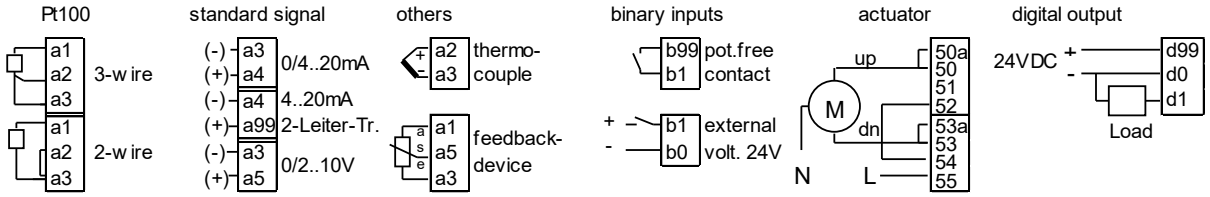
see sheet 99s for additionally information

Wiring diagram:

Example, valid for each delivered controller is the wiring diagram on its casing only



Wiring, examples for input 1 and output 1 respectively:



**** RC- element**:
Depending on version, RC elements for external mounting are enclosed for the selective connection.

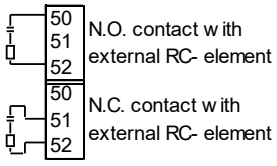


Connection without external RC- element
The RC- elements must not be used with small loads, for example auxiliary relays (depending on capacity) or electronic burner managers (note the manufacturer´s instructions).



Connection with external RC- element
The RC- elements are used to protect the relay contacts in case of higher loads, for example electrical control valves or contactors.

relay contact (RC external)



relay contact (RC int.)

alternative version with internal RC- elements, wired on terminal for the selective connection (factory set N.O. contact with RC element):

50a *without int. RC-*
50 *element*
50a *N.O. contact*
50 *with int. RC*
50a *N.C. contact*
51 *with int. RC*

Regelungstechnik nach Maß

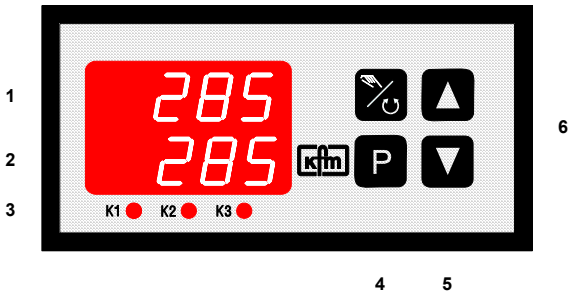
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1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



Brief description:

KFM 91 is a microprozessor based industry controller series in panel mounting- format 48 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation.

An assembly system renders possible the simple basic version as well as a plurality of variants with up to 3 relays, several digital and analog out- and inputs and other additional devices.

Types:

(depending on configuration):	*type:*
indicator	9101.
one stage controller	9110.
two stage controller	9120.
heating / cooling controller	9130.
positioner / follow-up controller	9140.
two- point- PID controller	9150.
three- point- PID controller	9160.
three- point- step controller	9170.
continuous controller	9180.
setpoint generator	9193.

Sub-types:

	suffix (*)
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logik output	..L

function extensions

	suffix (*)
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices*:

	(*)
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
other interfaces on demand	

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 91700-99bwa-ogx. For more information see corresponding data sheets.'

Inputs:

max. 2 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 1000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 3 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 3 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:



The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)



The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.
(optional: switch on and off using separate ⏻ - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)



The *lower diplay* shows "H *" and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ⏻ - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates "-Ad-".
Cancel: P - key >5 sec again

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position "**U**" = unlocked
(Lock access after the adjustments: Switch position to "L" = locked).



After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.



*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter "Optimization")	25,0	___
***I**	integral action time Tn (min) (ref. to chapter "Optimization")	7,0	___
***d**	rate time Tv (min) (ref. to chapter "Optimization")	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0 (*201,701/SA3:10,0)	___

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - key,
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

* = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position "**U**" (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to "L"= locked)

Hold down the P - key and press the ▲ - key,
hold down both keys for more than 5 sec. until the display changes



Enter the code number (password) ▼...▲ (1...9999), factory setting: 1
move on to next input: *briefly* press P - key



Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)



Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.



Configurations are displayed in succession (type and design dependent) and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: "rtd / Iu"	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator "6...600" (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: "2...120" (sec.)	*20 sec.*
***out**	adjusting kind of output signal "0...20/ 4...20(mA)/ 0...10/ 2..10(V)“	*4...20 mA*
***out**	adjusting output characteristics direct / inverted "di / in"	*in*
	(for 2 output signals:"in in / in di / di in / di di")	
***td**	for 2 output signals: deadpoint between output 1 and 2 "0...10%"	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal "0..20/4..20(mA)/0..10/2..10(V)"	*4...20 mA*
Sou*	adjusting kind of information signal "Ist/Soll.." (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:"rel1 / rel2 / AUS" (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: "0...100" (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: "SiE/SiA"(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

* = In case of multiple measuring inputs or control loops: relay- or channel number

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

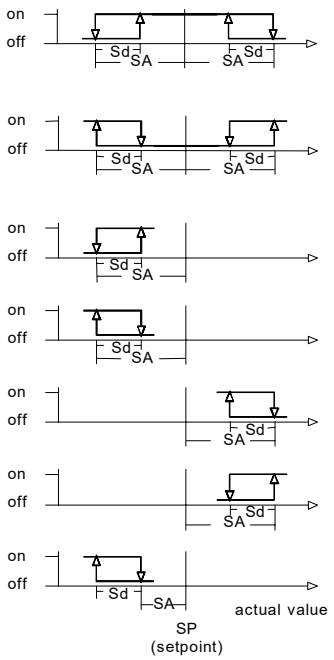
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

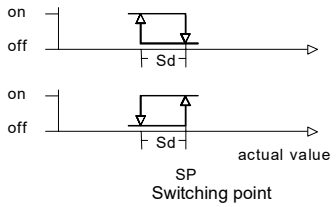
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

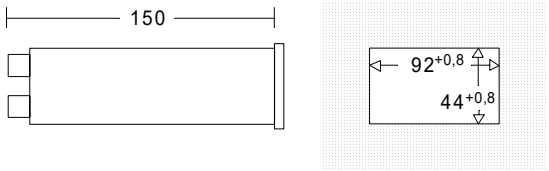
CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

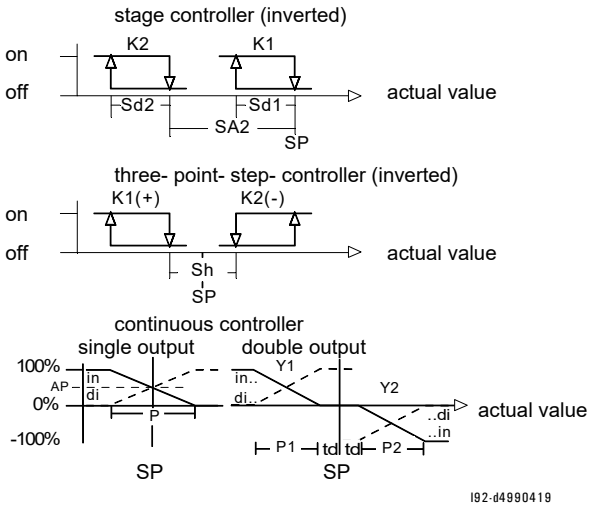
"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

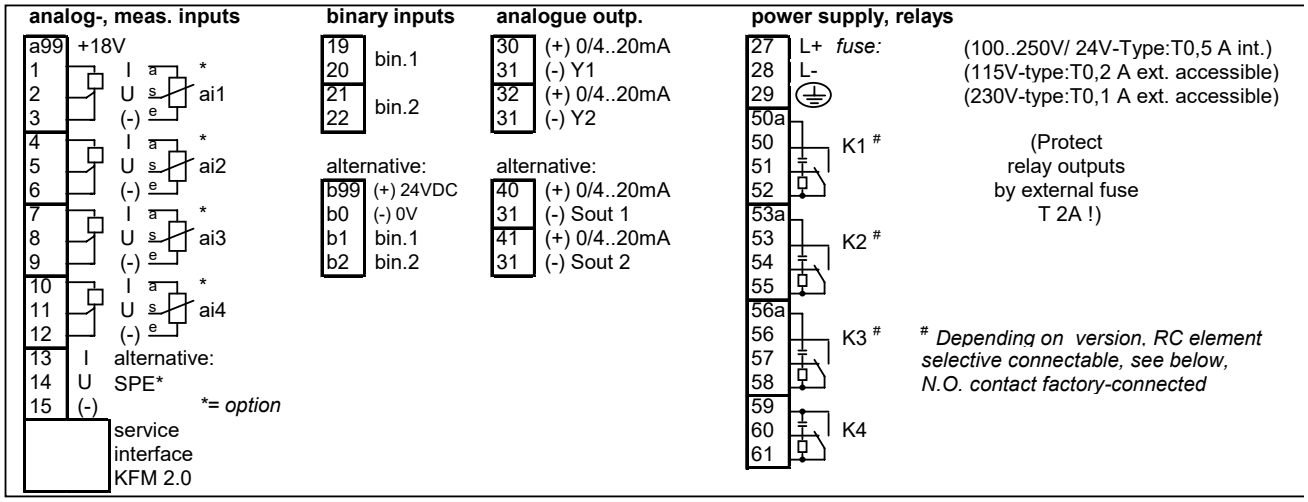
Installation dimensions:



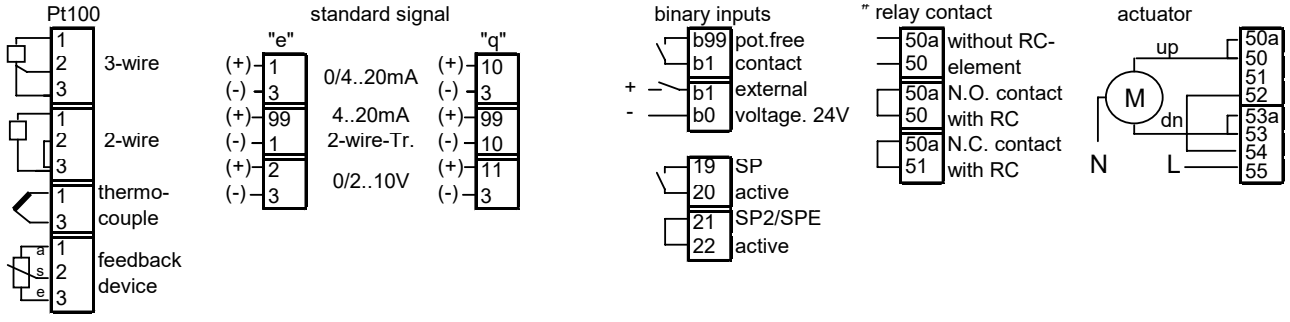


Other data:
Housing for panel mounting, 48 x 96 mm
Power supply: 230VAC +/- 10 %, 48...62Hz
alternative 115 VAC, 48 VAC, 24 VAC, 24 VDC
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



Certifications: DIN, BV, DNV, GL

Brief description:

KFM 92 is a microprocessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices. All relay contacts are implemented as potential-free changeover contacts. Depending on the version, external RC combinations are included, internal RC combinations for optional connection to terminals (N.O. contact factory- connected) or the N.O. contacts of all relays are permanently wired internally with RC combinations.The scope of delivery includes plugable terminal blocks.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logic output	..L

function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
interface Profibus, Interbus S, other	(99) sp/si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.
combined input Pt100 / standard signal	q.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 8 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse (if available) on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:



The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)



The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.
(optional: switch on and off using separate ↻ – key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)



The *lower diplay* shows "H *" and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ↻ – key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates "-Ad-".
Cancel: P - key >5 sec again

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position "**U**" = unlocked
(Lock access after the adjustments: Switch position to "L" = locked).



After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.



*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter "Optimization")	25,0	___
***I**	integral action time Tn (min) (ref. to chapter "Optimization")	7,0	___
***d**	rate time Tv (min) (ref. to chapter "Optimization")	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - key,
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

* = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position "**U**" (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to "L"= locked)

Hold down the P - key and press the ▲ - key,
hold down both keys for more than 5 sec. until the display changes



Enter the code number (password) ▼...▲ (1...9999), factory setting: 1
move on to next input: *briefly* press P - key



Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)



Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.



Configurations are displayed in succession (type and design dependent) and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: "rtd / Iu"	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
Filt	digital input filter for attenuation of disturbed input signals "0…99" (%) (no filter: enter 0)	*92 %*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS (adding / subtracting / absolute)	AbS
***Y' '**	travel time of the actuator "6...600" (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: "2...120" (sec.)	*20 sec.*
***out**	adjusting kind of output signal "0...20/ 4...20(mA)/ 0...10/ 2..10(V)“	*4...20 mA*
***out**	adjusting output characteristics direct / inverted "di / in" (for 2 output signals:"in in / in di / di in / di di")	*in*
***td**	for 2 output signals: dead center between output 1 and 2 "0...10%"	*0*
AP	correction of the output signal operating point	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting kind of information signal "Ist/Soll.." (actual/ setp.value)	*Ist1*
Sou*	adjusting type of information signal "0..20/4..20(mA)/0..10/2..10(V)" (*Sout= signal 1, Sou2= signal 2)	*4...20 mA*
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:"rel1 / rel2 / AUS" (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: "0...100" (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*Ist1*
	relay condition in case of measuring line fault: "SiE/SiA"(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

* = In case of multiple measuring inputs or control loops: relay- or channel number

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

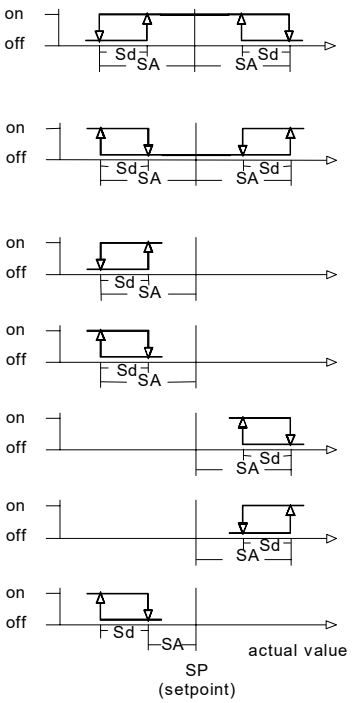
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

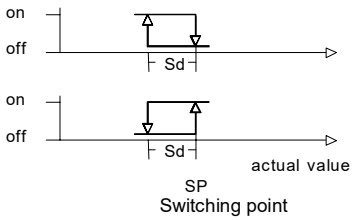
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**

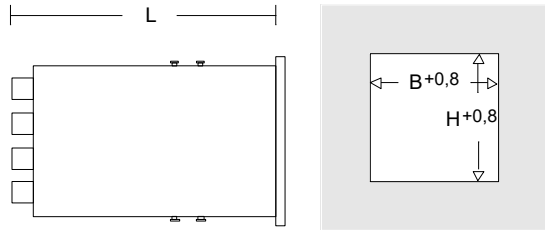
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Industry controller type 9..
Technical data

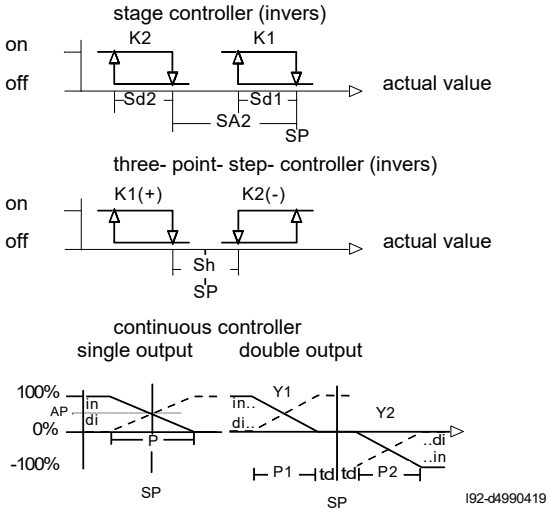
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

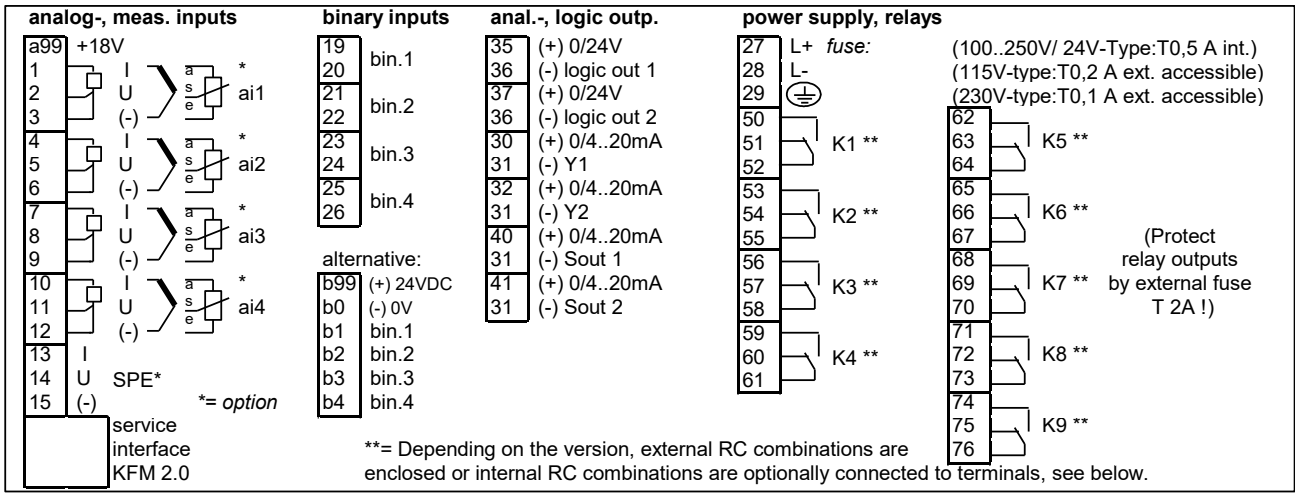


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

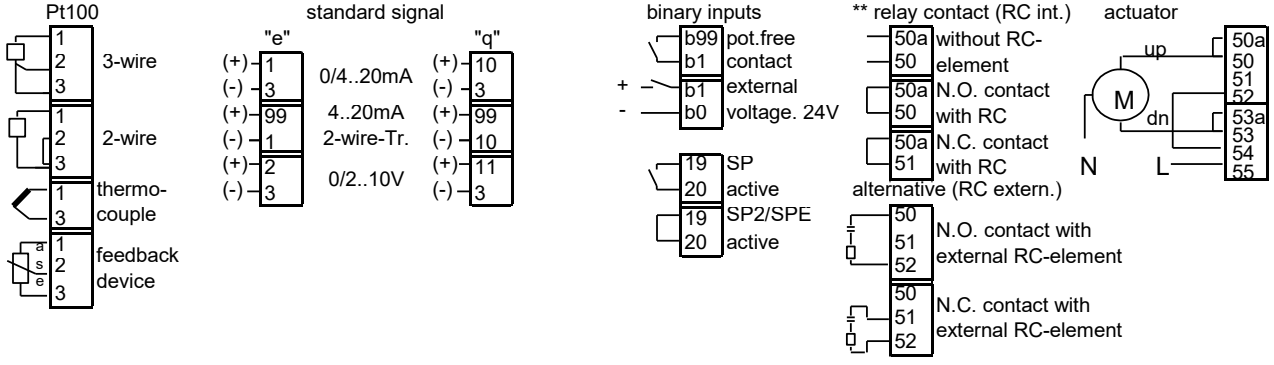


Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA)
Protective system DIN EN60529: IP54 resp. IP65 (flat seal + 4 mounting elements), terminals IP20
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



Brief description:

KFM 94 is a microprozessor based industry controller series in panel mounting- format 72 x 144 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 6 relays, several digital and analog out- and inputs and other additional devices.

Types: *(depending on configuration*):*	*type:*
indicator	9401.
one stage controller	9410.
two stage controller	9420.
heating / cooling controller	9430.
positioner / follow-up controller	9440.
two- point- PID controller	9450.
three- point- PID controller	9460.
three- point- step controller	9470.
continuous controller	9480.
continuous controller, 2 outputs	9481.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: (continuous) logic output	..L

Function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
Interbus S interface	(99) si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.'

Inputs:

max. 4 measuring inputs, acc. to sub-type:	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 6 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:



The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)



The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.
(optional: switch on and off using separate ⎋ - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)



The *lower diplay* shows "H *" and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ⎋ - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates "-Ad-".
Cancel: P - key >5 sec again

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position "**U**" = unlocked
(Lock access after the adjustments: Switch position to "L" = locked).



After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.



*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec.
until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter "Optimization")	25,0	___
***I**	integral action time Tn (min) (ref. to chapter "Optimization")	7,0	___
***d**	rate time Tv (min) (ref. to chapter "Optimization")	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - key,
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

* = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position "**U**" (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to "L"= locked)

Hold down the P - key and press the ▲ - key,
hold down both keys for more than 5 sec. until the display changes



Enter the code number (password) ▼...▲ (1...9999), factory setting: 1
move on to next input: *briefly* press P - key



Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)



Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.



Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: "rtd / Iu"	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91...:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator "6...600" (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: "2...120" (sec.)	*20 sec.*
***out**	adjusting kind of output signal "0...20/ 4...20(mA)/ 0...10/ 2..10(V)“	*4...20 mA*
***out**	adjusting output characteristics direct / inverted "di / in"	*in*
	(for 2 output signals:"in in / in di / di in / di di")	
***td**	for 2 output signals: deadpoint between output 1 and 2 "0...10%"	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal "0..20/4..20(mA)/0..10/2..10(V)"	*4...20 mA*
Sou*	adjusting kind of information signal "Ist/Soll.." (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:"rel1 / rel2 / AUS" (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: "0...100" (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: "SiE/SiA"(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

* = In case of multiple measuring inputs or control loops: relay- or channel number

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

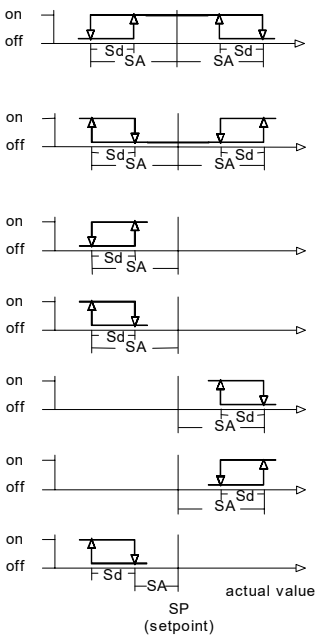
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

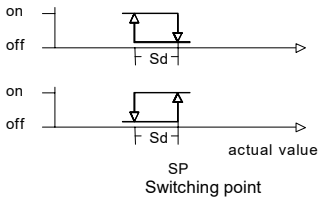
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

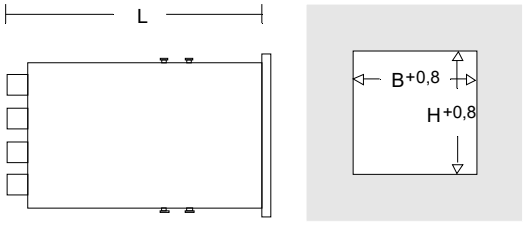
CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

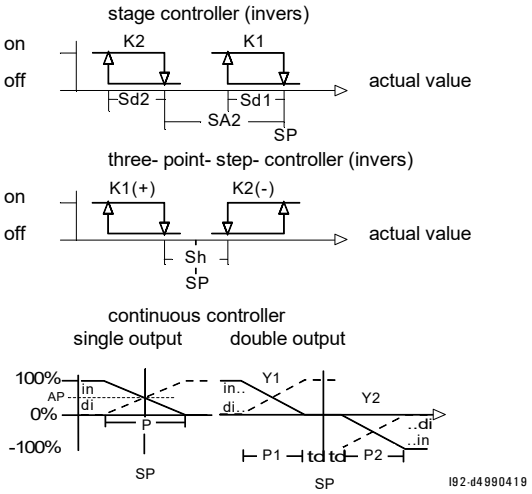
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

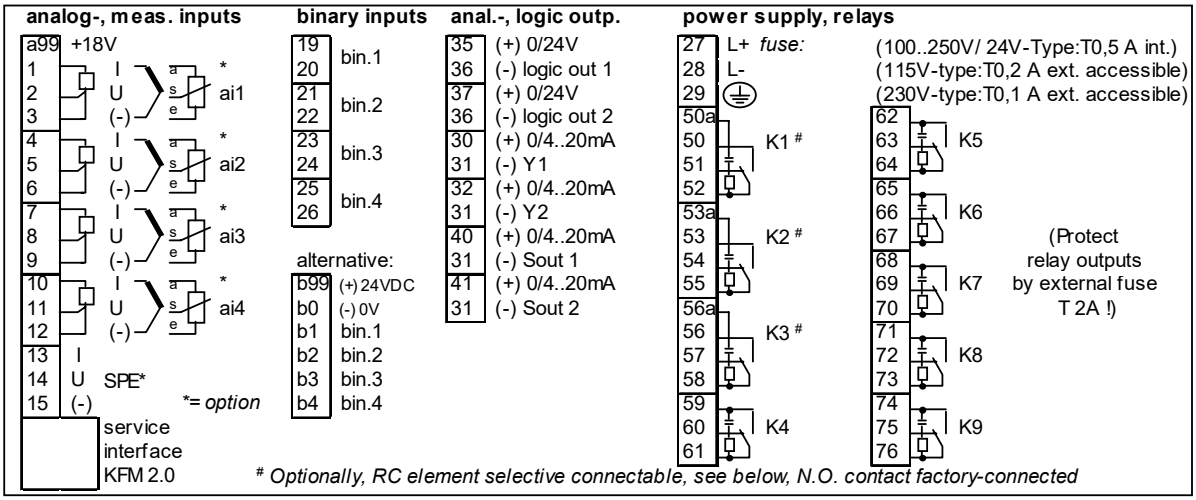


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

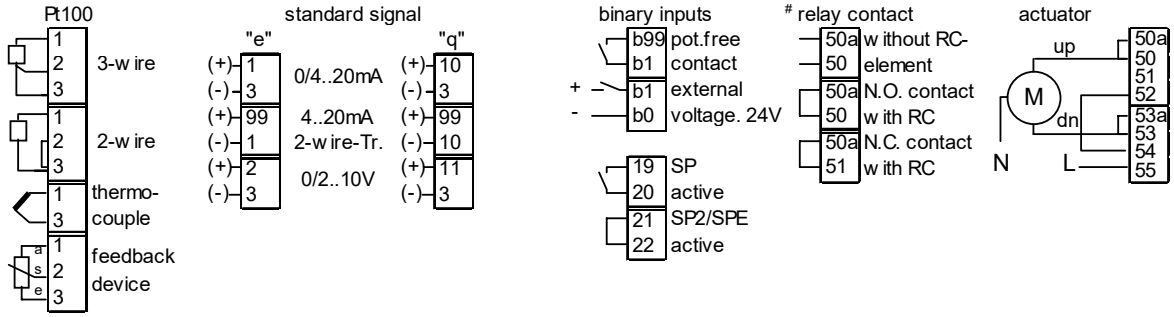


Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA) alternative 230VAC, 115 VAC, 48...62Hz
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

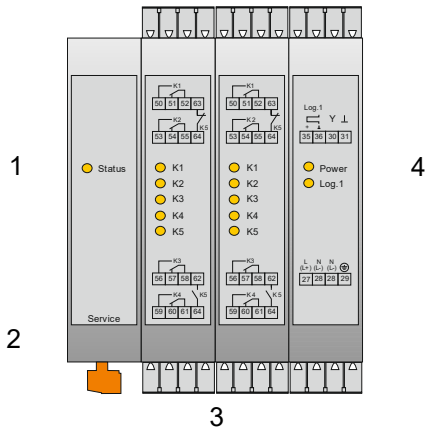
Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



1 Status-LED (CPU-module)
2 Service interface for configuration (PC)
3 Relay modules
4 Power-LED (power supply module)



Brief description:
Continuous controllers from the series 9 can be complemented with subsequently arranged switching steps by the modular step controller 991tz86e. Actuation is performed using the continuous control signal. The configuration of all parameters (setpoint distance, hysteresis, switch-on delay etc.) is done in the CPU-module of the modular step controller by the KFM-PC- software PKS. The modular step controller consists of one CPU- and power supply module each as well as one ore more relay modules with 5 relays each, depending on the number of required switching steps. The step controller can be complemented with 4 relay modules to a maximum of 20 relays. All relays are potential free change over contacts.

In the factory setting, depending on the number of relay modules, the switching points of the steps are evenly distributed throughout the entire control range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

Relays which are not needed may be switched off by setting the switch point >100%. The first step may be configured as a modulating output if desired. In parallel, depending on the version, there is a cyclic switching output 0/24V and a continuous control output 0(4)…20mA available for driving a semi conductor switch. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Version for automatic change-over of the steps
Every change in the output steps causes an automatic change-over of the active steps by activating the next higher output step for power increase and deactivating the lowest output step for power decrease. This forces an approximately even use of all steps including the connected load.

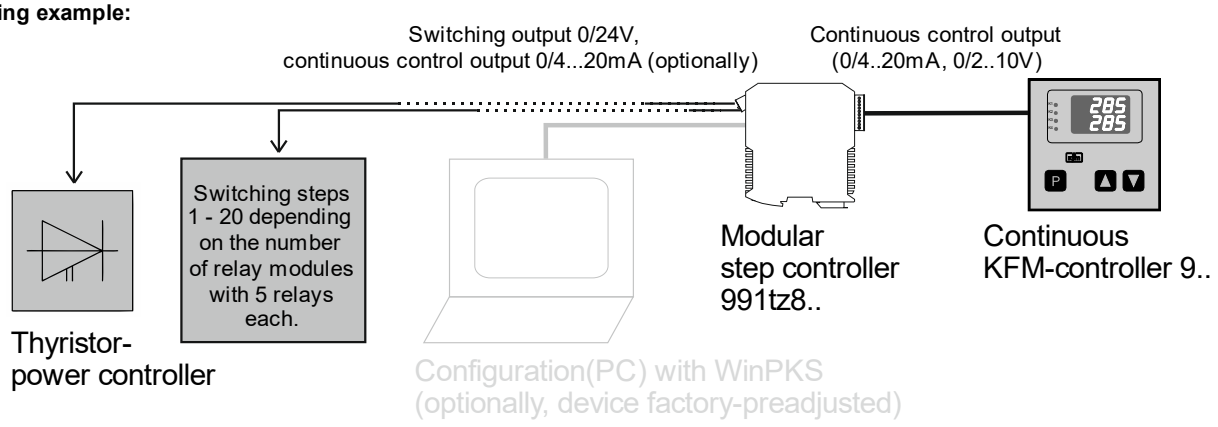
Type summary:

991tz86e.	CPU- module (with standard signal 0(4)...20mA, 0(2)...10V measuring input)
991tz870	Relay module with 5 relays
991tz850	Power supply module 100-250 VAC
991tz858	Power supply module 24 V AC/ DC

Device versions:

..Ly	Switching output 0/24V max. 40 mA and cont. control output 0(4)…20 mA load <=500Ω
...z	Automatic change-over of the steps

Wiring example:



Installation: Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Snap the modules onto the standard rail intended for use in the specified order. Then the housing of the modules have to be pushed together. The plug connectors connect the individual modules. In conclusion, both end pieces have to be mounted on both sides of the modular housing.

Before making any changes or additions, switch off the mains supply and wait at **least 5 seconds**!
After loosening the end pieces and **sliding the module housings apart**, the modules can then be removed **individually** or snapped into place in the specified order.

Electrical wiring:

Plug bar; connect up the controller at the rear following the wiring diagram

- wire cross section max. 1,5 mm^2
- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.
- Connect the modular device and the continuous controller using the supplied patch cable.

Putting into operation:

Switch on power supply. Control lamps, if available, will light up according to their function and the status of the in- and outputs. If nothing happens: Switch off power supply, check electrical connections and other adjustments.

Maintenance:

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads and the end pieces,
shift the housing of the modules apart and remove the individual modules.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Configuration:

		Factory setting
***ELo/*EHI**	for voltage / current input: start / end of display range	0 / 100
tE	Switch-on delay per step 1...60sec	5sec
PY..	*991t..p only:* percentage of the output power switched by step .. Preadjusted: Equal power for each step	dep. on no. of steps
SP..	Switch-on points for step 1...20, based on output 0...100% (or deactivation with setting 101%)	see table
Sd..	Switching differences %	see table
optional:		
rel	Switching behaviour of first step: St (normal step) / CY" (modulating)	St
cy"	Cycle for cycle behaviour (2...120 sec)	20 sec
out	Continuous control output signal "0...20 / 4...20" (mA**)**	4…20mA
st	*991t..z only:* function of the steps static ("stat") or automatic change-over of the steps ("auto")	auto
st..	*991t..c only* switching step allocations to the hardware outputs (right character belongs to output1, character left to it to output 2, etc.). *A "1" means that the accordant hardware output is switched on,* *if the output signal is higher than the respective switching point.*	St1=0001 St2=0010 St3=0011 St4=0100 St5=0101 St6=0110 St7=0111

Settings SP.., Sd.. in %, based on internal control signal 0...100%, set not required switching steps to 101%

for switching behaviour St= normal

SP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Sd..**
3 steps	34	66	97																		31
4 steps	27	50	74	97																	24
5 steps	22	41	59	78	97																19
6 steps	19	34	50	66	81	97															16
7 steps	16	30	43	57	70	84	97														13
8 steps	15	27	38	50	62	74	85	97													12
9 steps	13	24	34	45	55	66	76	87	97												10
10 steps	12	22	31	41	50	59	69	78	88	97											9
11 steps	12	20	29	37	46	54	63	71	80	88	97										9
12 steps	11	19	27	34	42	50	58	66	74	81	89	97									8
13 steps	10	17	25	32	39	46	54	61	68	75	83	90	97								7
14 steps	10	16	23	30	37	43	50	57	63	70	77	84	90	97							7
15 steps	9	16	22	28	34	41	47	53	59	66	72	78	84	91	97						6
16 steps	9	15	21	27	32	38	44	50	56	62	68	74	79	85	91	97					6
17 steps	9	14	20	25	31	36	42	47	53	58	64	69	75	80	86	91	97				6
18 steps	8	13	19	24	29	34	40	45	50	55	60	66	71	76	81	87	92	97			5
19 steps	8	13	18	23	28	33	38	43	48	52	57	62	67	72	77	82	87	92	97		5
20 steps	8	12	17	22	27	31	36	41	45	50	55	59	64	69	74	78	83	88	92	97	5

for switching behaviour CY= step1 modulating: preadjustments according to the upper table, but:
The last point ("97") can be omitted, move all switching steps by one position,
switching differences Sd.. uniformly to 0,1
example with 5 steps:

SP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Sd..**
5 steps		22	41	59	78																0,1

Error messages: The status LED of the resp. module signalises the operating state:

CPU- module:

green permanent*: Normal operation

green flashing*: *Only with configuration 4..20mA/ 2..10V:*
Measurement line error analogue input

red permanent: The detected module is unsuitable
-> Check the type name of the module, (see type summary)

red flashing: Communication error between one or more other modules
-> Check proper position of the connections beetwen the individual modules

Relay module:

green permanent*: Relay actuated, switched on or switched off depending on the configuration

red flashing: Communication error to the CPU
-> Check proper position of the connections beetwen the individual modules

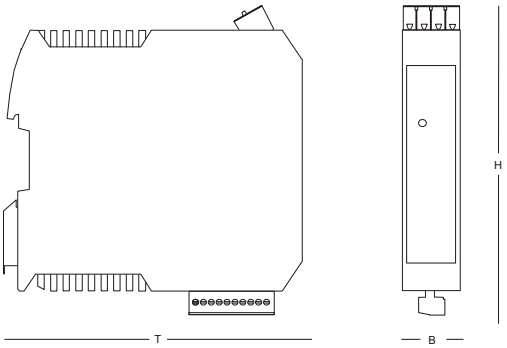
Power supply module:

green permanent*: Supply voltage on, normal operation

red flashing: Communication error to the CPU
-> Check proper position of the connections beetwen the individual modules

** alternative yellow, depending on version*

Installation dimensions (each module):

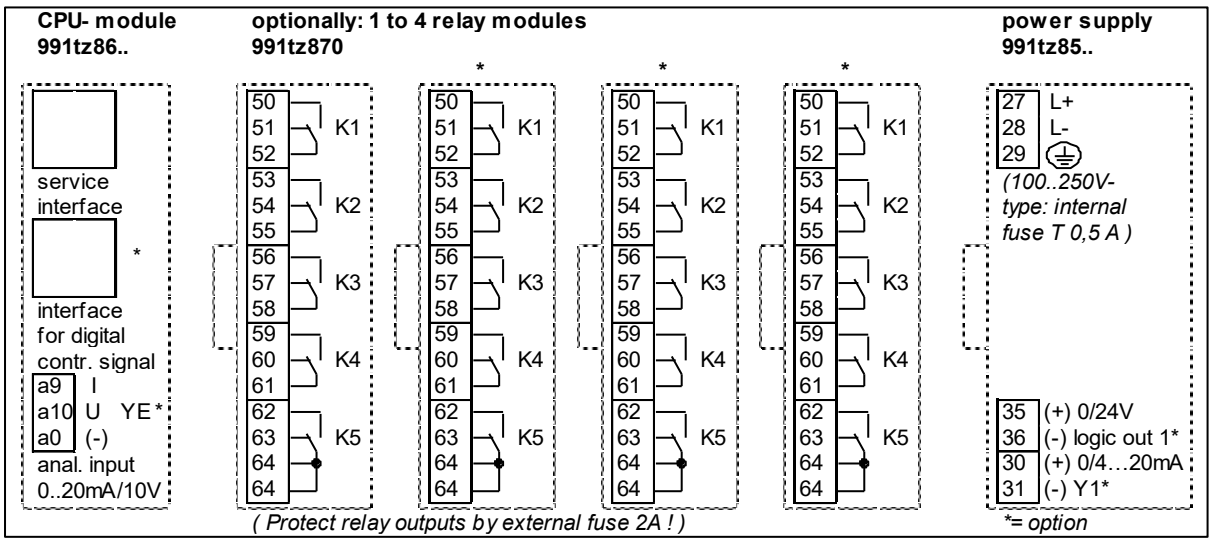


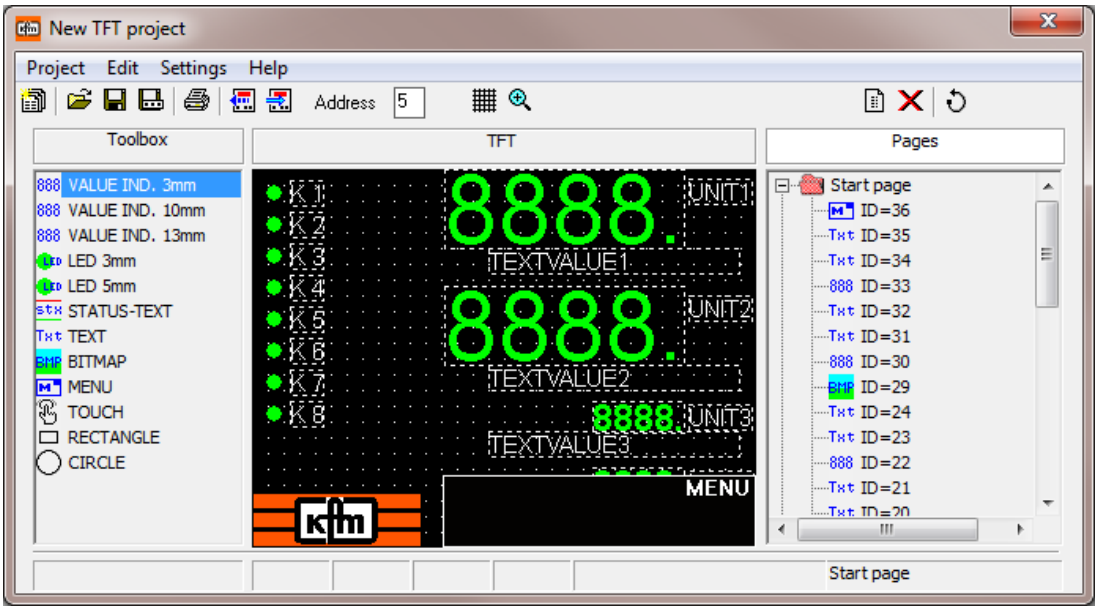
H= 124mm, B = 22,5mm, T = 116mm

Technical data:

Power supply: 100..250VAC, about 12VA,
alternative 24V DC/ AC, about 12VA
Relay output: 230 V / max. 2 A
Logic output: 0/24V max. 40 mA
continuous output 0/4…20mA: load <= 500Ω
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temp.: 0..60°C, nom. temp 20°C
Relative humidity <= 75 % yearly average,
(KWF to EN 60529) no condensation
EMC: referring to EN 61326

Connection diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)





TFT- displays from KFM- series 803 and 903 can be changed or completely new designed with this program.

Every retrievable value in the device can be placed at any position and designed freely across the individual pages. In addition, there are texts and graphical symbols in various form and color. It is also possible to import whole bitmap-, JPEG-, PNG- or GIF-files, for example company logos or pictures.

Beside the start page and the existing logger- and binary message page another logger page and a maximum of 5 free pages can be set additionally, to which can be page turned at the device. Also, pages can be deleted again and changed in their order.

The configuration can be saved as a file, that is easily taken over to devices of the same kind later or serve as a basis for customization for different devices.

Hint:

Alternatively, individual configurations can be supplied ex work at extra cost.

General:

A three- part editing window is opened with a central display field for the display to be processed, on the left there is a list (toolbox) with the available elements, which can be dragged into the display surface as well as a page index on the right side.

After starting the program, the display field and the page index are empty or show a preadjusted start file.

For communication the address Adresse 5 of the connected hardware must be entered in the toolbar. An automatic scan is started with the menu item „Settings“ -> „Find device address..“.

With the commands in the left area of the toolbar, a configuration (project) can be

- created new with the button “*new project*“
- opened from the PC hard disc by using the button “*open project*“
- or saved on the PC hard disc by using the button “*save project*“ resp. “*save as…*“.

Furthermore, it is possible from a connected device to

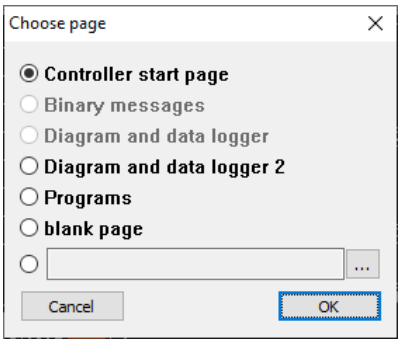
- read the TFT project from the device with the button “*receive project from controller*“ or
- to transfer the project into the device with the button “*send project to controller*“.

The start page of the project is shown on the display field at the program start. Optionally, it can be extended viewed or be equipped with a grid using the respective commands located in the central area of the toolbar.

The page index displays a list of all project pages in the order they can be switched forward at the device using the arrow up button. This order can be changed and pages can be inserted or deleted with the respective commands in the right area of the toolbar.

Note: Drag the selected page with the left mouse button pressed to the desired position to change the page order.

When a new page is added, a window appears, in which the type of the page can be set.



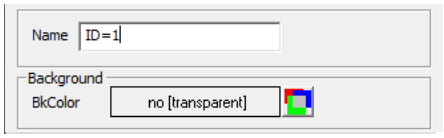
The design of the individual display pages is done with the elements from the toolbox (see page 3 - 4). A window appears with the symbol , where can be adjusted whether and after which time the display is switched back from the respective page to the controller start page.

The toolbox in the left area shows the different elements which can be dragged by the mouse to the desired position in the display. In the opposite, elements can be deleted with a double click on the right mouse button.

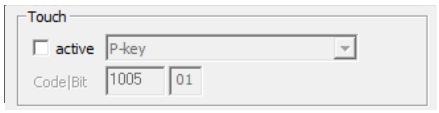
The xy- coordinates, the size and the name of the marked element is displayed at the bottom of the screen.

A double click of the right mouse button on the respective element opens a window, in which its necessary adjustments and assignments are made.

The description of the element within the project can be changed in the box “name” in the upper part of each setting window, the color behind the element can be changed in the field “background”.



Optionally, a touch element with a certain button function can be activated for devices with touch display in the lower part of the setting window.



The elements in detail:

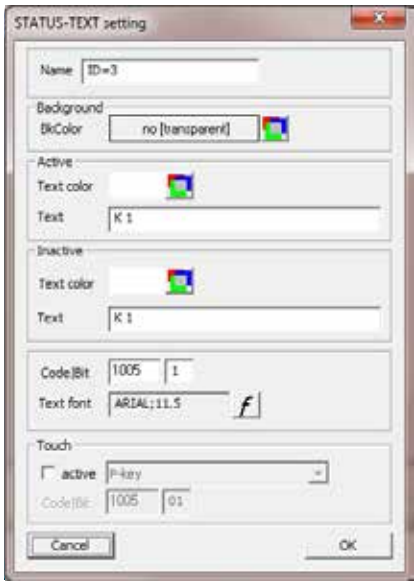


„VALUE SETTING“:

Controller parameter DSPL1/ 2/ 3/ 4 is choosable via dropdown- list for the value display using the box “Text → Relation“.

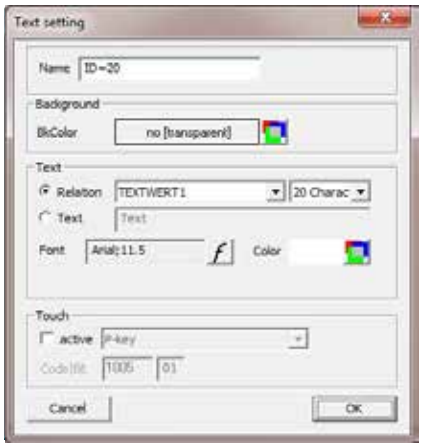
The parameter DSPL1/ 2/ 3/ 4 can be configured to setpoint- and actual values as well as correcting variables in accordance to the manual 903…

A parameter for the value display can be assigned permanently in the box “Text → Code“.



„LED“:

Code and bit selection, for example code 1005 and bit 1 for relay K1. The LED- and text color as well as the text in the box “active LED” and “inactive LED” is displayed at the controller in accordance with the status.



„TEXT“:

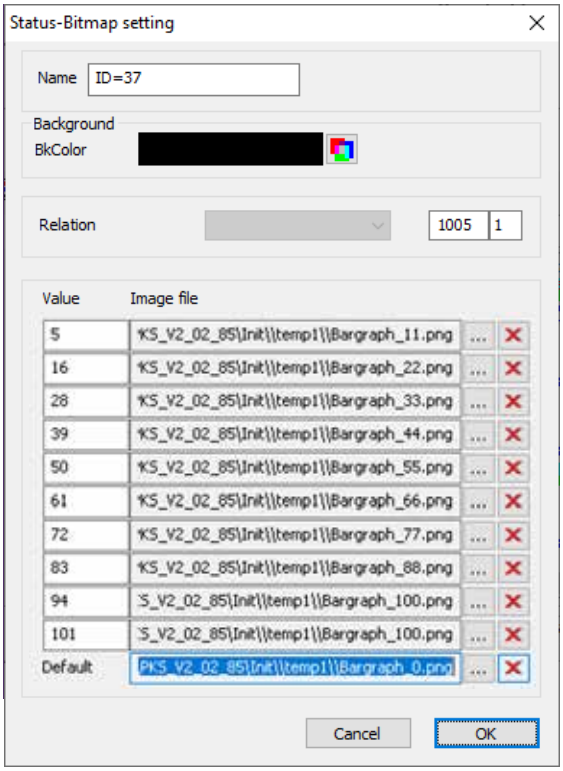
The descriptive text (controller parameter text1/2…) for the text display is choosable via dropdown list in the box “Text → Relation”. Alternatively, free texts can be set directly in the box
“Text → Text”.

The parameter Text1/2… can be configured at the controller from a list with fixed texts, for example: SETPOINT, ACT.VALUE or SUPPLY etc. and one freely editable text in accordance to the manual 903…



„PICTURE SETTING“:

A folder of a BMP-, JPEG-, PNG- oder GIF-file can be specified in the box “picture setting”.

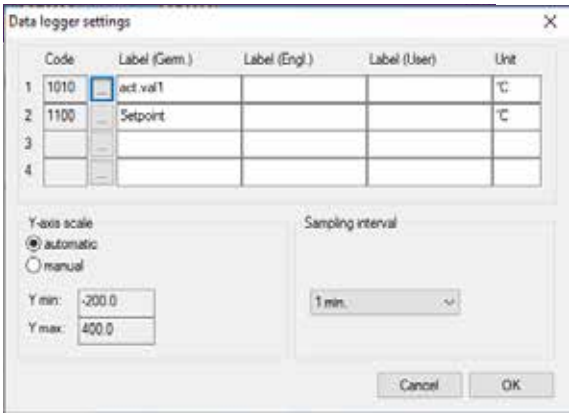


„STATUS-BITMAP“:

With the Status Bitmap function, 2 or up to 11 different image files can be displayed, depending on a binary or analogue input variable. The fields "..." can be used to specify the maximum of eleven paths to BMP, JPEG, PNG or GIF files. The paths are displayed in the column "Image file".
The respective symbol with the red X is used to delete path specifications.
Enter a value (-999999...9999999) for each image file in the column "Value".
(Value 0 = picture according to the "Default" path).

Code and bit are to be entered in the "Relation" field, e.g. code 1005 and bit 1 for relay K1 (binary input variable).

For analogue input variables, bit 0 must be entered in the "Relation" field.



„DATA LOGGER SETTINGS“:

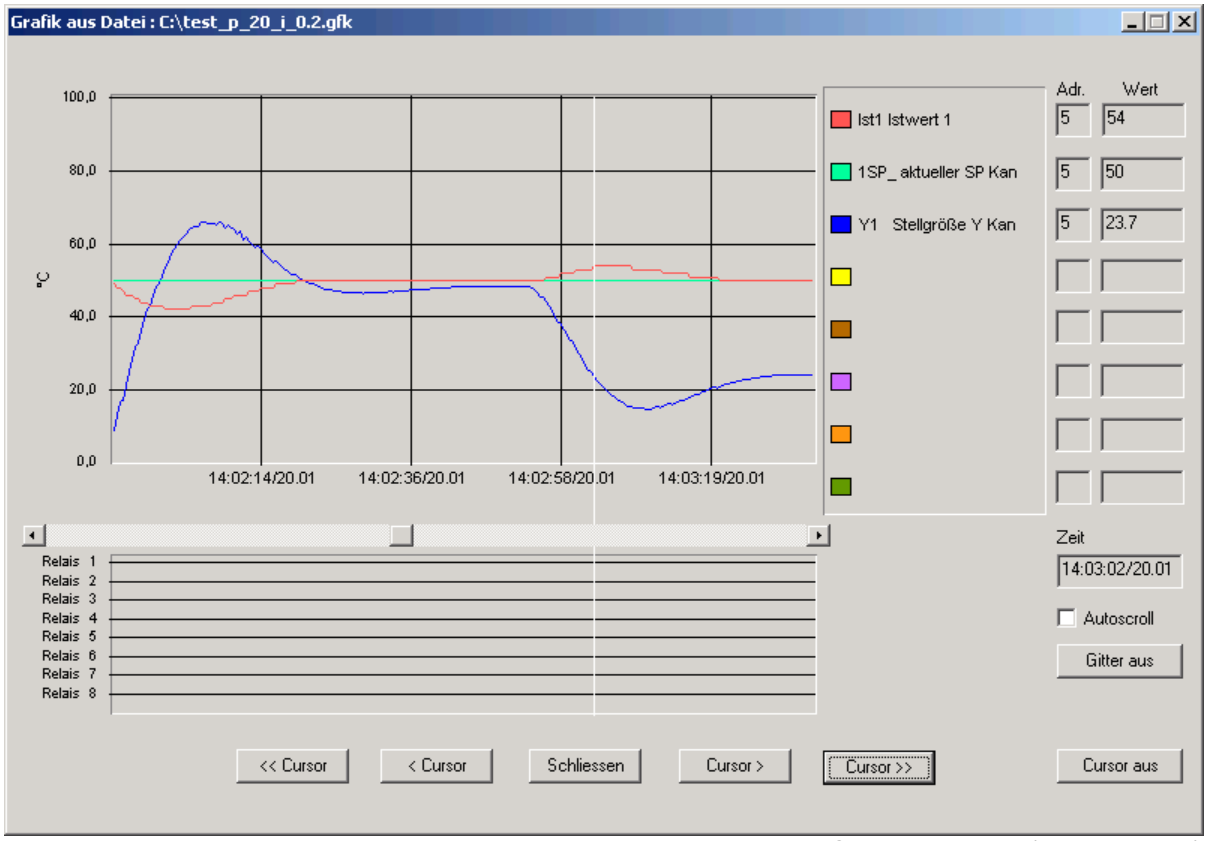
Clicking the left mouse button on the page "Diagram and data logger (2)" opens the data logger settings of the respective page.

The parameter for the recording can be selected in the "..." field; the designation is displayed on the controller in German, English or User-defined (User.) depending on the selected language. The unit is permanently displayed on the controller. A maximum of 4 parameters per page can be recorded.

The Y-axis sca le is done automatically or by means of a manual range specification.

The sampling interval for the recording can be adapted via dropdown list.

Note: The scaling of the Y-axis and the sampling interval for the recording are freely adjustable for each side.



Graphical Display (Line Recorder)

1. Displaying the current data

The data logger provides a graphical display of the controller data, which is simultaneously saved as a file in the PKS directory. The graphics factory setting shows both actual and set point values of a controller with the address 5. (Start: see 3.).

2. Displaying the saved data

A previously saved data recording is displayed on a diagram ("Data logger"->"Graphic from file" menu). Switching on the cursor mode enables numerical display of the individual data. (see 3.)

3. Starting the graphics/data logger

The data logger is activated and the progression over time of the parameters selected in the "Data logger" -> "Settings" menu is displayed on a diagram by selecting the "Data logger"->"Start" menu item.
The names of the channels displayed, the corresponding controller addresses and the currently transmitted values appear to the right of the graphics. The time is displayed below.

If the relay status of the controller is displayed (parameter 1005), the individual switch state of the relays is additionally displayed. At the same time the relay state is displayed to the right of the graphics as a bit sequence for the relays 8 to 1 (1: Relay ON, 0: Relay OFF).

If the "Autoscroll" in the graphics window is activated, then the graphics are automatically shifted to the left with each new sample, so that the current values can always be read-off on the right hand edge of the picture. The graphics remain still in case the Autoscroll function is deactivated and can be shifted manually with the scroll bar, in order to view the preceding time graph. However the graphics are updated continuously.
The grid can be hidden or shown with the "Grid OFF" or "Grid ON" button.

A graphics cursor can be switched on or off with the "Cursor On" or "Cursor Off" button. This can be moved along the time axis with the aid of the Cursor buttons. In cursor mode the current data is not displayed, but just the corresponding value of the cursor position is displayed to the right of the graph. The time displayed represents the sampling time for the cursor position.

The continuous recording can be paused with the "Data logger" -> "Stop" menu item. If the following request for saving the recorded data will be answered by "no", then the data will be overwritten when the data logger is restarted.

Regardless of the ongoing recording the Graphics screen can be exited with the "Close" button or <ESC>. Data will continue to be recorded in the background if the data logger is not stopped. It is possible to return to the continuous recording display at any time with the "Data logger" -> Actual graphic" menu item.

Notes for automatic data archiving:

The continuous recording data is sent to the "GRAFIK.GFK" file. This data is overwritten when the data logger is restarted.

In the case of permanent recording the "GRAFIK.GFK" file contains the record of the current week.
Automatic archiving takes place every Sunday after the first sampling which takes place after 6.00 am or after 7 days at the latest. The recorded file is saved and named with the days date.
Example: Recorded file "GRAFIK.GFK " is saved on the 18.12.2014 as "20141218.GFK".

The oldest data is deleted after the fourth sequential archiving, in order to limit the storage space. In order to save this data permanently it is necessary to store the required file in another directory beforehand or to rename it.
The file "GRAFIK.GFK" is located in the folder "Init" of the PKS installation directory, the file path can be seen from the menu item "About…" -> "About PKS".

4. Changing the defaults

The default graphic settings can be changed with the "Data logger"->"Settings" menu.

Another sampling time can be entered in minutes and seconds.

The scaling of the Y axis (temperature) in the graphics mode can be carried out manually or automatically. In the automatic setting, the scaling is automatically created in accordance to the smallest and largest recorded value. In the manual setting the values for the upper and lower limits can be entered.

A maximum of 8 channels can be recorded. The corresponding parameters of the connected controller are available by means of the button "…". Alternatively, parameters can be entered directly in the "Code" input boxes. The associated controller address for each parameter to be recorded is entered in the "Adr." box. The assignment and meaning of the parameter codes can be obtained from the 99s controller-interface operating instructions (example: parameter code 1010 = actual value 1).

Devices from 903K controller- series are configured and assigned to function packages ("projects") by a graphical user interface with 99pkm software. The program is protected with a password, the factory setting is 1. To prevent unauthorized use a new password can be assigned after entering the correct password. Projects can be created new with or without connected device or loaded from a device or a file for processing, saved as file or send to a device.

Circuit- workspace

A workspace for the circuit diagram appears on the right hand of the screen after the start of the program. The structure of the project is displayed on individual pages. The "page" area in the toolbar displays the number and description text of the active site, a list of all project pages and their description texts are opened by means of a mouse click on it. The description texts are automatically generated using the page headings. The fiels marked in yellow, located in the lower part of the circuit diagram page, are editable directly for processing comments. These are taken over to the table of contents automatically. The selection of another circuit diagram page is done by the drop down list or by page turning with the arrow buttons. The functions copy, paste, delete and the sort order for the circuit diagram pages are accessible via the adjacent edit- icons.

Modules

The left hand of the screen shows a selection list as folder structure, furthermore all kinds of functions in form of graphical elements. Is a device connected and activated or a project- file opened, the project scope existing in the device respectively loaded from the file is displayed only. Without connected device the required hardware- components for the internal- and eventually external hardware can be inserted from a drop down list by double click on the left mouse button, hardware- components are being removed with double click on the right mouse button.

Located in the bottom part, the detail view "available" and the number of available identical modules (instances) of the actually selected module are shown. The circuit diagram and the help-text for the marked module are opened with the buttons "S" and "H". The module is inserted to the respective place into the circuit diagram page by dragging with the left mouse button pressed down, the instance is distinguishable by the blue number. Double click with the right mouse button on the module and confirmation with the button "Yes” deletes the module and the number of available intances is updated.

Module connections

Modules in the circuit diagram are linked together by a click with the right mouse button at junctures, double click with the right mouse button on a link deletes the connection.

Module parameter

Module parameters are editable in windows, opened with a double click with the left mouse button on each circuit diagram element. Adjustments are finished with the button "Apply". The windows contains also the buttons "Help", "Print" (for parameter set) and "circuit diagram" (if existing) to open the flow chart of the module. Flow charts and help texts are available in the pdf format. If not existing yet, the Adobe Reader has to be installed and the respective folder linked with the menu item "Settings" -> "path for documentations".

Controller display
The module "Controller display" has been already inserted into the circuit diagram and it is used for configuration of the visual controller display as well as the parameters in the operation levels. Double click with the left mouse button on the module "Controller display" opens the "Display and logger editor".

Display and logger editor: → see manual: "B 99pkd E"

Display- and operation menu selection:
All editable parameters of the modules used throughout the circuit diagram appear here. Next to the name of the module the descriptive text "value", the parameter name "dialogue" and Code as well as the associated "level" is displayed respectively. By checkmark "adjustable in controller" the parameter is accessible for the operator on the controller in the displayed level. If required, the parameter can be hidden from the operator in controller mode by means of a fade-out condition. To do this, the value of the parameter code in the left-hand column must correspond to the value in the right-hand column, e.g. 1 (decimal 0-9999).
By checkmark "Display selection" the parameter is selectable in the controller menu for the value displays and can be preconfigured in the display selection "Display".
When using the KFM-PCS interface software for process visualisation, up to five different parameter pages can be generated by ticking the 'PCS Set' column.

Display:
Parameters, units and texts that are choosable on the controller for indication can be preconfigured in the display selection "Display". By checkmark "adjustable in controller" the parameter is accessible for the operator on the controller in the displayed level. The description text with * for units and texts can be edited in the display selection directly.

Language editor (German, English and a user-defined language):
All parameters of the modules and elements used in the circuit diagram from the display/data logger editor appear here. In addition to the module name, the designation appears in German, English and a user-defined language, as well as the parameter name and code, if available. Editable fields are displayed in white, others in grey. The "Load designation file" and "Save designation file" buttons are used to load or save files in csv format.

Automatic conversion
Obsolete modules are listed in tabular form and can be automatically converted and replaced with the latest modules when opening configurations, the list can be printed optionally. The project is opened unchanged when canceling the automatic conversion. The rules and hints of the automatic conversion are displayed in detail prior.

Menu bar, toolbar

New, open or save file 
A new project is created or a file loaded respectively saved with these icons.

Print 
The entire or individual selected circuit diagram pages of the project can be printed with the print command. It can be determined by checkmark whether the print out takes place with or without title and contents. Furthermore, each parameter window contains a "print"- button to print out the respective parameter set.

Load configuration (project) from controller , send to controller  compile 
The compilation takes place automatically within every transmission of a project to a device. An event window appears during the transmission, with the respective button it can be switched between the result of the compilation and the transmission protocol; its content can be printed with the printer symbol. A separate compilation is necessary for testing only.

Diagnosis on/off,
Real-time monitoring can be started or stopped by this button if hardware is connected.
The diagnosis allows to display a maximum of 20 analogue and digital values in real-time.
Hold down "Ctrl" key plus double left mouse click on the desired output- juncture to add or delete real-time displays.

Search (if available),
The search field can be used to search for text and numbers.

Address
The address of the connected hardware has to be inserted here for communication.
An automatic scan is started with the menu item "Settings" -> "Find device address..".

Project translate
The names of the modules can be switched over to different languages. The location for the translation text- file* "Text.txt" is visible in the menu item "Settings" -> "path for documentations", "translation text".
*= if existing

Select on/off,
Allows to mark a circuit diagram area as a group by the mouse and furthermore opens more adjacent symbols to copy, cut, paste or delete the marked area.

Extend, reduce, grid
These symbols cause an extended or reduced view of the circuit diagram and the grid on or off as well as to snap modules on the grid. The grid can also be extended or reduced. Various types of grids can be selected with the menu item "Settings" -> "grid settings".

Representation of the connections
This symbol cause a change to the representation of the connections into "simple line" or "angled line".

Pages
- see circuit diagram- workspace.

Menu/ Help
Here is the choice to display this manual or a detailed module overview and to start a demo-program.

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Internal hardware (Interne Hardware)

Hardware modules represent the real existing hardware of the device. The related terminals are displayed in orange colour, in case of inputs on the left side, in case of outputs on the right side.

Device identifier (Gerätekennung)

Device_identifier: (Gerätekennung:)
(max. 20 available)



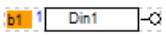
Function
The module provides the possibility to save an identifier in the device which is readable via the service interface.
See manual 99s for the parameter code.

Parameter

Text	(no control menu)	Text identifier (max. 10 characters)

Input (Eingang)

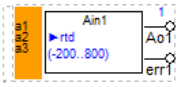
Din:
(max. 32 available)



Function
The module provides at the output pin a real digital hardware input with a maximum frequency of 1 Hz.

Parameter
none

Ain:
(max. 8 available)



Function
The module provides at the analogue output pin a real analogue hardware input. The additional output pin err1 is set to 0 with a correct measuring value and set to 1 with a measuring fault.

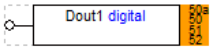
Parameter

Ain.	(Configuration level)	Input type for input no.. (RTD/0-20mA/4-20mA/0-10V/2-10V) alternative (TH K/TH J/TH S/0-20mA/4-20mA/0-10V/2-10V)
IST.	(Configuration level)	Correction value for changing the measuring value (depending on range)
.Blo/.Bhi	(Parameter level 2)	Start / end of display range (standard signal -999...9999, others depending on range)
.NST	(Parameter level 2)	Number of decimal places (0/1/2 depending on range)
AiSP*	(Configuration level)	Input type for input no.2.2 (0-20mA/4-20mA/0-10V/2-10V)
Elo/Ehi*	(Parameter level 2)	Start / end of external set point range (-999...9999)

** = Special feature input 2 with configuration external set point: standard signal configurable for external set point, PT100 input additionally usable.*

Output (Ausgang)

Dout:
(max. 16 available)

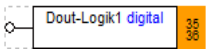


Function
The module provides a real digital hardware output. The signal connected to the input pin is emitted at the digital output depending on the configuration. 3 different PWM-modes are configurable in addition to the pure digital function.

Parameter

Typ	(Configuration level)	Output type (digital, PWM, PWM2s/10ms (cycle 2s, min. 10ms), PWM6s/20mS (cycle 6s, min. 20ms))
CY"	(Configuration level)	Cycle time (PWM) (2…120sec.)
Output	(no control menu)	Used hardware output (relay, logic)

Dout-Logic (Dout-Logik):
(max. 2 available)

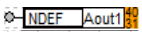


Function
The module provides a real digital hardware output. The signal connected to the input pin (0...100, bzw. 0/1) is emitted at the digital output depending on the configuration. One different PWM-mode is configurable in addition to the pure digital function.

Parameter

Typ	(Configuration level)	Output type (digital, PWM)
CY"	(Configuration level)	Cycle time (PWM) (2..120sec.)

Aout:
(max. 6 available)



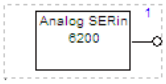
Function
The module provides a real analogue hardware output. The signal connected to the input pin is emitted at the analogue output with resolution in consideration of the signal range.

Parameter

.Sout	(Configuration level)	Signal assignment (Ist. SP., *extern: external signal at the input pin)
out...--Fkt	(Configuration level)	Setting output signal (0-20,4-20,20-0,20-4 (mA) also with absolute value for each setting (A...))
.SLo/.SHi	(Parameter level 2)	Start / end of signal output range (-999...9999)

Service interface (Service Schnittstelle)

Analog_SERin:
(max. 16 available)



Function
Via service-interface to code 6200...620F transferred values are emitted at the output pin of the respective module. The valid signal range and the decimal place are adjustable. The lower range limit is emitted in case of range over- or under run. A monitoring time provides the verification of the interface function.

Parameter

Bslo/Bshi	(Parameter level 2)	Admissible signal range (-10000... + 10000)
sNST	(Parameter level 2)	Number of decimal places (0,1,2)
Ta``	(Parameter level 2)	Monitoring time (0…100 sec., 0=without, last value is on hold)

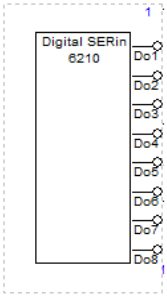
Analog_SERout:
(max. 16 available)



Function
At the input pin attached signals are send via service- interface to code 6220...622F and can be processed there for bus adapter, control system or for displaying at the TFT- front panel.

Parameter
None

Digital_SERin:
(max. 16 available)

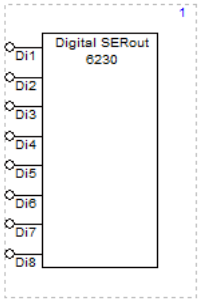


Function
Via service-interface to code 6210...621F transferred 8 bit-values are emitted as 0/1-signal at the output pins 1-8 of the respective module.
A monitoring time provides the verification of the interface function.

Parameter

Td``	(Parameter level 2)	Monitoring time (0...100 sec., 0= without, last value is on hold)

Digital_SERout:
(max. 16 available)



Function
At the input pins 1-8 attached 0/1 signals are sent via service- interface to code 6230...623F and can be processed there for bus adapter, control system or for displaying at the TFT- front panel as 8-bit values.

Parameter
None

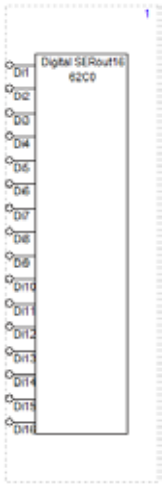
Digital_SERin16:
(max. 16 available)



Function
16-bit values transferred to the code 62B0..62BF via the service interface are output as 0/1 signals at output pins 1-16 of the respective module.
An adjustable monitoring time enables the interface function to be checked.

Parameter
Td16`` (Parameter level 2) Monitoring time
(0..100 sec., 0= without, last value is held)

Digital_SERout16:
(max. 16 available)



Function
0/1 signals applied to input pins 1..16 are sent to code 62C0..62CF via the service interface and are available there as 16-bit values for further processing for bus adapters, control systems or for display on the TFT device front.

Parameter
None

Switchover_Ser1/2: (Umschaltung_Ser1/2:)
(max. 1 available)

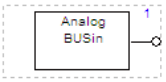


Function
The module provides a further second service interface in addition to the standard service interface. The interfaces can be used selectively via menu or control pin Di as well as parallel. The switched off service interface answers to requests with the sign "NAK" (hexadecimal "15") only.

Parameter
Sio (configuration level) Selecting the interface (Sio1/ Sio2/ dual/ bin(ary input))

Bus interface (Bus Schnittstelle)

Analog_BUSin:
(max.10 available)

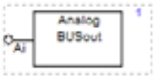


Function
Via bus-interface received analogue values are emitted at the output pin of the respective module. The valid signal range and the decimal place are adjustable. The lower range limit is emitted in case of range over- or under run. A monitoring time provides the verification of the interface function.

Parameter

Bblo/Bbhi	(Parameter level 2)	Admissible signal range (-10000... + 10000)
bNST	(Parameter level 2)	Number of decimal places (0,1,2)
bTa``	(Parameter level 2)	Monitoring time (0..100 sec., 0= without, last value is on hold)

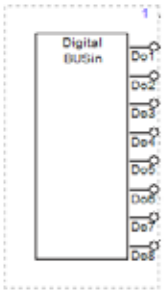
Analog_BUSout:
(max. 10 available)



Function
At the input pin attached analogue output signals are sent via bus- interface and can be processed there for connected devices.

Parameter
None

Digital_BUSin:
(max. 10 available)

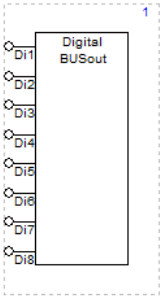


Function
Via bus-interface received 8-bit values are emitted as 0/1- signal at the output pins 1-8 of the respective module.
A monitoring time provides the verification of the interface function.

Parameter

bTd``	(Parameter level 2)	Monitoring time (0...100 sec., 0= without, last value is on hold)

Digital_BUSout:
(max. 10 available)



Function
At the input pins 1-8 attached 0/1 signals are sent via bus- interface and can be processed there for connected devices.

Parameter
None

Fieldbus (Feldbus)

Profinet:
(max.1 available, if supported by the hardware)



Function
KFM devices are connected to the Profinet using a Profinet module. The module is configured to the desired transmission data, e.g. actual value and setpoint, as well as communication parameters, e.g. IP address. The Profinet interface can thus replace the wiring of external analog (external setpoints, signal outputs) or digital signals (via binary inputs and status bits or via relay outputs and control bits).

Parameter
The Profinet module is configured to the desired transmission data, e.g. actual value, setpoint and status word, and the device name (kfm99spne), IP and MAC address are displayed.
For setting the desired transmission data, see sheet 99spne

Modbus:
(max.1 available, if supported by the hardware)



Function
KFM devices are connected to the Modbus TCP/IP using a Modbus module. The module is configured to the desired transmission data, e.g. actual value and setpoint, as well as communication parameters, e.g. IP address. The MODBUS interface can thus replace the wiring of external analog (external setpoints, signal outputs) or digital signals (via binary inputs and status bits or via relay outputs and control bits). The additional digital output pin Do is set to 0 for correct interface operation and to 1 for communication errors.

Parameter

IP	(Configuration level *)	Setting IP address manually (max. 254), e.g. 192.168.001.254 / for DHCP active- setting IP address automatically, set lowest IP address block 000, e.g. 192.168.001.000
SN	(Configuration level *)	Subnet mask setting
TM´´	(Configuration level)	Setting waiting time for Modbus monitoring (1-120 sec.)

** = adjustable directly on the device*

For setting KFM parameters, memory address and function, see sheet 99smts32

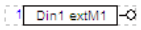
External hardware (Externe Hardware)

External module (Externes Modul) (max. 10 available)

The desired standard rail module can be selected from a list of available modules under external module and the containing hardware can be used individually in the configuration.
Available standard rail modules: see sheet 852

Input (Eingang)

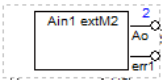
Din_extM:
(max. 80 available)



Function
The module provides at the output pin a real digital input of an external hardware with a maximum frequency of 1 Hz.

Parameter
None

Ain_extM:
(max. 20 available)



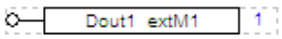
Function
The module provides at the analogue output pin a real analogue hardware input. The resolution is normal (852220) or high resolution (852280) depending on the used hardware. Each hardware module provides 2 analogue inputs with the same resolution. The additional output pin err1 is set to 0 with a correct measuring value and set to 1 with a measuring fault.

Parameter

AinM.....	(Configuration level)	Input type for input no.. (RTD/0-20mA/4-20mA/0-10V/2-10V)
ISTM.....	(Configuration level)	Correction value for changing the measuring value (-200..+800)
M.....Blo / Bhi	(Parameter level 2)	Start / end of display range (-200...+800)
M.....NST	(Parameter level 2)	Number of decimal places (0/1/2 depending on range)

Output (Ausgang)

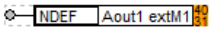
Dout_extM:
(max. 50 available)



Function
The module provides a real digital hardware output. The signal connected to the input pin is emitted at the digital output depending on the configuration.

Parameter
None

Aout_extM:
(max. 6 available)



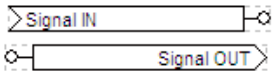
Function
The module provides a real analog hardware output. The signal applied to the input pin is output at the analog output taking into account the signal range.

Parameter

Sout	(Configuration Level)	Signal assignment (actual. SP., *external: external signal at the input pin)
out...--Fkt	(Configuration level)	Output type (0-20,4-20 mA)
SLo/.SHi	(Parameter level 2)	Permissible input signal range (-999..9999)

Signal connection (Signalverbindung)

Signal_IN: / Signal_OUT:
(max. 300 available each)

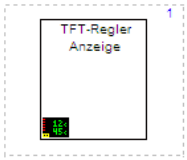


Function
Bus symbols are used for the textual labeling of signals and its easy usage on different points within a configuration. A differentiation is made between signal in- and signal out depending from the position of the signal pin.

Parameter
Beschriftung (no control menu) (freely adjustable)

Display/Anzeige

TFT-controller_display: (TFT-Regler_Anzeige:)
(max.1 available)

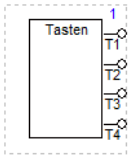


Function
In this module, each parameter of the used modules can be individually selected whether it should appear in the device menu. Furthermore, it can be determined which values are available for displaying. Another part of the module is the workspace for graphical display layout with value displays, status messages, objects, texts and bitmaps.

Parameter
None

Note: For detailed explanations, refer to the 99pkd operating instructions.

Buttons: (Tasten:)
(max.1 available)

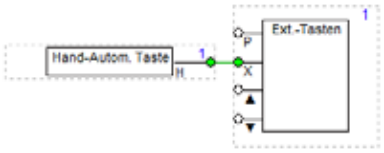


Function
Depending on the hardware version, the module provides the status of the real front keys on the output pins.

T1 = P-button
T2 = Special button (for example, manual operation / automatic mode or ON / OFF)
T3 = Arrow up button
T4 = Arrow down button

Parameter
None

Manual-autom.buttons: (Hand-Autom.Taste:)
(max.1 available)

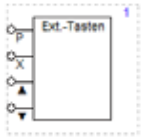


Function
The module is required if a separate manual button is to be used on the front.

H = Special manual/automatic button

Parameter
None

Ext.-buttons: (Ext.-Tasten:)
(max.1 available)



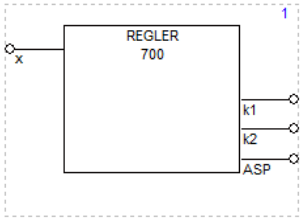
Function
In addition to the real front keys, the module enables device operation by means of digital signals applied to the input pins.
Simultaneous operation via the front and external keys is possible.
T1 = P key
T2 = Special key e.g. manual/automatic or ON/OFF
T3 = Arrow up key
T4 = Arrow down key

Parameter
None

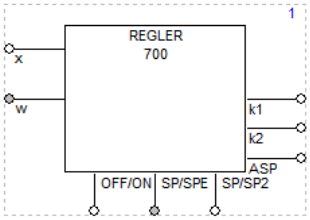
Control functions (Regelfunktionen)

Controller:

Controller: (Regler:)
(max. 10 available)



Function
The module calculates a regulating variable, based on actual- and set point value, depending from control function, and puts it out on the respective output pins. The range of the actual value signal, which is connected at the input pin x, is recognized by the module automatically. The set point value SP is present internally, so in the simplest case the pin w is left unconnected. Continuous control signals are emitted on Y1 and/or Y2 depending on the configuration, switching ones on K1 and/or K2. Additionally, the active set point value is emitted on output pin ASP. Depending from control function, the basic- (standard) or extended control module can be selected by the option field.



With extended control module only (depending on control function):
The control pin Off/On is used to switch off and on the control function. The control outputs are switched off or set to 0% in off status.
When not in use, the pin must be connected with the constant 1.

Type 800 / 900 (continuous) only: If switching to a defined regulating variable is required during power up, the respective signal has to be connected to pin Ye, when not in use to the constant 0.

With external set point value setting the desired signal must be connected to pin w. The switch over between internal and external set point takes place using the hardware pin SP/SPE or via controller menu depending from the parameter SPEF and the wiring of the control pin SP/SPE.

The same logic applies also for second set point SP2 and parameter SP2F. When not in use, the input pin SP/SP2 must be connected with the constant 0.

Type 400 (positioner) only: The alignment is started with a digital input pin, the active alignment is signalized on the digital output pin Abgl.

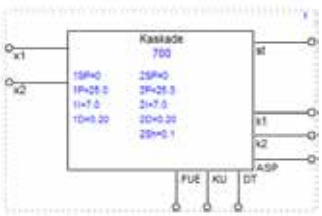
Parameter (depending on function and option field only) / Option field: "basic(standard)" or "extended"

Typ	(Configuration level)	Control function (200:2-stage, 300:3 point, 400:positioner, 500:2 point-PID,700:3 point-step, 800:continuous., 900: continuous with 2 outputs as sequence (H/C))
Lo/Hi	(Parameter level 2)	Set point setting range (-200..+800)
SP/SP2	(Setpoint level)	(internal resp. main-) set point, second set point (-200..+800)
SP-F	(Setpoint level)	Set point switch over menu (SP, SPE, SP2)
SPBf	(Setpoint level)	Switch over bus- setpoint (Off, Bus) (with adjustment menu)
ZBR	(Parameter level 2)	Time basis set point value gradient (min, hrs)
Gr1/Gr2	(Parameter level 2)	Set point value gradient for increasing/decreasing gradients (0-100)
SA2/SD1/2	(Parameter level 1)	Switching distance/ difference 2-stage controller (0,1..250/-200..800)
SA1/2/SD1/2	(Parameter level 1)	Switching distance/ difference 3 point-/ positioner (0,1..1000)
P/I/D/SH	(Parameter level 1)	Control parameter PID (0,1..999,9 / 0..999,9 / 0 .. 99,99) (SH: response sensitivity 3point-step (0,05..1,0))
SPEF/SP2F	(Configuration level)	Function external-/second set point (Off, Bin(ary inp.), menu)
SPBF	(Configuration level)	Function bus set point (Off, Bin(ary inp.), menu)
SPOV	(Configuration level)	Acceptance of external/bus setpoint The last valid external/bus setpoint (OVER) Bus setpoint is accepted for the internal setpoint. (OFF) Setpoint unaffected.
SPE	(Configuration level)	Type of effect external set point (abs(olut), add(ing), sub(tracting))

YM	(Configuration level)	Setting time of controlled drive (3point-step/posit. only) (6-600 sec)
Out	(Configuration level)	Setting output characteristic (in(vers)/di(rect) resp. combinations with type 900)
AP	(Configuration level)	Output signal operating point (-100...+100)
td	(Configuration level)	Dead zone between Y1 and Y2 (type 900 only)(0..10%)
Y_S	(Configuration level)	Behaviour of the setting output in the event of meas.- line error (Off / Rel1/ Rel2/ resp. -100..+100%)
rF1/rF2	(Configuration level)	Waiting- and re-start window for gradient (0,1..999,9)

Note: For this purpose see manual B903K for detailed explanations.

Cascade: (Kaskade:)
(max. 1 available)



Function
Note: Detailed explanations see list sheet 991k

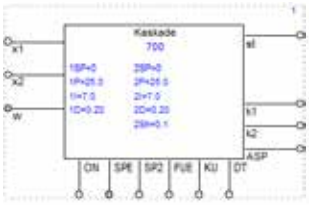
The cascade module is a cascading of 2 controllers; the output variable of the first controller (guide controller / input 1) serves as the reference variable for the second (sequential controller / input 2). The output variable of the sequential controller is available at the corresponding output pins depending on the configured control function.
The module automatically detects the ranges of the actual value signals applied to the input pins x1 and x2. Setpoints 1 SP and 2 SP are available internally. Depending on the configuration, continuous control outputs are output at Y1 and/or Y2, switching outputs at K1 and/or K2. In addition, the active setpoint is output at output pin ASP and the status of the cascade is output at output pin st (0 = master controller switched off, 1 = cascade active).

The control pin FUE is used to switch off the master controller influence for optimization or permanent. When not in use, the input pin FUE must be connected with the constant 0.

Depending on the wiring of the KU control pin, the basic setpoint of the sequential controller can be set independently. When not in use, input pin KU must be connected with constant 0.

Depending on the wiring of control pin DT, function dT control is active. When not in use, input pin KU must be connected with constant 0.

Depending on the set control function, the basic (standard) or extended control module can be selected using the option field.



Only with extended control module (depending on control function):
The control pin ON is used to switch the control function off and on.
In the Off state, the control outputs are switched off or set to 0%. When not in use, the pin with constant 1 must be connected.

Only type 800 / 900 (continuous): If a defined manipulated variable is to be switched on at switch-on, a corresponding signal must be applied to pin Ye; if it is not used, the constant 0 must be applied.

If the setpoint is set externally, the desired signal must be applied to pin w. Depending on the setting of the parameter SPEF and the wiring of the control pin SPE, the switchover between internal and external setpoint is made via the hardware pin SPE or via the controller menu.
The same logic also applies to the second setpoint SP2 and parameter SP2F. When not in use, input pin SP2 must be connected with constant 0.

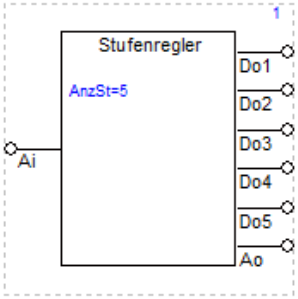
Type 400 (positioner) only: The alignment is started with a digital input pin, the active alignment is signalized on the digital output pin Abgl..

Parameter (depending on function and option field only) / Option field: "basic(standard)" or "extended"

Typ	(Configuration level)	Control function (200:2-stage, 300:3 point, 400:positioner, 500:2 point-PID,700:3 point-step, 800:continuous., 900: continuous with 2 outputs as sequence (H/C))
1 SP	(Setpoint level)	Guide controller setpoint, at the same time basic setpoint sequential controller (-200..+800)
2 SP	(Setpoint level)	Display: current sequential controller setpoint= sum off Basic setpoint and guide controller influence, simultaneously basic setpoint sequential controller (-200..+800)
SP2	(Setpoint level)	Second set point (-200..+800)
SP-F	(Setpoint level)	Setpoint changeover menu (SP, SPE, SP2)
SPBf	(Setpoint level)	Bus setpoint changeover (off, bus) (with menu setting)
2SPb	(Setpoint level)	independent basic setpoint sequential controller (-200..+800)
1P/1I/1D	(Parameter level 1)	Control parameters PID guide controller (0,1..999,9 / 0..999,9 / 0 .. 99,99)
FUE	(Parameter level 1) (With menu setting)	Switch-off of guide controller Influence (ON/OFF)
SA2/SD1/2	(Parameter level 1)	Switching distance / difference 2-stage controller (0,1..250/-200..800)
SA1/2/SD1/2	(Parameter level 1)	Switching distance / difference 3point / positioner (0,1..1000)
2P/2I/2D/SH	(Parameter level 1)	Control parameter PID sequential controller (0,1..999,9 / 0..999,9 / 0 ..99,99) (SH: response sensitivity 3-point step (0,05..1,0))
Lo/Hi	(parameter level2)	Setpoint lower/upper limit (-200..+800)
2Lo/2Hi	(parameter level2)	Permissible maximum difference of the slave controller setpoint (-999..+9999)
2FLo/2FHi	(parameter level2)	Minimum / maximum value of the slave controller setpoint (-200..+800)
ZBR	(parameter level2)	Time base setpoint gradient (Min, Std)
Gr1/Gr2	(parameter level2)	Setpoint gradient for increasing/decreasing gradients (0-100)
FUEF	(Configuration level)	Function Master controller ((opt)imization, binary input, menu)
SPEF/SP2F	(Configuration level)	Function External/second setpoint (Off, Binary(input), Menu)
SPBF	(Configuration level)	Function Bus setpoint (off, binary input, menu)
SPOV	(Configuration level)	Acceptance of external/bus setpoint The last valid external/bus setpoint (OVER) Bus setpoint is accepted for the internal setpoint. (OFF) Setpoint unaffected.
SPE	(Configuration level)	Effect External setpoint (Abs(olut),Add(ing),Sub(tracting))
dt 1/2	(Configuration level)	Difference values between reference and subsequent variable separate adjustable for heating / cooling (0..+800/0..+800)
YM	(Configuration level)	Actuator positioning time (only 3-pos step /positioner) (6-600 sec)
2out	(Configuration level)	Output effect (in(vers)/di(rect) or combinations for Type 900)
td	(Configuration level)	Dead band between Y1 and Y2 (Type 900 only)(0..10%)
AP	(Configuration level)	Operating point (-100..+100)
Y_S	(Configuration level)	Actuator output behaviour in case of measuring cable error (OFF / Rel1/ Rel2/ or -100..+100%)
ib	(Configuration level)	Integration band of the guide controller (1..100)
rF1/rF2	(Configuration level)	Wait and restart window for gradient (0,1..999,9)

Note: For detailed explanations, refer to the B903K and B991k operating instructions.

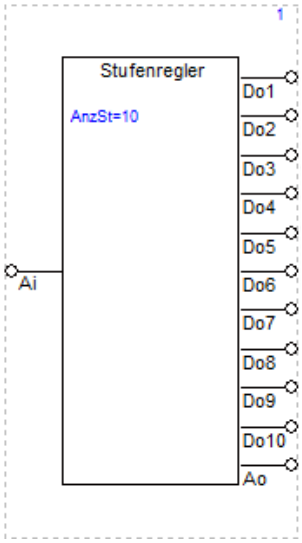
step controller: (Stufenregler:)
(max. 20 available)



Function
The module converts the variable present at the analog input Ai, e.g. manipulated variable 0..100%, into a corresponding number of switched-on switching stages at the respective output pins Do1..Do20. The number (maximum 20) and switching points of the stages can be changed at will.

The signal between the stages is available at the analog output Ao. Optionally, a signal 0-100% can be output instead of the first stage, which, together with a dout switched to PWM, outputs a clocked signal.
This causes an equalization of the power jumps between two stages and thus an almost stepless behaviour.

A built-in switch-on delay prevents the simultaneous switching on of all stages and thus load jumps in the supply network; it is set together for all stages.



Optionally, the next higher level (power increase) or the lowest level (power reduction) can be switched on or off automatically each time the power level is changed. This ensures an almost uniform use of the individual stages including the connected load.

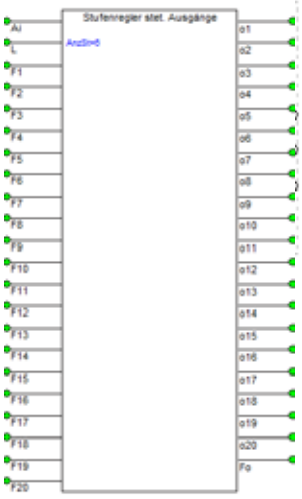
Assignment of switching stages for different output powers:
Note: Maximum 4 switching steps / output pins Do1..Do4
In order to switch as many switching stages and thus power stages as possible with a few loads of different sizes (e.g. heating elements or groups thereof), the outputs are switched individually or together according to the calculated and required power.

Parameter (only according to setting)

AnzSt	(no control menu)	Number of switching steps (1..20)
st	(Configuration level)	Switching behaviour of the stages (stat(ic), auto(matic), ZS (assignment of switching stages))
rel	(Configuration level)	Switching behaviour first stage (St (normal stage), CY(clocking))
tE	(Configuration level)	Switch-on delay (0..60 sec.)
SP*	(Configuration level)	Switch-on points level*
Sd*	(Configuration level)	Switching Differences level*
CY"	(Configuration level)	Cycle with clock behaviour (2..120 sec.)
ZSzs1	(Configuration level)	Assignment switching stage 1 (0000..1111 binary)
ZSzs2	(Configuration level)	Assignment of switching stage 2 (0000..1111 binary)
ZSzs3	(Configuration level)	Assignment of switching stage 3 (0000..1111 binary)
ZSzs4	(Configuration level)	Assignment of switching stage 4 (0000..1111 binary)

= No. of switching step 1..20

step controller continuous outputs: (Stufenregler stet. Ausgänge:)
(max. 20 available)



Function
The module converts the variable present at the analog input Ai, e.g. manipulated variable 0..100%, into a corresponding number of continuous signals at the respective output pins o1..o20. The number (maximum 20) of continuous outputs can be changed as required.

A built-in switch-on / switch-off delay prevents all stages from being switched on at the same time and thus load jumps in the supply network; it is set for all stages together.

As an option, the next highest signal output (power increase) or the lowest signal output (power decrease) can be activated automatically each time the power changes. This ensures that the individual signal outputs, including the connected load, are used almost equally. With active limitation (YHi), the automatic step change is deactivated.

Integrated operating logic records and evaluates the operating states of the actuators connected to the signal outputs (binary inputs F1..F20 Fail-safe). Outputs with faults are deactivated. Faults are signaled by means of a collective relay on output pin Fo.

The power of each heating level can be limited to a maximum value (YHi) via the binary input L.

Parameter (only according to setting)

AnzSt	(Configuration level)	Number of steps (1..20)
st	(Configuration level)	Function of the steps (stat(ic), auto(matic))
tE	(Configuration level)	Switch-on delay per step (0..60 Sek.)
tP	(Configuration level)	Switch-off delay per step (0..60 Sek.)
YHi	(Configuration level)	Output limitation (0..100)
Fi.Dir	(no control menu)	Direction of control, F1..F20 (in(vers), di(rect)))

Manual control channel function (Handleitkanal:):
(max. 10 available)



Function

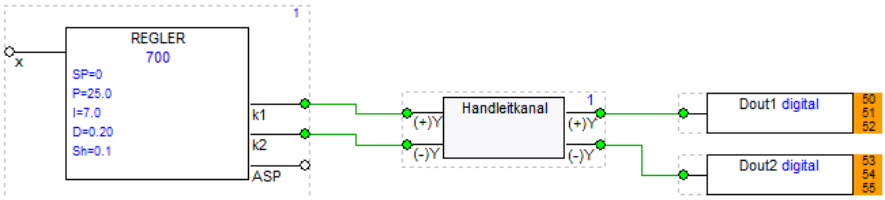
The manual control channel function interrupts the automatic control function and enables manual output of the control signal.

Note: The manual control channel module is not normally required for single-channel, multi-channel and cascade controllers. Depending on the number of inserted controller modules, the manual control function is automatically generated by means of the normal display text "MAN." for single-channel devices or the manual control function overview menu for multi-channel devices.

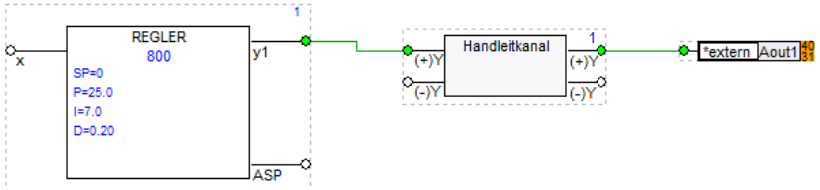
The manual control channel module can be used for multi-channel controllers with a common output or limiting function and various special versions. Thus, only channels relevant for the application are available in the manual control function and internal process variables are not displayed.

The corresponding control output signal is available at the output pins k1 / k2 or y1 and y2 of the upstream control module and is connected to the input pins, depending on the control function:

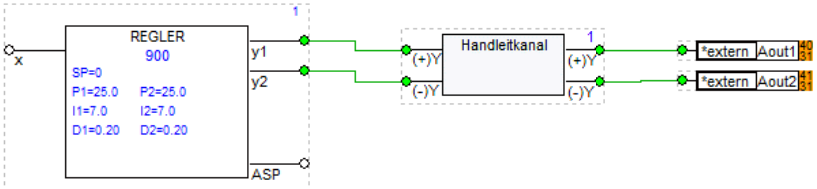
Configuration 700, 300, 400:



Configuration 800, 500:



Configuration 900, 9xhh, 9xkk:

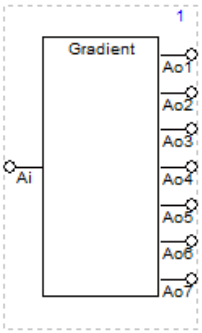


If more than one hand control channel module is inserted, the hand control function overview menu is generated automatically.

Parameter
None

Function extension (Funktionserweiterung)

Gradient:
(max. 20 available)



Function
The gradient is recalculated and emitted on pin Ao3 by sending a parameter set* (at least one (target-) set point value) to the gradient module. It is generated as quotient from the difference between the new send (target-) set point value and the actual set point value connected to input Ai divided by the actual ramp time. Further, the actual values for (elapsed) time (pin Ao1) and set point value (pin Ao2) as well as the associated saved values for (target-) time (pin Ao4), (target-) set point value (pin Ao5), tolerance (pin Ao6) and frequency (Pin Ao7) are available at the other outputs of the gradient module.

Instead of the actual (target-) set point value the calculated gradient and the actual target set point value can be sent to a subsequent arranged controller module.

Tolerance- and frequency value do not have any influence within the module.

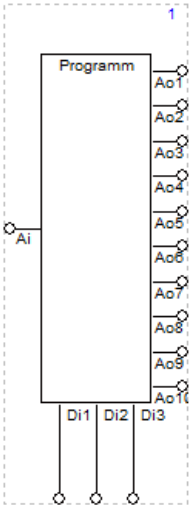
Note: An overarching strategy with external time- or set point value priority can be provided by analysing the actual ramp time and (target-) time respectively actual set point value and (target-) set point value for each actual segment

* = The calculation of the gradient is initiated by sending a (target-) set point value in the end or by confirmation of the (target-) set point value in the parameter level 2 using the p-button (also without changing the (target-) set point value).

Parameter

t'	(Parameter level 2)	Hold or ramp time, within the (target-) set point value is to be reached (hrs., min., sec.)
SP	(Parameter level 2)	(Target-) set point value (-999.0..+9999.0)
T	(Parameter level 2)	Tolerance value (-999.0..+9999.0)
F	(Parameter level 2)	Frequency value (0.0..+9999.0)

Program: (Programm:)
(max. 4 available)



Function
Note: Detailed explanations see list sheet 991p

The basis set point SP0 value is active before and after the program execution. Then it is also emitted at the output for the actual program set point value (pin Ao3), all other outputs emit 0.

The program execution is controlled by the control inputs Di1..3: The program is started (pin Di1), stopped (pin Di2) or canceled (pin Di3) with a single impulse at one of the inputs or by menu. The respective status (0=off, 1=on, 2 = stop) is emitted at the program- status output (pin Ao10).

Further, the actual values for cycle (pin Ao1), (elapsed) time of the actual segment (pin Ao2) and segment (pin Ao5) as well as the respective saved values for (target-) time (pin Ao6), (target-) set point value (pin Ao7), tolerance (pin Ao8) and frequency (pin Ao9) are provided at the remaining outputs.

Additionally, the quotient of the difference between the actual and the last (target-) program set point value divided by the actual program time is emitted as gradient at a separate output (pin Ao4). On program startup the basic set point value is used as the last (target-) program set point value for calculation. A 0 is emitted for the gradient if the last and the actual value are equal or the actual program time is 0.

The desired number of program cycles is adjusted using P-CY, whereby P-CY = 0 causes a continuous repeating program cycle.

Tolerance- and frequency value do not have any influence within the module.

The 4 possible instances can be operated subsequently or parallel. Thus, after the expiration of a program a second one can be started automatically.

Instead of the actual program set point value the calculated gradient and the actual target set point value can be sent to a subsequent control module.

Note: An overarching strategy with external time- or set point value priority can be provided by analysing the actual program time and (target-) program time respectively actual program set point value and (target-) program set point value for each actual segment.

integrated set point monitoring:

Constant monitoring takes place during the program sequence, to check whether the actual value (pin Ai) follows the current set point value. The program sequence is stopped as soon and as long as the difference set as admissible is exceeded:
With a *ramp*, the further increase or decrease of the set point value is stopped. With *holding times* the specified time increases accordingly. With a *jump* the next time segment does not start till afterwards.

Parameter

SP0	(Set point level)	Basic set point value, before and after program execution active (-200..+800)
P-Cy	(Set point level)	Number of program cycles (0..1000), 0 = continuous program cycle
Pro	(Set point level)	actual operating status (on / stop / off)
Pr-S	(Parameter level 2)	Number of program steps (0..10)
t'.1.. .t'.10	(Parameter level 2)	Holding or ramp time (hrs., min., sec.)
SP.1..SP1.10	(Parameter level 2)	(Target-) program set point value (-200..+800)
T.1 .. T.10	(Parameter level 2)	Tolerance value (-999.0..+9999.0)

F.1 .. F.10	(Parameter level 2)	Frequency value (-999.0..+9999.0)
dSP	(Configuration level)	Set point value monitoring,admissible deviation between set point value and actual value (0..200), the function is deactivated with adjustment 0

Configurable additional contact (Zusatzkontakte):

Configurable_additional_contact: (Konfigurierbarer_Zusatzkontakt:)
(max. 20 available)



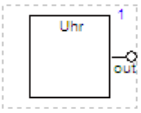
Function
The module provides the entire function of a configurable additional contact. The output out is switching depending from actual- and set point value below, above or on both sides of the set point value or independently from it in accordance with the configuration. Special configurations are possible in conjunction with program-, ramp- and clock functions. For checking purposes, the contact can be configured to switch off or on. The adjustment “bus” is available for the connection of a bus adapter or a control system in conjunction with a hardware output. The digital output is switched on or off by setting or clearing the respective bit in the control word 1005.

Parameter

ZP.	(Parameter level1)	Switch.- difference resp. set point resp. switch on time (BLo...BHi)
ZD.	(Parameter level1)	Switching difference resp. switch on duration (BHi-BLo)
ZSK.	(Configuration level)	Switching functions (LCA, LCE, SuA, SuE, SoA, SoE, StA, USA, USE, RTCA, RTCE, PRA, PRE, BUS, SR A, SR E, NW A, NW E, IP A, IP E, SRIA, SRIE)
ZSK.	(Configuration level)	Assigned measuring input (Ist1..4, ALARM, PRE-ALARM, “*extern”: external signal at input pin “in”)
ZSK.	(Configuration level)	Assigned set point/control loop (SP1..4, “*extern”: ext. Signal at input pin “***”)
ZSK.	(Configuration level)	Behaviour in case of measuring line fault (SiA,SiE)

Note: For this purpose see manual B903K for detailed explanations.
The configurable switching contact has to be used exclusively for new projects!

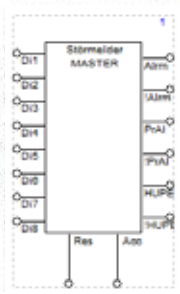
Clock: (Uhr:)
(max. 1 available)

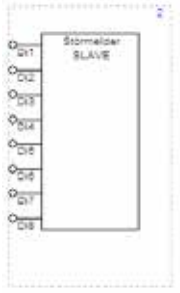


Function
The module provides time- depending switching functions, for example for night or weekend temperature reduction, in conjunction with the respective configured additional contacts (see also configurable additional contacts).
The time of the device is displayed automatically at the module when a KFM device is connected. The time can be changed by menu and send to the device using the send-button.

Parameter
None

Malfuntion alarm display: (Störmelder:)
(max. 1 Master + 9 Slave available)



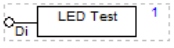


Function
Operating- and malfunction messages at the digital inputs Di1..Di8 from master- and slave modules are processed and outputted selective at the output pin Alrm or PrAl as collective message by the master module. Thereby, all alarm messages are put out on Alrm and all pre- alarm messages on PrAl. (Except inputs with parameter adjustement Di.Funktion=AloS "alarm without collective message" and Di.Funktion=PAoS "pre-alarm without collective message "). The output Horn/ Hupe is used for new- value messages.
!Alrm, !PrAl and !Hupe put out each signal in reversed form.
A message- and history list incl. LED, plain text, date and time can be displayed on the display of the controller using the parameter DSPT (see controller display), operating messages are displayed green, pre-alarms yellow and alarms red. Messages are recorded selective in the history list, (max. 40, oldest value is overwritten), switched off malfunction messages are marked with a check.
The direction of control can be configured direct or reverse and optionally a switch on delay for each input can be determined. A filled- in circle at the according input pin displays reverse action, a X displays a deactivated input pin. Messages and the horn/ Hupe can be reset resp. accepted by using the digital input reset (Res) and accept (Acc). When using additional contacts, those can be used as collective relay, new- value message, impulse relay or in combination (see additional contact parameter)

Parameter

Di.Dir	(Configuration level)	Direction of control (di/in/dis)
Di.Historie	(Configuration level)	Message recording (on, off)
Di.Funktion	(Configuration level)	Function collective relay (Alrm (alarm)/ AloR (alarm without reset)/ AloS (alarm without collective message)/ PrAl (pre-alarm)/ PAoR (pre-alarm without reset)/ PAoS (pre-alarm without collective message)/ STAT (none))
Di.Verzögerung	(Configuration level)	Switch on time delay (0...100 sec)
Accept function	(Configuration level)	Function alarm message / accept Horn-Hupe (on/ off)
Blinken	(Configuration level)	Function flashing alarm message (first value message-1Val/ new value message-NewV/ off)
StmTxt	(KFM-PC Software PKS)	message texts for active binary input, max. 40 characters

LED Test:
(max. 1 available)

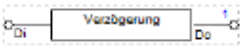


Function
The malfunction alarm display is complemented by the LED test function: All hardware input LEDs, if existing, lights when a 1 is connected to the input .

Parameter
None

Signal manipulation (Signalbeeinflussung)

Delay: (Verzögerung:)
(max. 20 available)



Function
The signal at the digital input Di is put out with an adjustable time delay to the digital output Do by the module. Positive adjustments cause a switch on delay, negative a switch off delay

Parameter

DT	(Configuration level)	Time delay (sec.) (-9999...+9999)

Signal_value: (WertSignal:)
(max. 20 available)

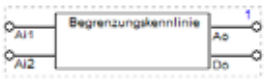


Function
The input signal is converted to the output range 0…100 (normalized) in consideration of the WLo/WHi limits.

Parameter

Wlo/Whi	(Parameter level 2)	Start / end of display range (-9999...+9999)

Limitation characteristic (Begrenzungskennlinie:):
(max. 20 available)

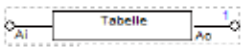


Function
The connected signal at input Ai1 (for example regulating variable) is limited, depending from a second value for example actual value, by adjustable key points and put out on output Ao. When the limiting function is active, the digital output Do is set to 1.

Parameter

tP1	(Configuration level)	Limiting point x-coordinate 1 referring to Ai2 (-999...9999)
yP1	(Configuration level)	Limiting point y-coordinate 1 referring to Ai1 (-100...+100)
tP2	(Configuration level)	Limiting point x-coordinate 2 referring to Ai2 (-999...9999)
yP2	(Configuration level)	Limiting point y-coordinate 2 referring to Ai1 (-100...+100)
BKtm	(Configuration level)	Direction of limiting characteristic (min/max-limiting)

Table: (Tabelle:)
(max. 20 available)

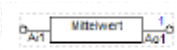


Function
The analogue input value at Ai is compared with the X-values of 11 table-points by the module and the respective Y-value is put out at the output Ao. Intermediate values are interpolated, the lower- or higher range limit is emitted in case of range under- or overrun. The output range results from the minimum and maximum Y-value. The X-values must be entered in ascending order.

Parameter

TX./TY.	(Parameter level 2)	X-/Y-value for table points(-10000..+10000)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

Average: (Mittelwert:)
(max. 20 available)

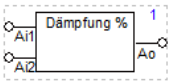


Function
The arithmetic average is calculated continuously by the module from the analogue input values at Ai using the adjusted number of samples and the selected sampling time. The result is put out at the output Ao.

Parameter

Ta	(Configuration level)	Sampling time (0,2..10 seconds)
nMW	(Configuration level)	Number of samples (2..100)
Mnst	(Configuration level)	Number of decimal places of the output Ao (0..3)

Damping % (Dämpfung %):
(max. 20 available)



Function
The Damping % module limits the rate of change of the signal at Ai1 with the setting d`` and outputs the limited signal at Ao.
The effective limiting range can optionally be limited to a sub-range of the input signal of Ai1 (as a bandwidth above and below the value applied to Ai2, e.g. active setpoint).

Example parameter db:
The input signal Ai1 has a range of 0 to 20 bar, with a setpoint (Ai2) of 10 bar, the damping should be limited to the range of 5 to 15 bar.

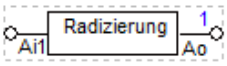
The setting for the parameter *db (%) is as follows:
The damping should be effective between 5 and 15 bar.
This results in a damping range of 10 bar, in relation to the measuring range of 20 bar this is 50 %.

Parameter

db	(Configuration level)	Damping range which is effective in accordance with value (%) at Ai2 (0..100)
d``	(Configuration level)	Permissible rate of change for signal at Ai1 per second (in 0...100 % of the signal range) - no limit: enter 0.0

For new projects, only use the damping %!

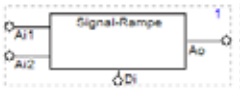
Square root extraction: (Radizierung:)
(max. 20 available)



Function
The square root extraction module outputs the extracted value of the analog input Ai at the analog output Ao.

Parameter
None

Signal-ramp: (Signal-Rampe:)
(max. 20 available)

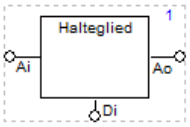


Function
The value of the offset- input Ai2 is put out by the module immediately at the analogue output Ao when a 0 is connected to the control input Di. After the change from 0 to 1 at the digital control pin Di, the value of the signal is put out at the output Ao starting from the value of the offset- input Ai2 with a freely adjustable gradient. After reaching the value of Ai1, its value is put out at Ao without delay while the digital control input is 1
.

Parameter

GrSR	(Configuration level)	Gradient (value/sec.) (0...9999)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

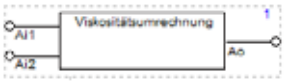
Hold element: (Halteglied:)
(max. 20 available)



Function
The value of the offset- input (in) is put out by the module at the analogue output (out) while a 0 is connected at the digital control input pin. When the digital input pin is switched from 0 to 1, the actual connected value is put out until the digital control input is switched back again from 1 to 0.

Parameter
None

Viscosity conversion: (Viskositätsumrechnung:)
(max. 20 available)

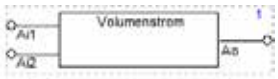


Function
The module calculates, with configuration of the parameter Unit to cSt, the kinematic viscosity and puts it out at the analogue output Ao. It is calculated in accordance to a stored formula from the dynamic viscosity at the analogue input Ai1 depending from the temperature at the analogue input Ai2 and the adjusted density for d15. With configuration of the parameter Unit to mPas, the dynamic viscosity at the analogue input Ai1 is put out at the analogue output Ao without calculation.

Parameter

d15	(Setpoint level)	Density at 15°C (500...1500)
Unit	(Parameter level 2)	Unit switch over (cSt/mPas)

Volume flow: (Volumenstrom:)
(max. 20 available)

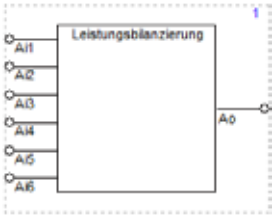


Function
The module calculates the volume flow and outputs it at the analog output Ao. This is calculated according to a stored formula from the differential pressure at analog input Ai1 as a function of the density at analog input Ai2.

Parameter

Vs.d	(parameter level 2)	Diameter of aperture in mm (1...10.0)
Vs.D	(parameter level 2)	Inner diameter of pipe in mm (10.0...1000)
Vs.uf	(parameter level 2)	Conversion factor (m³/h, l/m)
Vs.kf	(parameter level 2)	Correction factor (0.800...1.200)
Vs.Nst	(parameter level 2)	Decimal place (0,1,2)

current accounting: (Leistungsbilanzierung:)
(max. 20 available)



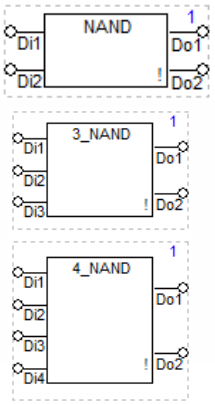
Function
The module balances the power and outputs it at the analog output Ao. The power is calculated according to a stored formula from the mass flow at analog input Ai1 or the volume flow at analog input Ai2, the density at analog input Ai3, the specific heat capacity at analog input Ai4 and the difference between two actual values at analog inputs Ai5 and Ai6.

Parameter

Lb.AQ	(Parameter level 2)	Select source Mass flow (mass/Vol.)
Lb.uf	(parameter level 2)	Conversion factor (W/kW)
LB.kf	(parameter level 2)	Correction factor (0.800...1.200)
Lb.Nst	(parameter level 2)	Decimal place (0,1)

Logic (Logik)

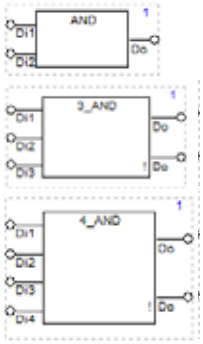
NAND: / 3_NAND: / 4_NAND:
(max. 20 available each)



Function
The module links the values at the digital inputs Di1 and following with a NOT AND function and outputs the result at the output pin Do. The mode of operation can be set separately for each input, either directly or inverted. A filled circle at the corresponding input pin indicates inversion. The output pin !Do (if present) outputs the signal from Do in inverted form.

Parameter
MSN. (Parameter level 1) Direction of control Di. (direct/invers/disabled* “di/in/dis”)
** disabled = Input masked*

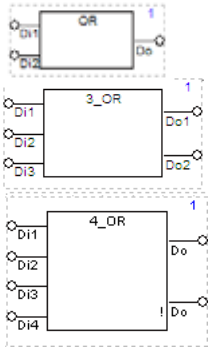
AND: / 3_AND: / 4_AND:
(max. 20 available each)



Function
The values at the digital inputs Di1 and following are linked with an AND- function by the module and the result is put out at the output pin Do .
The direction of control is adjustable for each input individually direct or reverse. A filled in circle at the according input pin displays reverse action. The output pin !Do (if existing) puts out the signal from Do in reverse form

Parameter
MSN. (Parameter level 1) Direction of control Di. (direct/invers/disabled* “di/in/dis”)
** disabled = Input masked*

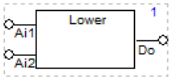
OR: / 3_OR: / 4_OR:
(max. 20 available each)



Function
The values at the digital inputs Di1 and following are linked with an OR- function by the module and the result is put out at the output pin Do. The direction of control is adjustable for each input individually direct or reverse. A filled in circle at the according input pin displays reverse action. The output pin !Do (if existing) puts out the signal from Do in reverse form.

MSN. (Parameter level 1) Direction of control Di. (direct/invers/disabled* “di/in/dis”)
** disabled = Input masked*

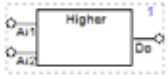
Lower:
(max. 20 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is lower than Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
None

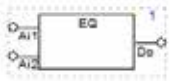
Higher:
(max. 20 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is higher than Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
None

EQ:
(max. 20 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is equal to Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
RNST (no control menu) Rounding (0-2,Nst)

SR-FlipFlop:
(max. 20 available)



Function
Due to a rising edge at the S-input (set) the output Q remains to 1 until it is reset by a rising edge at the R-input (reset). The S-input has priority while R and S are simultaneously set to 1.

Parameter
None

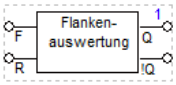
RS-FlipFlop:
(max. 20 available)



Function
Due to a rising edge at the S-input (set) the output Q remains to 1 until it is reset by a rising edge at the R-input (reset). The R-input has priority while R and S are simultaneously set to 1.

Parameter
None

Edge evaluation: (Flankenauswertung:)
(max. 20 available)



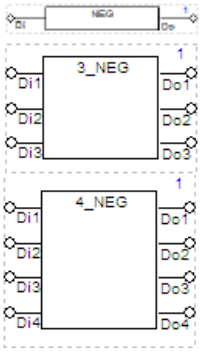
Function
A rising or falling edge at the F input (edge) causes output Q to remain at 1 until it is reset by a rising edge at the R input (reset).

Parameter

Typ	(Configuration level)	Rising or falling edge selection (0→1/ 1→0)

Operators (Operatoren)

NEG: / 3_NEG: / 4_NEG:
(max. 20 available each)



Function
The reversed value of each according input pin is put out by the module at the digital output pin Do. and following.

Parameter

Maske NEG Eingang.	(no control menu)	Masking inputs (enbl/dis)

MUL:
(max. 20 available)

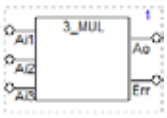


Function
The value from input Ai1 is multiplied with the value from input Ai2 and put out by the module at the output pin Ao. The range of the product is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

MBlo/MBHi	(no control menu)	Start / End product range (-9999999.00…99999999.00)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

3_MUL:
(max. 20 available)



Funktion
The value from input Ai1 is multiplied with the value from input Ai2 and Ai3 and put out by the module at the output pin Ao. The range of the product is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

MBlo/MBHi	(no control menu)	Start / End product range (-9999999.00…99999999.00)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

ADD:
(max. 20 available)



Function
The value from input Ai1 is added to the value from input Ai2 and put out by the module at the output pin Ao. The range of the sum is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

ABlo/ABHi	(no control menu)	Start / End sum range (-9999999.00…99999999.00)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

DIFF:
(max. 20 available)

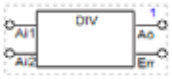


Function
The value from input Ai1 is subtracted from the value from input Ai2 and put out by the module at the output pin Ao. The range of the difference is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

0Blo/0Bhi	(Parameter level 2)	Start / End difference range (-9999999.00…99999999.00)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

DIV:
(max. 20 available)

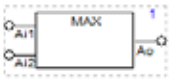


Function
The value from input Ai1 is divided by the value from input Ai2 and put out by the module at the output pin Ao. The range of the quotient is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

dBlo/dBHi	(no control menu)	Start / End quotient range (-9999999.00…99999999.00)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

MAX:
(max. 20 available)



Function
The higher one of both signals from the input pins Ai1 and Ai2 is put out at the analogue output pin Ao .

Parameter
None

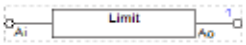
MIN:
(max. 20 available)



Function
The lower one of both signals from the input pins Ai1 and Ai2 is put out at the analogue output pin Ao .

Parameter
None

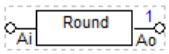
Limit:
(max. 20 available)



Function
The signal from input pin Ai is limited in accordance to adjustable range limits and put out by the module to the output pin Ao .

Parameter
LLo/LHi (Parameter level 2) Start / End of range (-999.0 ... +9999.00)

Round:
(max. 20 available)



Function
The module outputs the signal from input pin Ai rounded to the adjustable decimal places at output pin Ao.

Parameter
NSt (no control menu) Decimal place rounding (0 ... 2)

Counter (Zähler)

Counter: (Zähler:)
(max. 20 available)

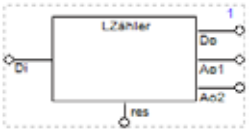


Function
The impulses (rising edge, max. 5 Hz) from the digital input Di1 are counted by the module and the count value is compared with a freely adjustable limit value. The digital output Do is set to 1 when the limit value is reached.
The control input Di2 is used to reset the count value and the output Do .

Parameter

N	(Parameter level 2)	limit value (0...9999)

LCounter: (LZähler:)
(max. 20 available)

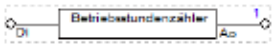


Function
The impulses (rising edge) from the digital input Di are counted and the count value is put out by the module to the analogue output Ao1. The value is saved independent from the power supply. The analogue output is still without function. The output Do is set if the freely adjustable limit value is exceeded by the count value. The control input res is used to reset the count value and the output Do.

Parameter

LimLZ	(Parameter level 2)	limit value (0...9999)

Operating_hours_counter: (Betriebsstundenzähler:)
(max. 20 available)

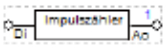


Function
The switched on time of a 1 signal from the digital input Di is counted by the module and the time value in hours is put out to the analogue output Ao. The value is saved independent from the power supply every 6 minutes. The parameter Set Counter is used to reset the value respectively to set a predetermined counter value in case of devices for replacement.

Parameter

SetC	(Configuration level)	Set Counter (0...99999.9)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

Impulse_counter: (Impulszähler:)
(max. 20 available)



Function
The impulses (max. 2500/sec.) from the digital input Di are counted and the count value is put out by the module to the analogue output Ao .

Parameter
None

Totaliser: (Summierer:)
(max. 20 available)



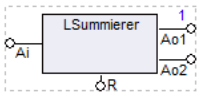
Function
Note: See list sheet 99cb for detailed explanations and examples.

An analogue value from the analogue input Ai per time unit / time factor (for example impulses per second) is summed up by the module. The count value is put out to the analogue output Ao1, that means the sum of the analogue values in time unit / time factor of the base value (for example litres per hour). The actual value of the "base time factor" (for example litres per hour) is put out to the analogue output Ao2. The calculation of the outputs can optionally be multiplied or divided. The value is saved independent from the power supply every 6 minutes. The parameter Set Counter is used to reset the value respectively to set a predetermined counter value in case of devices for replacement.

Parameter

Faktor	(Configuration level)	Factor (didi/dimu/mudi/mumu) ((di)vided or (mu)ltiplied)
tf_o1	(Configuration level)	Output value 1 time factor (0,001...9999)
tf_o2	(Configuration level)	Output value 2 time factor (0,001...9999)
SetC_sm	(Configuration level)	Set Counter (0...99 999 999) (max. 8 significant digits)
NKS_o1	(Configuration level)	Output 1 decimal place (0...3)
NKS_o2	(Configuration level)	Output 2 decimal place (0...3)

Limit Totaliser: (LSummierer:)
(max. 20 available)



Function
Note: See list sheet 99cb for detailed explanations and examples

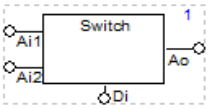
An analogue value from the analogue input Ai per time unit / time factor (for example impulses per second) is summed up by the module. The count value is put out to the analogue output Ao1, that means the sum of the analogue values in time unit / time factor of the base value (for example litres per hour). The actual value of the "base time factor" (for example litres per hour) is put out to the analogue output Ao2. The calculation of the outputs can optionally be multiplied or divided. The value is saved independent from the power supply every 6 minutes. The control pin R or the parameter Set Counter is used to reset the value respectively to set a predetermined counter value in case of devices for replacement

Parameter

Faktor	(Configuration level)	Factor (didi/dimu/mudi/mumu) ((di)vided or (mu)ltiplied)
tf_o1	(Configuration level)	Output value 1 time factor (0,001...9999)
tf_o2	(Configuration level)	Output value 2 time factor (0,001...9999)
SetC_sm	(Configuration level)	Set Counter (0...99 999 999) (max. 8 significant digits)
Grenze	(Configuration level)	limit (0...99 999 999) (max. 8 significant digits)
NKS_o1	(Configuration level)	Output 1 decimal place (0...3)
NKS_o2	(Configuration level)	Output 2 decimal place (0...3)

Switches (Schalter)

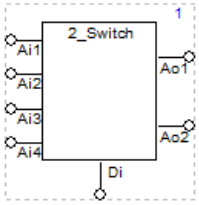
Switch:
(max. 20 available)



Function
One of the signals from analogue inputs Ai1 and Ai2 is put out by the module to the analogue output Ao depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao.
Di = 1: Ai2 is put out to Ao.

Parameter
None

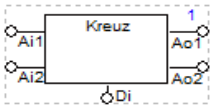
2_Switch:
(max. 20 available)



Function
One of each signal from the analogue inputs Ai1 and Ai2 respectively Ai3 and Ai4 are put out to the analogue outputs Ao1 respectively Ao2 depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao1 and Ai3 is put out to Ao2.
Di = 1: Ai2 is put out to Ao1 and Ai4 is put out to Ao2.

Parameter
None

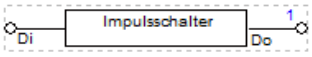
Cross_over: (Kreuz:)
(max. 20 available)



Function
The signals from the analogue inputs Ai1 and Ai2 are put out by the module to the analogue outputs Ao1 and Ao2 depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao1 and Ai2 to Ao2.
Di = 1: Ai1 is put out to Ao2 and Ai2 to Ao1.

Parameter
None

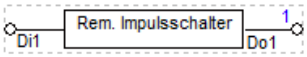
Impulse_switch: (Impulsschalter:)
(max. 20 available)



Function
The state of the output Do is changed by the module when the digital input Di is changed from 0 to 1. The state of the output Do is not saved when the power supply is switched off .

Parameter
None

Remanent pulse switch: (Rem. Impulsschalter:)
(max.20 available)

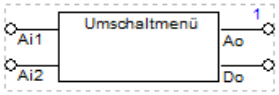


Function
The module changes the state of output Do when the digital input Di changes from 0 to 1.
The switching status of output Do is stored in a power-failure-proof memory.

Parameter
None

Caution!
Write operations on EEPROM or flash-memory are done when using the module. With constantly changing input values the limited number of memory- write cycles can be exceeded and result memory errors in case of power failure. Too frequently write operations should be avoided.

Switch_over_menu: (Umschaltmenü:)
(max. 20 available)



Function
The signals from the analogue inputs Ai1 and Ai2 are put out by the module to the analogue output Ao depending on the selection in the switch over menu.

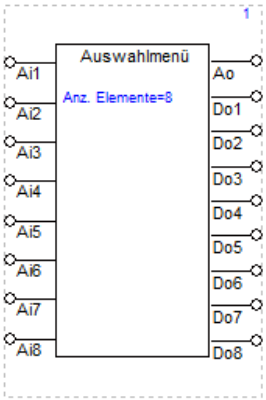
The digital output pin Do is set to 0 when Ai1 is selected and set to 1 when Ai2 is selected. The name and the description for the switch over menu as well as the designation for Ai1 and Ai2 are freely editable texts.

The menu level, within the switch over menu should be listed, is freely selectable.

Parameter

mname	(no control menu)	Designation for the menu
mdesc	(no control menu)	Description for the menu (displayed in addition to the designation)
mtext1	(no control menu)	Designation for Ai1
mtext2	(no control menu)	Designation for Ai2
mlevel	(no control menu)	Level within the menu is listed
mdset	(no control menu)	Preadjustment for input selection

Selection menu: (Auswahlmenü:)
(max. 20 available)



Function
The module outputs one of the signals present at the analog inputs Ai1...Ai8 to the analog output Ao depending on the selection in the selection menu.

The digital output pin associated with the selection is set to 1, all others to 0. The name and description for the selection menu, as well as the naming of Ai1...Ai8 are freely changeable texts.

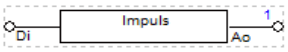
The number of inputs and the menu level at which the selection menu is to be listed can be freely selected.

Parameter

amname	(no control menu)	Menu name under which the menu is listed.
amdesc	(no control menu)	Menu description (displayed as an addition to the name)
AnzElm	(no control menu)	Number of inputs (elements)
amtext1	(no control menu)	Selection text for naming Ai1
amtext2	(no control menu)	Selection text for naming Ai2
amtext3	(no control menu)	Selection text for naming Ai3
amtext4	(no control menu)	Selection text for naming Ai4
amtext5	(no control menu)	Selection text for naming Ai5
amtext6	(no control menu)	Selection text for naming Ai6
amtext7	(no control menu)	Selection text for naming Ai7
amtext8	(no control menu)	Selection text for naming Ai8
amlevel	(no control menu)	Level at which the menu is listed
amdset	(no control menu)	Presetting which input is selected

Impulses (Impulse)

Impulse: (Impuls:)
(max. 20 available)

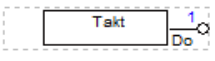


Function
An impulse with an adjustable length and amplitude is put out by the module to the output pin Ao with a rising edge from the input pin Di .

Parameter

DT	(Parameter level 2)	Impulse length (0...9999ms)
LEVEL	(Parameter level 2)	Impulse amplitude (0...9999)

Clock: (Takt:)
(max. 20 available)



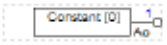
Function
A cyclical clock signal with levels 0 and 1 is put out by the module to the output Do. The cycle duration is adjustable

Parameter

T(s)	(Configuration level)	Cycle duration (1...999)

Constant (Konstante)

Constant:
(max. 20 available)



Function
A constant value is put out by the module to the output .

Parameter

Constant	(Configuration level)	Constant value (-10000...+10000)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

Adjustable constant: (Einstellbare Konstante:)
(max. 20 available)



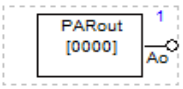
Function
A value is put out which is adjustable via menu in the set point level. The name and the description of the constant are freely editable texts .

Parameter

cname	(no control menu)	Designation for the constant in the menu
cdesc	(no control menu)	Description for the menu (displayed in addition to the designation)
cdset	(no control menu)	Constant pre-adjustment (value)
NSt	(sepoint level)	Number of decimal places (0/1/2 depending on range)

Parameter

PARout:
(max. 20 available)

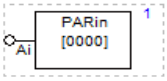


Function
In accordance to the entered controller- parameter code, the respective parameter is put out as analogue value in consideration of the decimal place to the output pin. So from nearly every module, any parameter can be read out and used in the configuration.

Parameter

Code	(no control menu)	valid parameter code in accordance to KFM 2.0 protocol (Detailed explanations see list sheet 99s)

PARin:
(max. 20 available)



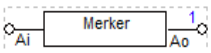
Function
The module reads the analogue value from Ai1 in consideration of the decimal place with a frequency of 1 Hz and writes the result into the parameter of the entered parameter code. In this way, values can be written to the parameter set of nearly every module.

Caution!
Write operations on EEPROM or flash-memory are done when using the module. With constantly changing input values the limited number of memory- write cycles can be exceeded and result memory errors in case of power failure. Too frequently write operations should be avoided.

Parameter

Code	(no control menu)	valid parameter code in accordance to KFM 2.0 protocol (Detailed explanations see list sheet 99s)

Flag: (Merker:)
(max. 20 available)

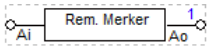


Function
The module temporarily stores the value at the analog input Ai and outputs the value at the analog output pin Ao after processing the configuration function, the initialization value is adjustable.

Parameter

Mi	(no control menu)	Initialization value (-9999...+9999)

Remanent flag: (Rem._Merker:)
(max. 20 available)



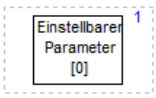
Function
The module stores the value at the analog input Ai in a non-volatile memory and outputs the value at the analog output pin Ao after processing the configuration function, the initialization value is adjustable.

Parameter

Mi	(no control menu)	Initialization value (-9999...+9999)

Caution!
Write operations on EEPROM or flash-memory are done when using the module. With constantly changing input values the limited number of memory- write cycles can be exceeded and result memory errors in case of power failure. Too frequently write operations should be avoided.

Adjustable parameter: (Einstellbarer_Parameter:)
(max. 20 available)



Function
The module supplies any code with a value that can be set in a menu on a selectable level. Name, description and the default setting for the parameter can be changed freely.

Parameter

pname	(no controller menu)	Name of the parameter in the menu
pdesc	(no controller menu)	Description of the parameter (which is displayed as an addition to the name)
pdset	(no controller menu)	Preset of the parameter (value)
plevel	(no controller menu)	Level (setpoint, configuration, parameters level 1 and 2)
pcode	(no controller menu)	valid parameter code according to KFM 2.0 protocol
pNSt	(parameter level 2)	Number of decimal places (0,1,2)
plo	(parameter level 2)	Lower value limit (-999...9999)
pHi	(parameter level 2)	Upper value limit (-999...9999)

Comments (Kommentar)

Comments: (Kommentar:)
(max. 100 available)



Function
The module displays comments in the circuit diagram. The size of the comment window can be modified while the left mouse button is pressed down on the grey edge at the bottom right .

Parameter
None

Label:
(max. 100 available)

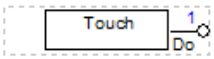


Function
This module displays labels in the schematic. The size of the window cannot be changed.

Parameter
None

Touch

Touch:
(max. 20 available)



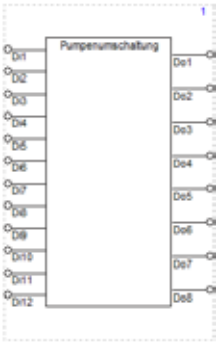
Function
The state of a touch- element (from the display) is put out in 0/1- signals by the module. It can be selected whether the element is used as button or switch

Parameter

Typ Taste/ Schalter	(no control menu)	Function type of the display touch-element (butt/ swit)

Special functions (Sonderfunktionen)

Pump changeover: (Pumpenumschaltung:)
(max. 20 available)



Function (short description)
This module causes automatic switching of two pumps depending on the two adjustable running times LZP1 / 2 The current operating times for instance 1 can be read out with the parameter codes B3B0 and B3D0. On the input side, in addition to the control inputs, there are also inputs for operating and fault messages. On the output side, in addition to the two outputs for enabling the pumps, further outputs are available for operating and fault messages as well as for passing on control commands.
(Detailed explanations on request)

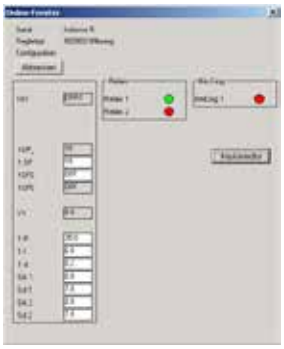
Di1: 0 = Off, 1 = Operation
Di2: 0 = Fill, 1= Operation
Di3: Pump 1 feedback
Di4: Pump 2 feedback signal
Di5: 0= manual, 1= automatic
Di6: Pump preset, 0 = Pump 1, 1 = Pump 2
Di7: Reset button
Di8: Flow fault, 0 = fault, 1 = ok
Di9: Pump 1 fault, 0 = fault, 1 = ok
Di10: Motor pump 1 fault, 0 = fault, 1 = ok
Di11: Pump 2 fault, 0 = fault, 1 = ok
Di12: Motor pump 1 fault, 0 = fault, 1 = ok
Do1: Release pump 1
Do2: Release pump 2
Do3: Start impulse
Do4: Message output fault flow
Do5: Pump running operation message
Do6: Reset output pump module
Do7: Reset output motor pump 1
Do8: Reset output motor pump 2

Parameter
LZP1 (parameter level2) Running time pump1 (0.1 .. 200 hours)
LZP2 (parameter level2) Running time pump2 (0.1 .. 200 hours)

The interface software KFM – PKS offers different function areas, which can be optionally and independently used. The software is distinguished by simple handling.

1. Online remote operation

On starting, the program automatically searches for any connected controllers. A window then appears, displaying the actual value, set value and parameters of the first controller found. Settings with a white background can be changed; changes have immediate effect in the controller. If more than one controller is connected (RS485 only), the required controller can be selected via a menu.



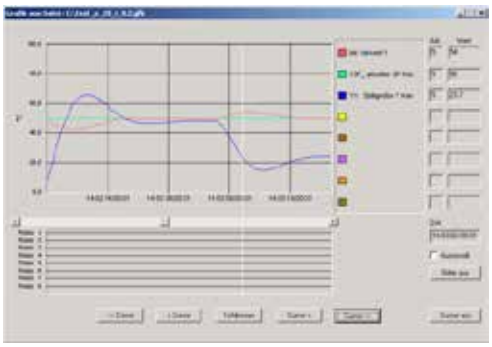
2. Data transfer

Optionally also the complete parameter block of the selected controller can be read out, edited, displayed as a table and printed out.
It is also possible to save the complete parameter setting as a file. Equally, parameter sets that have already been saved can be loaded into the controller.



3. Graphical Display (Line Recorder)

The data arriving from the controller can be displayed as a continuous diagram. Recordings made previously can also be recalled and displayed.

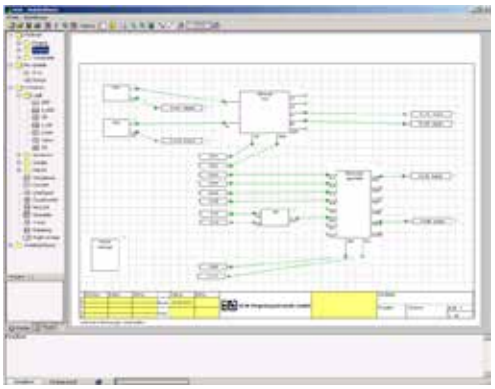


4. Data Recording (Logger)

Up to eight types of data arriving from the controller can be stored continuously in a file. This file can later either be recalled and displayed as a graph, or can be used by other programs.

5. Module software (optional)

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the controller series 902K..



Installation

- First end all applications which are running on the PC.
- Insert the PKS-CD in the CD drive and start the "Setup.exe" installation.
- A selection of german or english language for PKS is available.
- For installing and using of PKS agree to the liability exclusion.
- Select the destination folders of the hard disk drive into which the PKS files are to be installed in the following dialog. We recommend using the folders which are suggested.
- Apart from PKS it is possible to choose the TERMINAL program for modem configuration optionally.
- Then a link can be established with PKS in the Start menu as well as desktop icons.
- In addition to a summary of the chosen components the installation starts finally after clicking on the "Install" button.

Connection of the controller to a COM interface:
Connect the controller to the COM interface of the PC with the supplied RS232 or RS485 interface adapter. Ensure that the COM port is set accordingly after the PKS program start in the menu "options"->"settings".

Connection of the controller to a USB interface:
Connect the controller to the PC with the supplied USB interface adapter. The driver is installed automatically depending on the operating system, otherhwise manually: After you get the message "new hardware found", insert the included driver CD and launch the installation from the CD in the windows dialog. Following installation, the USB adapter appears in the windows system level as a further COM port. During driver installation the desired COM port is requested.
Ensure that the COM port of the USB adapter is set accordingly after the PKS program start in the menu "options"->"settings".

Connection of a device via Ethernet interface:
Connect the controller to the network interface of the PC with the supplied Ethernet interface adapter. Ensure that the COM- setting "Ethernet" and the IP-address of the Ethernet- interface adapter are set accordingly after the PKS program start in the menu "options"->"settings".
Further informations: → see manual: "B 99se E"

Information on uninstalling software

The interface software PKS and the software TERMINAL for modem configuration can be completely removed by execution of the program \uninst0000.exe wich is located in the PKS installation directory. If a link in the start menu has been created during the installation, it is possible to launch the "PKS,Terminal uninstall" from there.

Program operation

ADDRESS SEARCH window

Scanning for connected controllers is carried out once the program is started. The controller addresses are interrogated individually. As soon as a controller is found, the address appears black and the ONLINE window, respectively the configuration window in case of a bus adapter, is called up automatically.

Notes for working with several controllers:
If several controllers are operated simultaneously with PKS (only possible with the RS485 connection, suitable interface adapter necessary), the first controller found will be registered and it's data displayed in the ONLINE window. The address of this controller appears black in the ADDRESS SEARCH window.
The addresses of other controllers found are also displayed. All windows (apart from the ADDRESS SEARCH window) must be closed if another controller is to be selected. Afterwards the required address can be selected by clicking it in the ADDRESS SEARCH window. The ONLINE window of this controller opens automatically. Then handle the controller as described above.

ONLINE window

The ONLINE window shows actual values, setpoint values, switch states of the relays as well as the binary inputs and the most important parameters of the controller found. The data is updated continuously. Values can be changed in the input boxes (white). Changed values are sent immediately to the controller. The ONLINE window can be closed with <ESC> or by clicking the "close" button and reopened again with <F8> or the "Online"->"Online window" menu item.

Hint to mask editor
The display of the relays and the binary inputs in the ONLINE window can be inverted here and identifiers may be given to them (the inversion does not affect the actual switch state).
The mask setting and identifiers can be opened and saved manually with the "open and "save" buttons. If the "Open and save mask automatically" box is activated then the mask setting and identifiers will be saved and used automatically for the next operation with PKS.

Transfer of complete parameter data records

1. Reading out parameters
Alternatively to the ONLINE window the complete data record of the controller can be read out with the <F5> key or with the "File" -> "Data ← Controller" menu item. The parameters are displayed in the PARAMETER window and can be saved as a file or be printed ("File" menu). In addition a previously stored data record can be reloaded. In the PARAMETER window it is possible to add a comment in the form of a description of the controller to the file.

2. Parameter transmission
A changed or loaded data record can be transmitted to the controller by pressing the <F6> key or with the "File" -> "Data → Controller" menu item, changes have immediate effect if a controller is connected (display "online", green background).

*Note: Depending on the device, template files are optionally available for new data records without connected hardware, the files are saved in the PKS installation directory and can be used with the menu item "File"->"open" (file type: *.PKV).*

Important: A previously stored and reloaded data record (display offline, red background) is only active after transmission to the controller.

WARNING: Incorrect changes of the data records may prevent the controller from working properly. It is therefore recommended to carry out modifications using professionally trained personnel.

Note only for LCD and TFT controller, for example 902../903../93.. or 824..
The descriptive texts for displayed values on the controller can be edited and archived with the menu item "edit label". Available descriptive texts are factory set in german and english language, they can be altered by using the buttons paste "DE" and paste "EN" (also with cyrillic characters). The desired descriptive texts can be activated after using the >OK<-button.

Options / Settings

The settings of the serial interface and the data transfer mode are carried out under the "Options" -> "Settings" menu. Password- protected menu items can be displayed by using the button "extended>>>".

Serial port

Enables the selection of the active interface of the controller / MODEM and the Baud Rate to be used, the IP- address and a port must be set for an Ethernet connection.

Besides a fixed selection of the Baud Rate of 9600, 19200 and 38400 the automatic Baud Rate detection can be selected. The automatic Baud Rate detection is recommended.

Data transfer mode (COM- interfaces only)

LOCAL:
The data is transferred by a controller connected directly to the serial interface.

REMOTE:
Transfer of the data from the controller to the PC is by means of remote data transfer/MODEM. Following the activation of the "REMOTE" option, the user is requested to enter a telephone number. Following confirmation, the PC MODEM tries to create a connection to the controller MODEM. This procedure can take around 30 seconds. If connection succeeds, the red "Offline" display of the dialog window changes to a green "Online" display. The telephone symbol in the background of the main window also changes from red to green. The connection remains active until the "Disconnect line" button is activated.

extended>>>

Allows to select additionally menu entries for displaying under the menu item "Extras". The selection is protected by passwords.

Extras / KFM-device programming (to display: "Options" -> "extended>>>")

KFM-device programming offers the possibillty for a device update with KFM provided software.

The device has to be connected to the PC and registered by address scanning in advance: choose the menu item "Extras" -> "Controller programming".

The device programming is protected by a password, the factory setting is 1.

To prevent unauthorized use a new password can be assigned after entering the correct password.

The COM port setting must be set accordingly and the respective file has to be selected to start the device programming.
You will be guided automatically through the rest of the proccess, a protocol shows the progress.

Extras / Accessory device for external setpoint and analogue signal outputs (99e..)

See instruction manual 99e.., e.g. for commissioning.

In case of a detected accessory device, (with or without connected controller to the accessory device) the respective configuration window opens automatically, it is manually available under the menu item "Extras" ->"99e..".

The configuration window shows the interface address of the controller which is connected to the accessory device. The configuration of the connected accessory device is being requested and displayed with the button read, the button send saves the actual configuration to the accessory device.

The corresponding parameters of the controller, which is connected to the accessory device, are available by means of the button "…", without connected controller there is a selection of the most common parameters available. Alternatively, parameters can be entered directly in the "Code" input boxes.

The buttons open and save allow to create archives and archived configurations can be reloaded.

Important: A previously stored and reloaded data record (display offline, red background) is only active after transmission to the accessory device.

Extras / Profibus-DP-adapter (99spde)
Extras / Modbus-adapter (99sm)

In case of a detected bus adapter, the respective configuration window opens automatically, it is manually available under the menu item "Extras" ->"99spde.. " for Profibus respectively Extras" ->"99sm.. " for Modbus.

The configuration window shows the bus address (configured at the bus adapter by a rotary encoding switch) as well as the interface address of the connected controller.
The configuration of the connected adapter is being requested and displayed with the button read, the button send saves the actual configuration to the adapter.

The corresponding parameters of the connected controller are available by means of the button "…". Alternatively, parameters can be entered directly in the "Code" input boxes.

Modify the parameter for reading from the controller or sending to the controller.

The buttons open and save allow to create archives and archived configurations can be reloaded.

See instruction manual interface 99spde, e.g. for organization of the profibus data modules and manual interface 99sm for the supported Modbus functions.

Notes for Modbus adapter 99sm
It is neccessary for the Modbus to select the data modules and the baudrate.

Optionally a latency period and a surveillance period for the bus can be entered, setting 0 deactivates the function.

Extras / read history or fault message

Recording times, message texts and the status of the operating- and fault messages are read out from connected KFM- malfunction alarm devices and displayed in a table view. The table can be saved and printed.

Extras / TFT display: → see manual: "B 99pkd E"
Extras / 903K module software: → see manual: "B 99pkm E"
Data logger: → see manual: "B 99pkl E"

Online / KFM Monitor

The values of any parameter from connected devices can be read or send with the KFM monitor. The communication is continuously displayed in a protocol and can be printed.

Note for the KFM Monitor:
The usage of the KFM- monitor is recommended to experienced users only! For the provided parameters see also manual 99s.

General information:

Serial interfaces enable digital communication with computers or higher ranking control systems.
An RS 232 (optional USB) interface permits connection of one controller per computer interface. The RS485 interfaces enable the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level). Several Interfaces upon request.

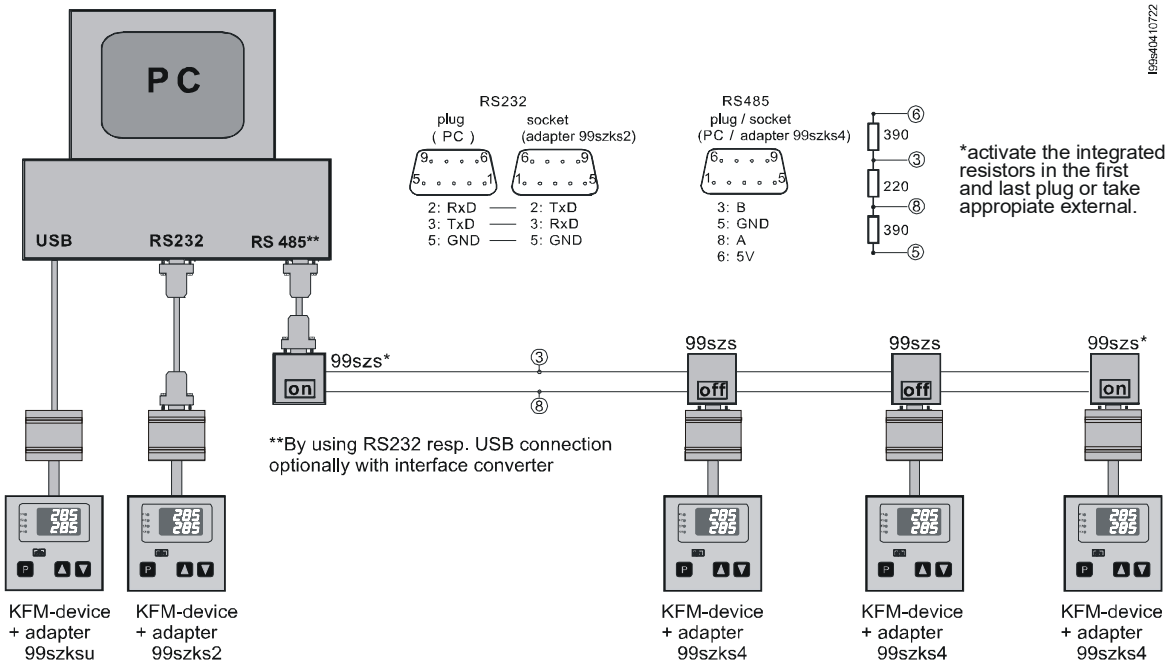
Technical data:

Interface:	direct connection - RS232, USB	bus connection - RS485
Connection:	serial, asynchronous 2 wire (+GND)	serial, asynchronous 2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Branch connection length:	15m	2m
Max. number of controllers:	1	31
Transmission direction:	-	data flow control
Transfer rate:	9600, 19200, 38400 Bit / s	9600, 19200, 38400 Bit / s

Connection lines:

Cable junction for KFM devices is done by adapters which are linked to the service interface.
By direct connection: RS232(99szks2), alternatively USB(99szksu)
By bus connection: RS485(99szks4)
To establish the bus connection, providing that there is no interface RS485 on PC resp. at the PLC existing, an interface converter RS232 resp. USB to RS485 is necessary.
Use screened lines to connect the interfaces (e.g. KFM 99szl.).
Place the screening on the controller earthing terminal.
Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate external resistors.

Wiring example:



Transmission protocol:

Data is transmitted according to the KFM protocol 2.0 which is laid out in line with the ISO 1745.

Data format:

Each field of the data frame comprises a start bit, the 7 bit ASCII value,
a parity bit for even parity and a stop bit.
Transmission rate: 9600, 19200 or 38400 Bit/s (depending on type resp. setting).

Data frame (telegram) :

The data frame commences and ends with a control character (see table) and comprises of 2 bytes for the controller address (ADR) and 4 bytes for the parameter code (code) as well as up to 6 bytes for the number value, i.e.: number value on the left from the decimal point: up to 4 bytes; 1 byte for the decimal point, number value on the right of the decimal point: 1 byte.
1 byte = 1 digit or letter or control character = 1 ASCII value

Data integrity:

The data frames for parameter transmission are safeguarded with a "BCC" sign, i.e.the transmitted data is supplemented by a check sum consisting of the logic linking (EXOR) of all transmitted characters between STX (excl.) and ETX (incl.).
The controller acknowledges a successful transmission with "ACK". A faulty transmission is confirmed by "NAK".

Examples: The computer requests data

EOT	ADR	ADR	Code	Code	Code	Code	ENQ

the controller response:

STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX	BCC

The computer sends data. To this effect, the controller must be in operational state, because the simultaneous entry of data via interface and controller keyboard is inadmissible.

EOT	ADR	ADR	STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX	BCC

controllers response to a successful transmission: ACK

controllers response to a faulty transmission: NAK

Control characters:

control characters	value(HEX)	meaning
STX	02	start of text
ETX	03	end of text
EOT	04	end of transmission
ENQ	05	enquire
ACK	06	acknowledge
NAK	15	not acknowledge
=	3D	value allocation

Permitted characters for code and value:

ASCII-code	value (HEX)	description	ASCII-Zeichen	value(HEX)	description
"0"	30	zero	"9"	39	nine
"1"	31	one	"A"	41	ten (code)
"2"	32	two	"B"	42	eleven (code)
"3"	33	three	"C"	43	twelve (code)
"4"	34	four	"D"	44	thirteen (code)
"5"	35	five	"E"	45	fourteen (code)
"6"	36	six	"F"	46	fifteen (code)
"7"	37	seven	"."	2E	dec.point (value)
"8"	38	eight	"-"	2D	minus sign(val.)

general information:

Only for older devices without online- functionality:
Transmission parameters are distinguished between online parameters and offline parameters, depending on their processing in the KFM – devices.
Online- parameters allow data transmission while the controller is in normal operating mode. In contrast, **offline**- parameters cannot be transmitted while the controller continues normal operation. So the controller has to be stopped by sending "10FE = 7708" (the display shows "ConF"). After the transmission the controller has to be switched-over to the normal operating mode by sending "10FF = 7708".

(The parameter code is exemplary for channel 1. For example: 113A = travel time of actuator channel 1. For the other channels change the number at the second place to the true channel number, for example 123A = travel time of actuator channel 2).
Parameters are available depending on type and design.

display	purpose	value range	CODE (HEX)	type
Operating indication:				
-	status- / control words 1..5 (word structure see page 6)		1001..05	online
IST1	actual value 1..6		1010..15	online*
ISTM1.1..10.2	actual value external modules 1..20		6250..64	online*
Y(1)..5	controller output channel 1..5	-100...100	1020..24	online*
Y	active controller output (e.g. 99g8.)	-100...100	102A	online*
D.W.	difference actual value 1 – actual value 2		1052	online*
M.W.	average actual value 1 / 2		1051	online*
Setpoint level:				
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00	online
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01	online
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34	online*
SP..	actual program step set point		3002	online*
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64	online
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C	online
2SP	current sequential controller set point value		103F	online*
P-CY	number of program cycles**	0...20	0148	online
"	number of program cycles module softw.**	0...1000	2650	online
A-CY	current program cycle module software**	0...1000	3003	online
Pro	actual program status	0=off,1=on,2=stop	3001	online
d15	density	500...1500	0152	offline
Parameter level 1:				
FUE	guide controller on/off	0=off,1=on	014D	online
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06	online
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A	online
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E	online
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F	online
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14	online
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16	online
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07	online
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F	online

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

display	purpose	value range	CODE (HEX)	type
Parameter level 2:				
Unit	display unit °C / °F	0=°C, 1=°F	013F	offline
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129	offline
UNIT	viscosity	0=cst, 1=cP	0151	offline
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A	offline
1..6bLo	min. value range input 1..6	-999...bHi	010C..11	offline
M1.1..10.2bLo	min. value range ext. modules input 1..20	-999...bHi	E4D0..E4	offline
1..6bHi	max. value range input 1..6	blo...4000	0112..17	offline
M1.1..10.2bHi	max. value range ext. modules input 1..20	blo...4000	E4E0..E4	offline
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C	offline
(1..3)SHi	max. value range signal output	SLo...4000	0130..32	offline
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128	offline
FLo	low limit set point value guide controller	0... Fhi	1130	online
FHi	high limit set point value guide controller	Flo...400	1131	online
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d	offline
M1.1..10.2nst	decimal point ext. modules input 1..20	0...2 (dep. on the range)	E550..64	offline
1 Lo	low limit set point value	-999...bHi	112E	offline
1 Hi	high limit set point value	blo...4000	112F	offline
DT	allowed deviation actual val.(dt control)	0...400	1146	offline
dSPL	lower display indication	0=OFF,1=SP, 2=rSP,3=Y,4=°C,5=°F, 6=bar,7=%,8=Ist1,9=Ist2...	0140	offline
DSP1..4	indication display line 1..4	0=OFF, 1=1 SP, 10=IST1, 11=IST2	0164..67	offline
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B	offline
Pr-S	number of program steps **	0...20	0149	offline
SP.1 .. 20	1...20. program setpoint val., program 1**	Lo...Hi	4101..14	online
H' 1.. 20	1...20. holding time, program 1**	0...6000	3101..14	online
Configuration level:				
ConF	type of controller		013C	offline
Cod1	code number	0...9999	0142	offline
Cod2	code 2..4	0...9999	0161..63	offline
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800	offline
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29	offline
IstM1.1..10.2	correction actual value ext. modules 1..20	M.blo...M.bHi (+/-)	E4C0..D4	offline
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23	offline
AinM1.1..10.2	type of measuring input ext. modules 1..20	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	E4B0..C4	offline
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F	offline
YE	switch-over SPE / YE	0=SPE,1=YE	114E	offline
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D	offline

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

display	purpose	value range	CODE (HEX)	type
configuration level (continued):				
REL_	switch.behaviour of the first step,step contr.	0=stat, 1=rel	1144	offline
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A	offline
(1) TE	switch-on delay per step, step controller	0...600	1(1)43	offline
Cy"	cycle time	2...120	013D	offline
(1) TP	pause time step controller	0...60	1(1)45	offline
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B	offline
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C	Offline
dSLo	valve drop. minimum	0...50	1122	offline
out	limitation selection (min / max)	0=Lo, 1=Hi	1127	offline
dSHi	valve drop. maximum	50...100	1123	offline
(1) ib	integration range limit channel 1	0...100	1(1)40	offline
(1)YLo	low limit control output	0...Yhi	1(1)38	offline
(1)YHI	limitation control output	-100...100	1(1)41	offline
(1)YHi	high limit control output	YLo...100	1(1)39	offline
(1) TY	control output slope	0...100	1(1)42	offline
(1) DB	damping range	0...100	1(1)25	offline
(1) D"	damping value	0...100	1(1)26	offline
Gr1..2	gradient 1..2	0...100	1132..33	offline
rF1..2	waiting window value 1..2	0.1...999.9	1134..35	offline
td	dead range	0.0...10.0	113D	offline
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38	offline
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A	offline
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E	offline
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F	offline
(1)YAP	operating point	YLO...Yhi	1(1)37	offline
YH	switch over control val. on / off	0=off,1=on	1148	offline
YH	external control value	0...100	1149	offline
d.SP	max. deviation actual value	0.1...200.0	0147	offline
t"	tolerance period act.value (ser. interface)	1...100	014E	offline
rEL1..8	function selection additional contact 1..8	0=LC A, 1=LC E, 2=Su A, 3=Su E, 4=So A, 5=So E, 6=St A, 7=US A, 8=US E, 11=OFF, 12=ON	2010..17	offline
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F	offline
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27	offline
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F	offline
Adr	controller address	1...255	0141	offline
BAUD	baud rate (series 92..)	0=9600	2629	offline
	baud rate (series 902..)	0=9600, 1=19200, 2=38400	2629	offline

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

parameter for series 9..

read: (from KFM device)

status word 1 (8 Ascii-characters, code 1001)

char. 8	char. 7	char. 6	char. 5	char. 4	char. 3	char. 2	char. 1

Ascii- character 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input

status word 2 (0 - 40 Ascii-characters depending on existing binary inputs, code 1002)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

Ascii-character 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (0 - 40 Ascii-characters depending on existing additional contacts, code 1005)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

Ascii-character 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (2 Ascii-characters, code 1004)

character 2				character 1			
bit 4	bit 3	bit 2	bit 1	bit 8	bit 7	bit 6	bit 5

bit 1 .. 4: control bus-setpoint 1 .. 4
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (10 Ascii-characters, code 1005)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = contact deactivated
1 = contact activated

parameter for malfunction indicator type 821, 822

CODE (HEX)	parameter*	range
100F	status word binary input 1-16	0, 1

Logical organization of the hexadecimal status word with the resp. LEDs:

figure 7				figure 6				figure 5				figure 4				figure 3				figure 2				figure 1				figure 0			
4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13

figure 7..4 = status LED 1 to 16 (0 = LED off, 1 = LED active)
figure 3..0 = flashing status LED 1 to 16 (0 = LED constantly on, 1 = LED flashing)

example: LEDs 1,6,8,11,16 active (0001 1010 0100 1000),
LEDs 6,8,16 flashing (0000 1010 0000 1000)
=> status word 1 = "1A48 0A08" (as ascii-character string)**

parameter for tableau type 8219sbtm

CODE (HEX)	parameter*	range
0901	status word binary input 1-16 of I/O-unit 1	0, 1
0902	status word binary input 1-16 of I/O-unit 2	0, 1
0903	status word binary input 1-16 of I/O-unit 3	0, 1
0904	status word binary input 1-16 of I/O-unit 4	0, 1

Logical organization of the hexadecimal status word 1-4 with the resp. LEDs:

addr	addr	,	figure 7				figure 6				figure 5				figure 4				figure 3				figure 2				figure 1				figure 0			
			4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13

addr — double-digit address of the resp. I/O-unit (e.g. malfunction indicator address 04)

, — separator (comma) between address and status word

figure 7..4 — status LED 1 to 16 (0 = LED off, 1 = LED active)
figure 3..0 — flashing status LED 1 to 16 (0 = LED constantly on, 1 = LED flashing)

example: LEDs 2,5,7,10,15 active (0010 0101 0010 0100),
LEDs 5,7,10 flashing (0000 0101 0010 0000)
=> status word 1 = "04, 2524 0520" (as ascii-character string)**

note: In case of an interruption between tableau and I/O-unit, the address 00 will be send.

* (Parameters are available depending on type and design.)

** Transmission as hexadecimal number, e.g. 1 (ASCII)= 31 (hex) , see also section "data format", page 2!

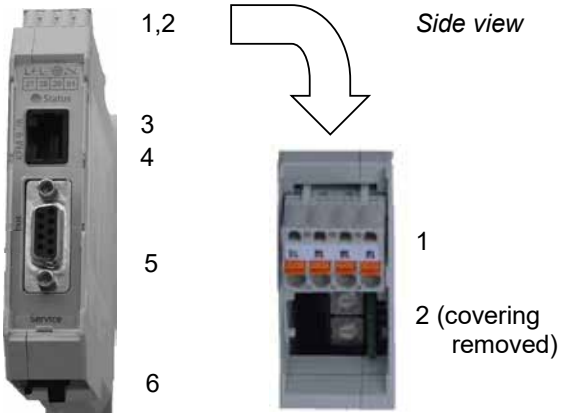
programming example in “C” (extract):

```
void send_data_frame( void)
{
int i;
char antwort=' ', z_buff[80];
unsigned char bcc;

printf( "\n\ndata ----> controller");
for ( i=0; i<=strlen( lst); i++ )                    // send data - frame
    {
    if ( i==0 )
        {
        sende_byte( 0x04);                           // send 'EOT'
        sende_byte( adresse[0]);                     // send 1. adress-byte
        sende_byte( adresse[1]);                     // send 2. adress-byte
        sende_byte( 0x02);                           // send 'STX'
        sende_byte( code[0]);                        // send 1. code-byte
        bcc=code[0];
        sende_byte( code[1]);                        // send 2. code-byte
        bcc = bcc^code[1];
        sende_byte( code[2]);                        // send 3. code-byte
        bcc = bcc^code[2];
        sende_byte( code[3]);                        // send 4. code-byte
        bcc = bcc^code[3];
        sende_byte( EQL);                            // send '='
        bcc = bcc^EQL;
        }
    sende_byte( lst[i]);                             // send data
    bcc = bcc^lst[i];
    }//for
sende_byte( 0x03);                                   // send 'ETX'
bcc = bcc^0x03;
sende_byte( bcc & 0x00ff);                           // send BCC-byte

for ( i=1; i<=400; i++ )
    {
    if ( (inportb ( com+LSR) & 0x01) ) antwort=inportb( com+RBR);
    if ( antwort==NAK ) { printf( "\nOut of Range !"); break;}
    if ( antwort==ACK ) { printf( "\nOK !"); break; }
    delay( 1);
    }//for
if ( i==401 ) printf( "\nNo response !");
};
```

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug Modbus- RTU
6 Configuration interface (service) for PC connection



Brief description:
The connection of KFM devices to the MODBUS- RTU is realised by the external bus adapter 99sm.. which is configured to the requested transmission data e.g. actual value and setpoint. The MODBUS interface is able to replace separate wiring of external analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).
The MODBUS interface is carried out as RS232-, RS485- or RS422- bus interface. The adapter has to be connected directly to the bus wiring using the 9-pole D-SUB plug.
Suitable resistors (e.g. in the connector plugs) must be present at the beginning and at the end of the bus line for communication via data bus. Shielded and twisted cables must be used. Lay the shield to ground potential. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. The bus adapter provides the MODBUS-functions 01/05 (read single bit), 03 / 04 (read input register) and 16 (write multiple register). Analogue values are transmitted as 2 x 16 bit floating point numbers, binary values as 1 bit or 2 byte-word (16 bit, if necessary a multiple of it). The function of the adapter can be supervised by a fault bit. Additionally connection faults are recorded in the fault memory for diagnostic purposes.

Types:

fifth and sixth position		*seventh position*	
99sm04.	Adapter for 4 MODBUS values, power supply 24V DC	99sm..2	for RS 232 interface
99sm12.	Adapter for 12 MODBUS values, power supply 24V DC	99sm..4	for RS 485 interface
99sm28.	Adapter for 28 MODBUS values, power supply 24V DC	99sm..6	for RS 422 interface

device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The MODBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the WinPKS PC software via the service interface.

	designation	*KFM parameter*	*MODBUS-register#*	*factory setting read / write*
Data word 1	Control word 1	1004	10 (“Dec“)	write
Data word 2	Bus setpoint 1	1060	20 (“Dec“)	write
Data word 3	Actual value 1	1010	30 (“Dec“)	read
Data word 4	Actual value 2*	1011	40 (“Dec“)	read
	** = depending on type*	*# =memory area in the modbus master*		
	for further parameter codes according to protocol *KFM 2.0 refer to manual 99sm.*			
Bus monitor	Monitor check time (0..100 sec), period within which a bus request shall take place, otherwise LED signals a failure. *Hint: Bus monitor is deactivated by setting 0*			5
Delay time	Delay time (0..250ms) for a modbus-adapter reply			0
Baudrate	Modbus baudrate (9600/19200/38400)			9600
Parity, Stopbits	Modbus parity (None/Even/Odd), number of stopbits (1, 2)			none, 2 stop
Bus address	0..99, **Coding switch**, available after removing the covering			5
	Hint: In case of multiple bus participants different addresses are to be adjusted !			

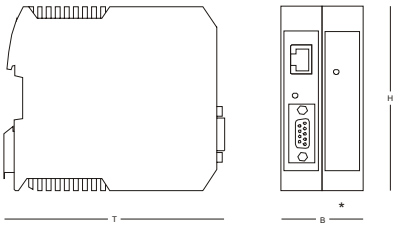
Commissioning:

Set the desired modbus-address by use of the coding switch. Connect Modbus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.
Use of the supply voltage on the Modbus interface only for terminating resistors.

The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and MODBUS adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error MODBUS, MODBUS not active, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error MODBUS and KFM device, each fault memory will be increased by 1.

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

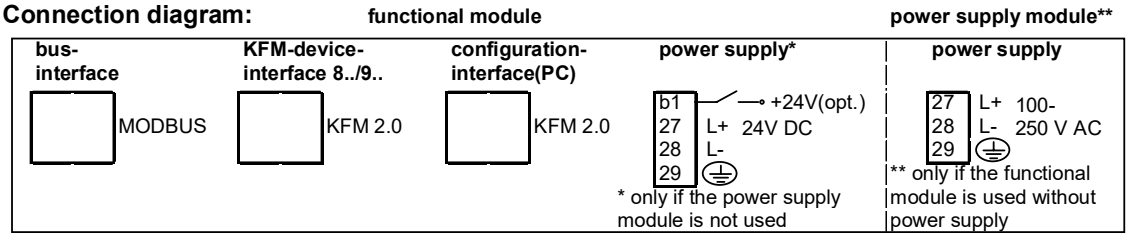
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA

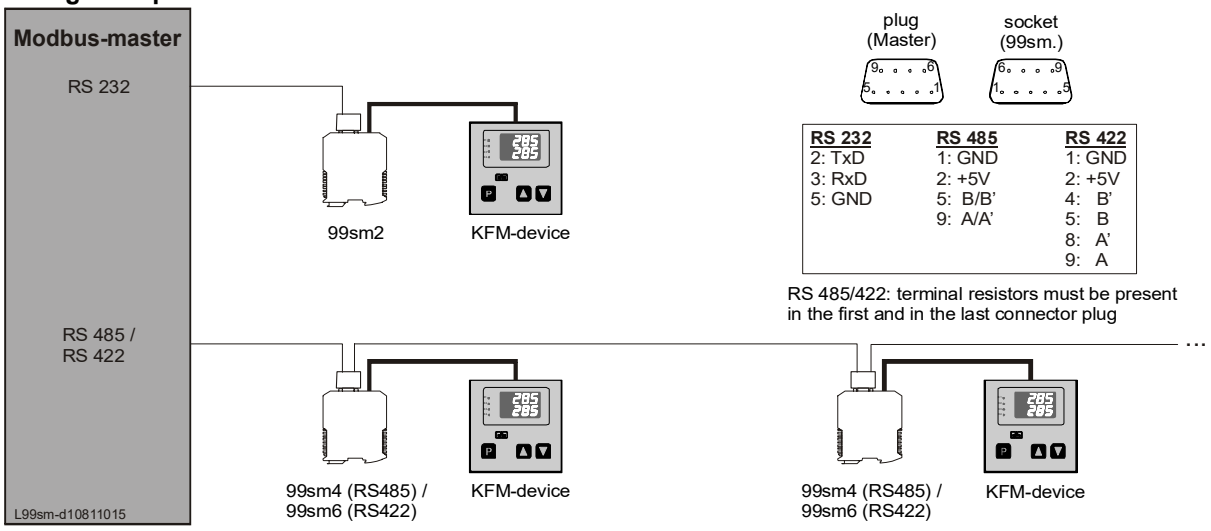
Technical data:

Modbus-interface:	RS232	RS485	RS422
Connection (serial):	asynch.,2-wire (+GND)	asynchronous, 2-wire	asynchronous, 4-wire
Cable lenght	15m	1000m	1000m
Max. number of devices:	1	31	31

Connection diagram:



Wiring example:



Data transmission:

The preadjusted transmission data are cyclically updated between the bus adapter and the connected KFM-device. By using the functions "read register" (function-code 0x03 and 0x04) as well as "write register" (function-code 0x10) the data can be accessed via modbus. For this purpose, the write- or read commands must contain the modbus- adapter address and the function-code in addition to the modbus-register wich is adjusted at the adapter, the number of data words (16 bit) to be transferred and the checksum (CRC). The data to be transferred depends on the type and uses 1 (status- and control word 1), 2 (analogue values or parameters) or 3 data words (status- and control words 2 and 3).

Hint: A freely adjustable memory area ("modbus- register") which is accessible via modbus, must be allocated in the adapter for each desired parameter code (see chapter parameter).

Structure of the supported modbus functions:

Modbus requests data (read, 0x03 / 0x04)

modbus adapter-adress	function-code	modbus-register	modbus-register	number of data words	number of data words	CRC	CRC

KFM-modbus adapter responds

modbus adapter-adress	function-code	number of bytes	value data w.1 hi-byte	value data w.1 lo-byte	value data w.2 hi-byte	value data w.2 lo-byte	value data w.3 hi-byte	value data w.3 lo-byte	CRC	CRC

Modbus transmits data (write, 0x10)

modbus adapter-adress	function-code	modbus-register	modbus-register	number of data words	number of data words	number of bytes	value data w.1 hi-byte	value data w.1 lo-byte	value data w.2 hi-byte	..	CRC	CRC

KFM-modbus adapter responds

modbus adapter-adress	function-code	para-meter code	para-meter code	number of data words	number of data words	CRC	CRC

Examples:

*Modbus requests modbus register 30 actual value 1 (code 1010 *) from modbus adapter with adress 5*

05	04	00	1E	00	02	75	4A

Modbus adapter with adress 5 responds with value 100

05	04	04	00	00	42	C8	8F	72

*Modbus transmits modbus Register 20 setpoint 1 (code 1060 *) value 100 to the modbus adapter with adress 5*

05	10	00	14	00	02	04	00	00	42	C8	17	F9

Modbus adapter with adress 5 responds

05	10	11	00	00	02	04	..	..

* see assignment table on page 1

Structure of the analog transmit values (2 data words)

Analogue data or parameters are transmitted in MODBUS-float-format (2 x 16 bit data words). The order of the individual bytes is switched compared to the single-float-format according to standard IEEE754. Depending on the master system used, this must be checked and adjusted if needed.

MODBUS-float-format

MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

Single-float-format (32bit) according to standard IEEE 754

SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S = sign (1 bit); E = exponent (complement to base 2); M = normalized mantissa (23 bit)

Structure of status- and control words

read: (from KFM device)

status word 1 (1 data word, generally existent)

bit 15	bit 14	..	..	..	..	bit 2	bit 1

bit 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
bit 8: status KFM-device-interface, 1 = normal operation, 0 = conn. error

status word 2 (3 data words, only existing if code 1002 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

Bit 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (3 data words, only existing if code 1005 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

Bit 1..40: status relays 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (1 data word, generally existent)

bit 15	bit 14	..	..	..	..	bit 2	bit 1

bit 1 .. 4: : control bus-setpoint 1 .. 4
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (3 data words, only existing if code 1005 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = deactivate contact
1 = activate contact

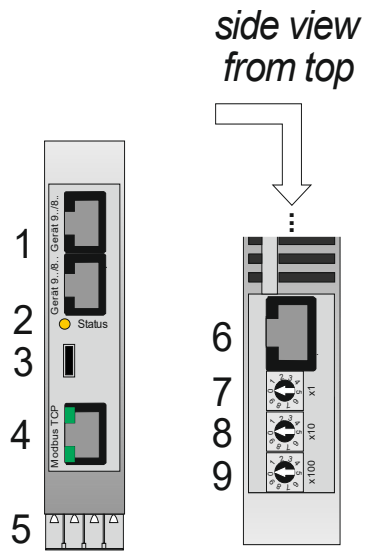
Diagnostics:

Two resettable internal fault memorys are available for communication error analysis on the modbus- and KFM-service-interface. The number of communication faults is recorded by code 5281(communication fault to the modbus) and 5282 (communication fault to the KFM-device). Both counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

display	purpose	value range	CODE (HEX)
Operating indication:			
-	status- / control words 1..5		1001..05
-	status word type 821H75s.		100F
IST1	actual value 1..6		1010..15
Y(1)..5	controller output channel 1..5	-100...100	1020..24
Y	active controller output (e.g. 99g8.)	-100...100	102A
D.W.	difference actual value 1 – actual value 2		1052
M.W.	average actual value 1 / 2		1051
Setpoint level:			
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34
SP..	actual program step set point		3002
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C
2SP	current sequential controller set point value		103F
P-CY	number of program cycles*	0...20	0148
Pro	actual program status	0=off,1=on,2=stop	3001
d15	density	500...1500	0152
Parameter level 1:			
FUE	guide controller on/off	0=off,1=on	014D
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F
Parameter level 2(Usable parameters depending on the type, consider potential mutual interference !)			
Unit	display unit °C / °F	0=°C, 1=°F	013F
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129
UNIT	viscosity	0=cst, 1=cP	0151
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A
1..6bLo	min. value range input 1..6	-999...bHi	010C..11
1..6bHi	max. value range input 1..6	blo...4000	0112..17
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C
(1..3)SHi	max. value range signal output	SLo...4000	0130..32
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128
FLo	low limit set point value guide controller	0... Fhi	1130
FHi	high limit set point value guide controller	Flo...400	1131
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d
1 Lo	low limit set point value	-999...bHi	112E
1 Hi	high limit set point value	blo...4000	112F
DT	allowed deviation actual val.(dt control)	0...400	1146
dSPL	lower display indication	0=OFF,1=SP,2=rSP,3=Y,4=°C, 5=°F,6=bar,7=%,8=Ist1,9=Ist2..	0140
DSP1..4	indication display line 1..4	0=OFF,1=1 SP,10/11=IST1/2	0164..67
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B
Pr-S	number of program steps	0...20	0149
SP.1 .. 20	1...20. program setpoint val., program 1*	Lo...Hi	4101..14
H' 1.. 20	1...20. holding time, program 1*	0...6000	3101..14

* (transmission only with deactivated program function)

display	purpose	value range	CODE (HEX)
Configuration level: (Usable parameter depending on the type, consider potential mutual interference !)			
ConF	type of controller		013C
Cod1	code number	0...9999	0142
Cod2	code 2..4	0...9999	0161..63
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F
YE	switch-over SPE / YE	0=SPE,1=YE	114E
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D
REL_	switch.behaviour of the first step,step contr.	0=stat, 1=rel	1144
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A
(1) TE	switch-on delay per step, step controller	0...600	1(1)43
Cy"	cycle time	2...120	013D
(1) TP	pause time step controller	0...60	1(1)45
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C
dSLo	valve drop. minimum	0...50	1122
out	limitation selection (min / max)	0=Lo, 1=Hi	1127
dSHi	valve drop. maximum	50...100	1123
(1) ib	integration range limit channel 1	0...100	1(1)40
(1)YLo	low limit control output	0...Yhi	1(1)38
(1)YHI	limitation control output	-100...100	1(1)41
(1)YHi	high limit control output	YLo...100	1(1)39
(1) TY	control output slope	0...100	1(1)42
(1) DB	damping range	0...100	1(1)25
(1) D"	damping value	0...100	1(1)26
Gr1..2	gradient 1..2	0...100	1132..33
rF1..2	waiting window value 1..2	0.1...999.9	1134..35
td	dead range	0.0...10.0	113D
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F
(1)YAP	operating point	YLO...Yhi	1(1)37
YH	switch over control val. on / off	0=off,1=on	1148
YH	external control value	0...100	1149
d.SP	max. deviation actual value	0.1...200.0	0147
t"	tolerance period act.value (ser. interface)	1...100	014E
rEL1..8	function selection additional contact 1..8	0=LCA, 1=LCE, 2=SuA, 3=SuE, 4=SoA, 5=SoE, 6=StA, 7=USA, 8=USE, 11=OFF, 12=ON	2010..17
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F
Adr	controller address	1...255	0141
BAUD	baud rate	0=9600, 1=19200, 2=38400	2629
anSERin	analog input value (via interface)	-10000..10000	6200..09
digSERin	8-bit digital input value (via interface)	00 .. FF hex e.g. 0..255	6210..19
anSERout	analog output value (via interface)	-10000..10000	6220..29
digSERout	8-bit digital output value (via interface)	00 .. FF hex e.g. 0..255	6230..39



1 RJ-45 KFM device connectors
2 Status LED bus adapter
3 Mikro- USB connector (internal only)
4 RJ-45 connection Modbus TCP
5 Connection power supply. 24V DC
6 RJ-45 service- connection for PC
7 Coding switch IP- address adjustment x1
8 Coding switch IP- address adjustment x10
9 Coding switch IP- address adjustment x100

General:
The Modbus TCP interface can replace the wiring of external analog (external setpoints, signal outputs) or digital signals (via binary inputs and status bits or via relay outputs and control bits).

The Modbus TCP connection is made by means of an intelligent bus adapter 99smt..., which is configured for the addresses of 1-2 KFM devices and the transmission data. Communication between the bus adapter and the service interface of the device(s) is carried out using the patch cables (1.5m) supplied.

With Modbus TCP the bus adapter 99smt... is identified by its IP address, responses are sent to the IP address of the master. The Modbus telegrams are transmitted in a TCP frame via Ethernet. The data can be accessed via Modbus TCP using the functions "Read a transmission value" (function code 0x03) and "Write a transmission value" (function code 0x16). For this purpose, the write or read commands must contain, in addition to the MBAP header and the function code, the Modbus register set in the adapter and the number of data words to be transmitted (16 bits). Depending on the type of data to be transmitted, 1 (digital values, status and control word 1), 2 (analog values or parameters) or 3 data words (status and control words 2 and 3) are used.

The function of the adapter can be monitored via error bits. Additionally, connection errors are registered in the error memory and are available for diagnosis.

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REFERENCE!
This symbol refers to further information in other sections, chapters or other manuals.

Versions:

99smts12	Adapter for 12 Modbus TCP transmission values (binary, analog values, status and control words) as slave, up to two device connections, power supply 24V DC
99smts28	Adapter for 28 Modbus TCP transmission values (binary, analog values, status and control words) as slave, up to two device connections, power supply 24V DC
99smtm	Adapter for Modbus TCP transmission values (binary, analog values, status and control words) as master
Power supply module 99e500n	(optional for supplying type 99smt..): power supply module 100-250V AC

Intended use

The device is used for the communication of digital and analog signals with measuring and control devices as well as higher-level controllers in an industrial environment in accordance with the technical data.
Any other use or use beyond this is considered improper.
The device has been built in accordance with the applicable standards, directives and safety regulations. Nevertheless, improper use may result in personal injury or damage to property.
To avoid hazards, the device may only be used for its intended purpose in a safe and proper condition and in accordance with the technical documentation supplied. Even if the device is used properly or as intended, it may still present application-related hazards, e.g. due to missing safety equipment or incorrect settings.

Personell qualification

This document contains the information required for the intended use of the device described in it. use of the device described in it.
It is intended exclusively for technically qualified personnel who are specially trained and have relevant knowledge in the field of automation technology. Knowledge and correct implementation of the information in the documentation supplied are prerequisites for safe installation, commissioning and safety during operation. Work on the device may only be carried out to the extent described and, like the electrical connection, only by qualified personnel.

Installation

Before mounting: Check the device for externally visible transport damage.Check the supply voltage on the basis of the type plate.Devices in modular design are supplied individually and must be snapped onto the standard rail intended for use one after the other in the specified sequence. The module housings must then be pushed together. The plug connectors then connect the individual modules to each other. Finally, the end pieces must be mounted on both sides of the module housings.

Electrical safety

- All electrical connection lines of the device must be disconnected during assembly/disassembly, service and repair work.
- The device is not suitable for installation in hazardous areas.
- In addition to faulty installation, parameters set incorrectly or inappropriately on the device can also impair communication. Safety devices independent of the device should therefore always be provided. The relevant safety regulations must be observed.
- Before plugging in and unplugging connecting cables, it must be ensured that the person
- electrostatically discharged (e.g. by touching grounded metal parts).
- metallic parts).
- The delivery condition of the device can deviate from the intended application during commissioning. The installer of the system is always responsible for commissioning.

Electrical wiring

- Pluggable terminal block; connection according to the connection diagram on the device.
- Only the supplied terminal blocks are to be used. Replace existing old terminal blocks.
- When connecting the power supply, do not interchange the phase and neutral conductor.
- Use cables with a wire cross-section of max. 1.5 mm2.
- Keep the communication and supply lines separate and do not lay them parallel to each other and not parallel to each other.
- Do not loop the grounding lines, but route them individually to a common grounding point in the control cabinet.
- Make sure that the cables are as short as possible and that the potential equalization is carried out correctly.
- For the cable material, during installation and also for the electrical
- For the cable material, during installation and also for the electrical connection of the device, the regulations of DIN VDE 0100 "Erection of low voltage installations" or the respective national regulations (e.g. based on IEC 60364) must be observed.
- Establish the connection between the adapter and the controller using the patch cable supplied.

Maintenance

All electronic devices of the manufacturer's program are practically maintenance-free. Provided that installation and commissioning have been carried out correctly and the equipment is protected against mechanical damage and inadmissible operating conditions, many years of trouble-free operation can be expected. In case of malfunctions, interventions are to be limited only to elements accessible outside the device or to elements expressly released for this purpose (connections, switching bridges, fuses).

Any intervention beyond this, especially inside the unit, will invalidate the warranty, make it more difficult to check and rectify the fault at a later date and, if carried out incorrectly, can cause considerable damage to the circuit.

To send in the unit for repair, disconnect the rear connectors with the supply lines connected, loosen the clamping devices, remove the controller from the front of the control cabinet.

In the interest of the quickest and most cost-saving repair possible, the faults and error messages detected should be specified as precisely as possible when sending in the unit.

see chapter Diagnosis on page 7

Settings: The Modbus TCP Adapter is delivered preset:

IP-address: 192.168.1.254 / MAC- address (see type plate)

The IP address setting of the Modbus TCP adapter is made via 3 rotary coding switches according to the following table and, if necessary, to set the higher IP addresses (first 3 number blocks) and other communication parameters using a configuration program in the PKS PC software (from version 2.02.81) via the configuration interfaces (Service).

IP Address setting	**IP-address** *(Modbus TCP- Port address: 502)*				**Coding switch table of values** *Hundreds, tens, ones*		
					x100	**x10**	**x1**
DHCP active	automatic						
Manual setting via coding switch, lowest IP address block (max. 254)	192*	168*	1*	254			

**= first 3 number blocks using PKS- PC software*

Commissioning:

Please connect the supplied patch cable (1.5m) with the service interface of the KFM device and the RJ-45 socket "9../8.." of the bus adapter. The Modbus TCP connection is made at the Ethernet socket.

Switch on the mains supply. Control lamps, if present, light up after a few seconds. Check other settings.

The LEDs signal the operating states:

LED	display	Meaning
Modbus TCP-adapter, LED "status"	green permanent*	*Normal operation*
	green flashing*	*Connection error between device 9../8... and bus adapter*
	red flashing	*Connection error between bus adapter and Modbus*
	red yellow flashing	*Connection error between device 9../8... and bus adapter and between bus adapter and Modbus*
	red permanent	*Error while loading the parameters, send in device for repair*
Power supply module, Power Led	green permanent*	*Power supply connected to power supply module*

*= yellow alternative, depending on version

Diagnosis:

For error analysis, three resettable internal error counters are available for recording connection errors on the fieldbus and on the device interfaces.

Under codes 5281 (connection error to the fieldbus), 5282 (connection error to device device 1) and 5283 (connection error to device 2) the numbers of connection errors are recorded.

By setting code 5280 (reset) to 1, all counters are set to 0. Reading the diagnostic codes and the reset function is only possible via the configuration interface.

Data transmission:

The preconfigured transmission values are updated cyclically between bus adapter and connected KFM device.

The data can be accessed via the Modbus TCP with the functions "Read a transmission value" (function code 0x03) as well as "Write a transmission value" (function code 0x16).

For this purpose, the write or read commands must contain, in addition to the MBAP header and the function code, the Modbus register set in the adapter and the number of data words to be transmitted (16 bits).

Depending on the type of data to be transmitted, 1 (digital values, status and control word 1), 2 (analog values or parameters) or 3 data words (status and control words 2 and 3) are used.

Note: Each desired KFM parameter code (see page 10 Transmission data) must be assigned a freely adjustable memory area ("Modbus register") in the adapter, which can be accessed via the Modbus.

Structure of the supported Modbus functions:

Modbus requests data (read, 0x03)

MBAP header	Function code	Modbus-register	Modbus-register	quantity data words	quantity data words

KFM Modbus adapter responds

MBAP header	Function code	quantity bytes	value data w.1 Hi Byte	value data w.1 Lo Byte	value data w.2 Hi Byte	value data w.2 Lo Byte	value data w.3 Hi Byte	value data w.3 Lo Byte

Modbus sends data (write, 0x16)

MBAP header	Function code	Modbus-register	Modbus-register	quantity data words	quantity data words	quantity bytes	value data w.1 Hi-Byte	value data w.1 Lo-Byte	value data w.2 Hi-Byte	..

KFM Modbus adapter responds

MBAP header	Function code	Para-meter code	Para-meter code	quantity data words	quantity data words

Examples:

*Modbus master requests actual value 1 from KFM-Modbus adapter register 30 (code 1010**)*

*	03	00	1E	00	02

KFM-Modbus adapter responds with value 100

*	03	04	00	00	42	C8

*Modbus master sends to KFM-Modbus adapter Register 20 Setpoint 1 (Code 1060**) value 100*

*	16	00	14	00	02	04	00	00	42	C8

KFM Modbus adapter responds

*	16	11	00	00	02	04

** see allocation table page 12

*** MBAP (Modbus Application Protocol)- header:**

Fields	Length	Description
Transaction identifier	2 byte	Identification of a Modbus TCP request/reply transaction
Protocol identifier	2 byte	0: = Modbus TCP protocoll
Length	2 byte	Number of the following bytes
Unit identifier	1 byte	Detection of a remote slave that is connected to a serial line or other buses.

Structure of the analog transmission values (2 data words)

Analog data or parameters are transmitted in MODBUS float format (2 x 16 bit data words). Compared to the single-float format (32bit) according to standard IEEE754, the sequence of the individual bytes is swapped. Depending on the master system used, this sequence must be checked and, if necessary, adapted.

MODBUS-float-format

MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

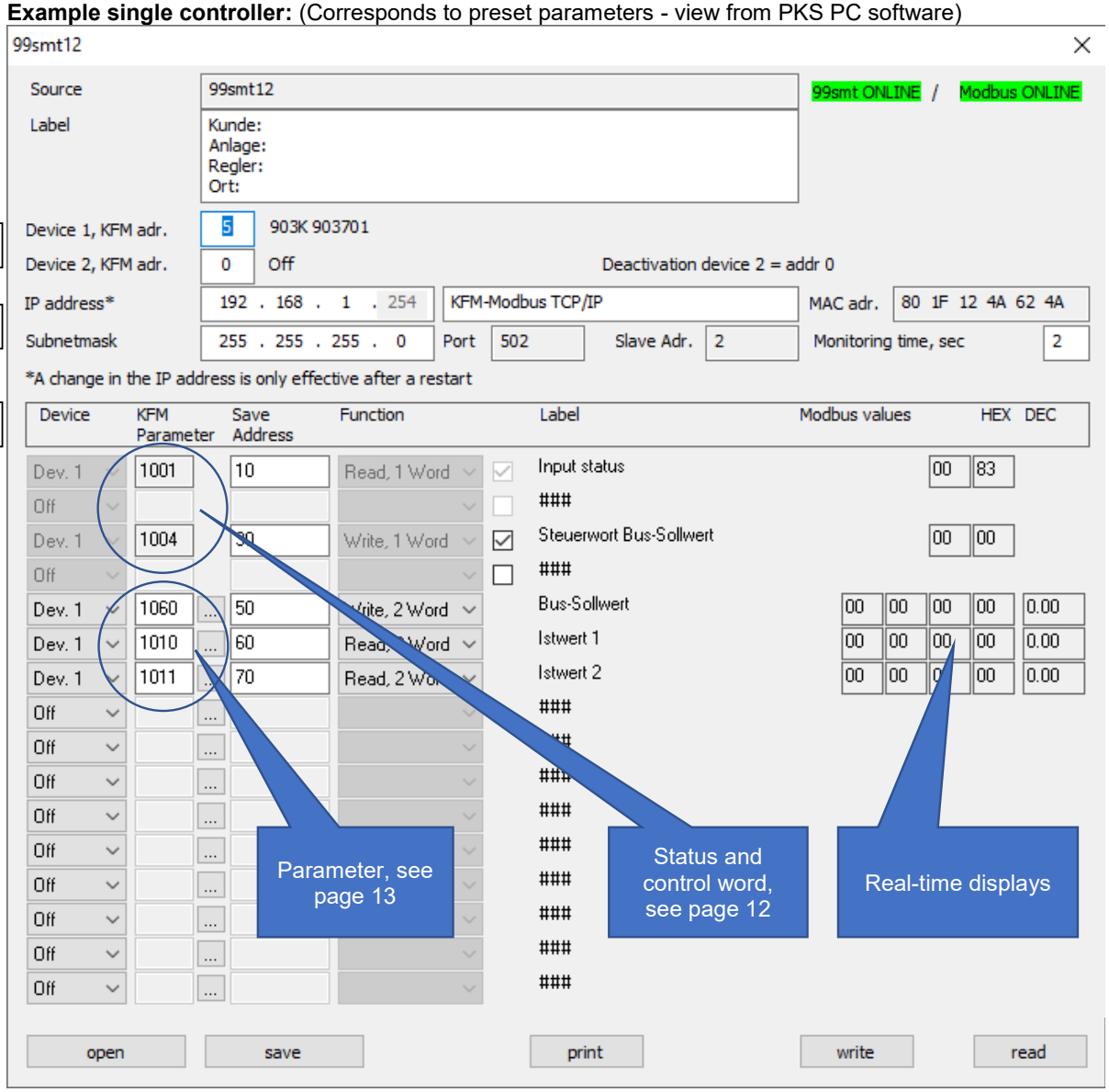
Single-float-Format (32bit) in accordance to standard IEEE 754

SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S = sign (sign, 1 bit); E = exponent in the complement of 2; M = normalized mantissa (23 bit)

Transmission data:
The adapters are supplied preset according to the example single controller.
Changes to the transmission data (e.g. actual value, setpoint and status word) can be made with the PKS PC software (from version 2.02.81) via the interface (Service).

Example single controller: (Corresponds to preset parameters - view from PKS PC software)



Important: A changed or loaded data set (display 99smt ONLINE, highlighted orange) must be sent to the device with the "send" button (display 99smt ONLINE, highlighted green) for activation and for displaying the Modbus values.

A: **Device 1(2), KFM Address:** Address input for connected KFM units

B: **Master IP address (DHCP) and subnet mask (see Settings page 6):** Enter first 3 number blocks, lowest IP address block according to rotary coding switch or DHCP.

Text KFM-Modbus TCP/IP and Port: Defined by Modbus specification, normally no adjustment necessary.

MAC address: Individual hardware address of the KFM adapter, readable on the housing.

Monitoring time, seconds: Time in which the last valid values are still held after a connection is still held. They are then set to 0.
Setting 0: If the connection is lost, the last valid value is held permanently.

Example single controller: *continuing*

C: **Device:** Selection of connected KFM devices (device 1 / 2 / off), assignment see A.

KFM parameters (if necessary, table from page 13): Enter code for selected KFM unit, preselect using button …

Memory address: Each transmission value must be assigned a freely adjustable memory area that can be accessed via the Modbus TCP / IP.

Function *„Read / Write“* (see also data transmission page 8): "Reading a transmission value" (function code 0x03) or "Writing a transmission value" (function code 0x16).

respectively. *1 Word, 2 Word or 3 Word* (see also structure of analogue transmission values page 9 or status and control words page 12): Depending on the type of data to be transmitted, different formats and byte sequences are available:
"… 1 Word": Status-/control word 1 or digital values (16 Bit)
"… 2 Word": Analogue values or parameters (32 Bit)
"… 3 Word": Status-/ control word 2 and 3

Designation: Description of the transmission value, changeable, preset. KFM parameter text

Modbus values (HEX DEC): Real-time display of the transmission values in hexa and decimal system

Structure of the status and control words

Read: (From adapter)

Status word 1 → Status measuring inputs and device interface

(1 byte, basically available, code 1001)

Byte 1 (Bit 1-8)							
8	7	6	5	4	3	2	1

Bit 1..7: Status measuring inputs 1 ... 7
0 = measurement is error-free; 1 = error at the associated measurement input
Bit 8: Status device interface, 1 = normal operation; 0 = connection error

Status word 2 → Status binary inputs

(5 bytes, only available if code 1002 is configured). *Alternatively, code 1003 for devices 826... or code 100F for devices 821 (status fault indicator)*

Byte 5 (Bit 33-40)								Byte 4 (Bit 25-32)								Byte 3 (Bit 17-24)								Byte 2 (Bit 9-16)								Byte 1 (Bit 1-8)							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1

Bit 1 ... 40: Status binary inputs 1 ... 40
0 = binary input is switched off; 1 = binary input is switched on

Status word 3 → Status binary outputs

(5 bytes, only available if code 1005 is configured)

Byte 5 (Bit 33-40)								Byte 4 (Bit 25-32)								Byte 3 (Bit 17-24)								Byte 2 (Bit 9-16)								Byte 1 (Bit 1-8)							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1

Bit 1..40: Status binary output (e.g. relay) 1..40
0 = binary output is switched off; 1 = binary output is switched on

Write: (To the adapter)

Control word 1 → Control bus setpoint

(1 byte, only available if code 1004 is configured)
Basically available for Profinet and Profibus.

Byte 1 (Bit 1-8)							
8	7	6	5	4	3	2	1

Bit 1 ... 8: Control bus setpoint 1 ... 8 (for types 90. / 93 max. 1 ... 4)
0 = bus setpoint is not active, internal setpoint (SP) is effective
1 = Bus setpoint is active (SPB)

Control word 2 → Control additional contact

(5 bytes, only available if code 1005 is configured)

Byte 5 (Bit 33-40)								Byte 4 (Bit 25-32)								Byte 3 (Bit 17-24)								Byte 2 (Bit 9-16)								Byte 1 (Bit 1-8)							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1

Bit 1 ... 40: Control additional contact 1 ... 40, as far as configured to "Bus" in the controller
0 = Switch off contact; 1 = Switch on contact

Operating indication:

display	purpose	value range	CODE (HEX)
-	status- / control words 1..5		1001..05
-	status word type 821H75s.		100F
IST1	actual value 1..6		1010..15
Y(1)..5	controller output channel 1..5	-100...100	1020..24
Y	active controller output (e.g. 99g8.)	-100...100	102A
D.W.	difference actual value 1 – actual value 2		1052
M.W.	average actual value 1 / 2		1051
Setpoint level:			
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34
SP..	actual program step set point		3002
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C
2SP	current sequential controller set point value		103F
P-CY	number of program cycles*	0...20	0148
Pro	actual program status	0=off,1=on,2=stop	3001
d15	density	500...1500	0152
Parameter level 1:			
FUE	guide controller on/off	0=off,1=on	014D
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F
Parameter level 2(Usable parameters depending on the type, consider potential mutual interference !)			
Unit	display unit °C / °F	0=°C, 1=°F	013F
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129
UNIT	viscosity	0=cst, 1=cP	0151
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A
1..6bLo	min. value range input 1..6	-999...bHi	010C..11
1..6bHi	max. value range input 1..6	blo...4000	0112..17
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C
(1..3)SHi	max. value range signal output	SLo...4000	0130..32
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128
FLo	low limit set point value guide controller	0... Fhi	1130
FHi	high limit set point value guide controller	Flo...400	1131
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d
1 Lo	low limit set point value	-999...bHi	112E
1 Hi	high limit set point value	blo...4000	112F
DT	allowed deviation actual val.(dt control)	0...400	1146
dSPL	lower display indication	0=OFF,1=SP,2=rSP,3=Y,4=°C, 5=°F,6=bar,7=%,8=Ist1,9=Ist2..	0140
DSP1..4	indication display line 1..4	0=OFF,1=1 SP,10/11=IST1/2	0164..67
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B
Pr-S	number of program steps	0...20	0149
SP.1 .. 20	1...20. program setpoint val., program 1*	Lo...Hi	4101..14
H' 1.. 20	1...20. holding time, program 1*	0...6000	3101..14

* (transmission only with deactivated program function)

Configuration level: (Usable parameter depending on the type, consider potential mutual interference !)

display	purpose	value range	CODE (HEX)
ConF	type of controller		013C
Cod1	code number	0...9999	0142
Cod2	code 2..4	0...9999	0161..63
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F
YE	switch-over SPE / YE	0=SPE,1=YE	114E
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D
REL_	switch.behaviour of step 1,step contr.	0=stat, 1=rel	1144
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A
(1) TE	switch-on delay per step, step controller	0...600	1(1)43
Cy"	cycle time	2...120	013D
(1) TP	pause time step controller	0...60	1(1)45
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C
dSLo	valve drop. minimum	0...50	1122
out	limitation selection (min / max)	0=Lo, 1=Hi	1127
dSHi	valve drop. maximum	50...100	1123
(1) ib	integration range limit channel 1	0...100	1(1)40
(1)YLo	low limit control output	0...Yhi	1(1)38
(1)YHI	limitation control output	-100...100	1(1)41
(1)YHi	high limit control output	YLo...100	1(1)39
(1) TY	control output slope	0...100	1(1)42
(1) DB	damping range	0...100	1(1)25
(1) D"	damping value	0...100	1(1)26
Gr1..2	gradient 1..2	0...100	1132..33
rF1..2	waiting window value 1..2	0.1...999.9	1134..35
td	dead range	0.0...10.0	113D
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F
(1)YAP	operating point	YLO...Yhi	1(1)37
YH	switch over control val. on / off	0=off,1=on	1148
YH	external control value	0...100	1149
d.SP	max. deviation actual value	0.1...200.0	0147
t"	tolerance period act.value (ser. interface)	1...100	014E
rEL1..8	function selection additional contact 1..8	0=LCA, 1=LCE, 2=SuA, 3=SuE, 4=SoA, 5=SoE, 6=StA, 7=USA, 8=USE, 11=OFF, 12=ON	2010..17
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F
Adr	controller address	1...255	0141
BAUD	baud rate	0=9600, 1=19200, 2=38400	2629
anSERin	analog input value (via interface)	-10000..10000	6200..09
digSERin	8-bit digital input value (via interface)	00 .. FF hex e.g. 0..255	6210..19
anSERout	analog output value (via interface)	-10000..10000	6220..29
digSERout	8-bit digital output value (via interface)	00 .. FF hex e.g. 0..255	6230..39

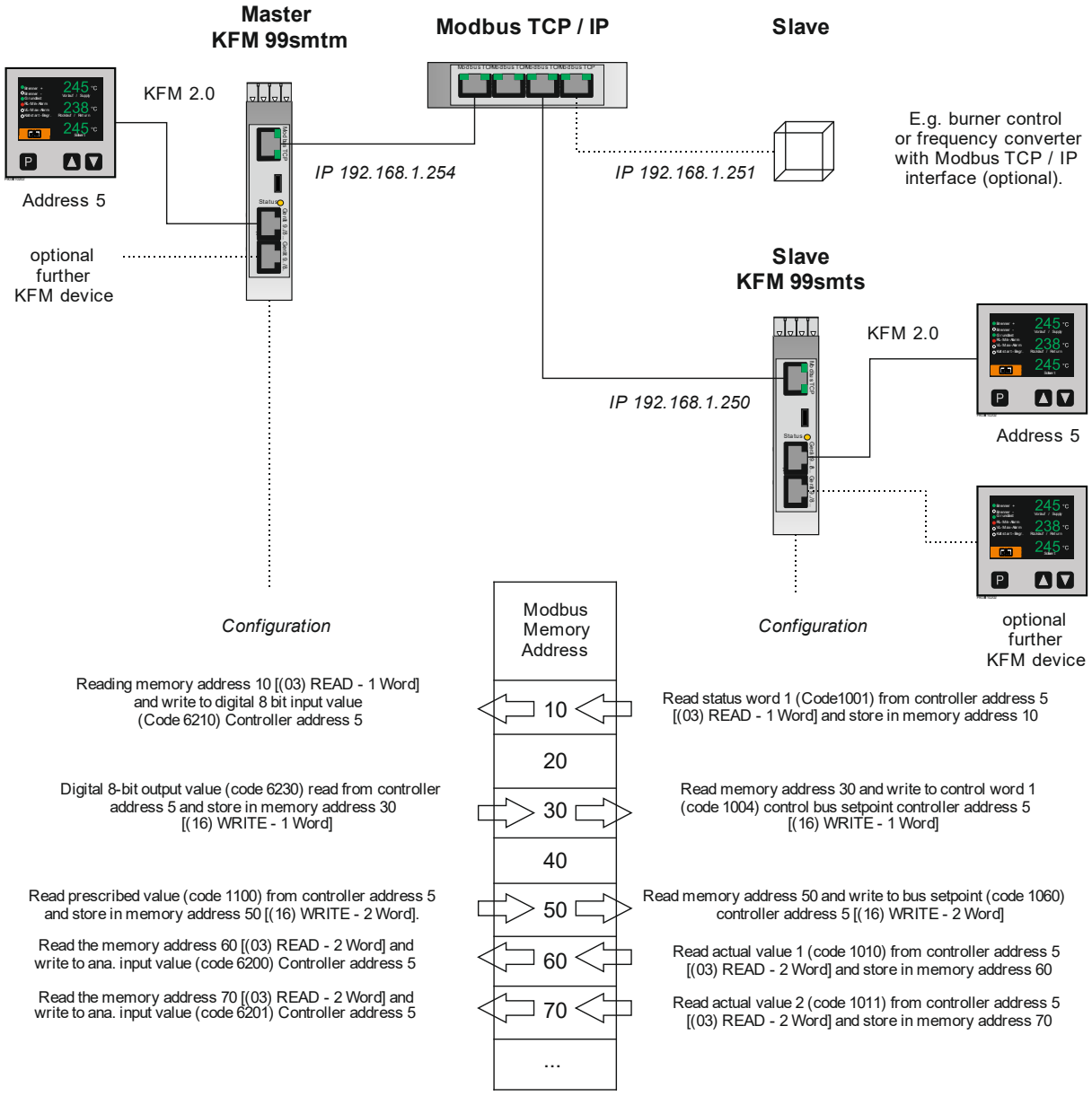
Modbus TCP / IP Master – KFM 99smtm

Modbus TCP / IP is a master / slave protocol for the exchange of process data. The slave processes a request from the master and acknowledges the request with a response, which may include requested data or status information.

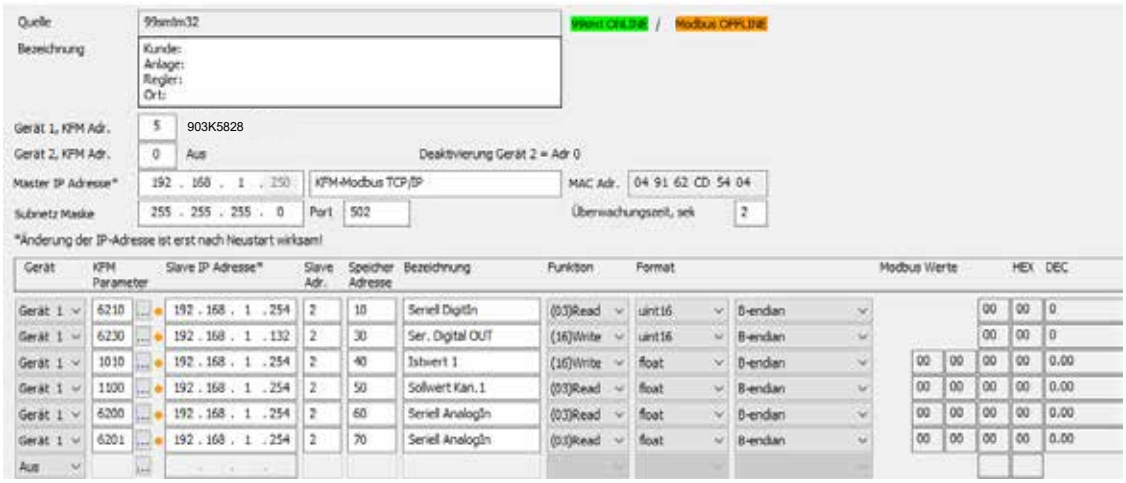
In addition to the slave connection via KFM bus adapter 99smts..., e.g. burner controls, frequency converters or decentralised I/O systems with Modbus TCP / IP interface can be used on the Modbus TCP / IP master KFM 99smtm.

The Modbus TCP / IP Master KFM 99smtm... is configured to the addresses of 1-2 KFM units and the Modbus TCP / IP transmission data.

Wiring example:



Example single controller: (corresponds to the factory default setting)



A: **Device 1(2), KFM Address:** Address input for connected KFM units

B: **Master IP address (DHCP) and subnet mask (see Settings page 6):** Enter first 3 number blocks, lowest IP address block according to rotary coding switch or DHCP.

Text KFM-Modbus TCP/IP and Port: Defined by Modbus specification, normally no adjustment necessary.

MAC address: Individual hardware address of the KFM adapter, readable on the housing.

Monitoring time, seconds: Time in which the last valid values are still held after a connection is still held. They are then set to 0.
Setting 0: If the connection is lost, the last valid value is held permanently.

Example single controller: *continuing*

C: **Device:** Selection of connected KFM devices (device 1 / 2 / off), assignment see A.

KFM parameters (if necessary, table from page 13): Enter code for selected KFM unit, preselect using button ...

Slave IP address: Enter IP address for Modbus TCP / IP slave participant (status LED green for connection to the participant, status LED orange for faulty connection).

Slave address: Fixed by Modbus specification, normally no adjustment necessary

Memory address: Each transmission value must be assigned a freely adjustable memory area that can be accessed via the Modbus TCP / IP.

Designation: Description of the transmission value, changeable, preset. KFM parameter text

Function (see also data transmission page 8): "Reading a transmission value" (function code 0x03) or "Writing a transmission value" (function code 0x16).

*F***ormat** (see also structure of analogue transmission values page 9 or status and control words page 12): Depending on the type of data to be transmitted, different formats and byte sequences are available:

"bin 1 Words": status/control word 1 or digital values (16 bit)	"little-/big-endian".
"bin 2 Words": Digital values (32 bit)	"little-/big-endian/ each with byte swap"
"bin 3 Words": status/control word 2 and 3	"none" (without)
"float": Analogue values or parameters (floating point)	"little-/big-endian/ each with byte swap"
"int 16": Data type integer 16-bit signed	"little-/big-endian".
"uint 16": Data type integer 16 bits unsigned	"little-/big endian"
"int 32": Data type integer 32-bit signed	"little-/big-endian/ each with byte swap"
"uint 32": Data type integer 32-bit unsigned integer	"little-/ big-endian/ each with byte swap"

Example Byte order "float" "Big-endian":
The floating point number 123456.00 or in hexadecimal 47 F1 20 00 is transmitted as 47 F1 20 00.

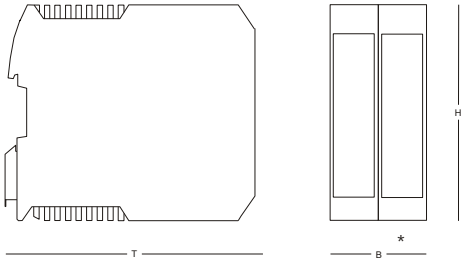
Big-endian:	*AB CD EF GH*
Little-endian:	*EF GH AB CD*
Big-endian byte swap:	*BA DC FE HG*
Little-endian byte swap:	*FE HG BA DC*

Modbus values (HEX DEC): Real-time display of the transmission values in hexa and decimal system

Technical data:

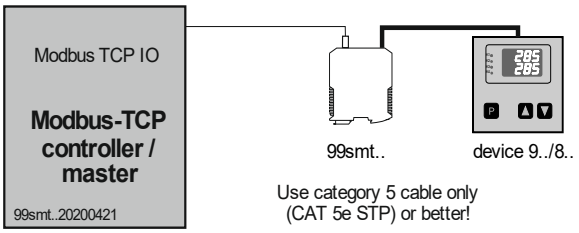
Housing: for standard rail mounting
Mounting position: any; protection class: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C; nominal temperature: 20°C
Power supply: 24V DC, approx. 12 VA, altern. 100-250V AC, approx. 12 VA
Modbus interface : Ethernet 10Base-T or100Base-TX (autom. Baudr.) according to IEEE802.3

Dimensions:

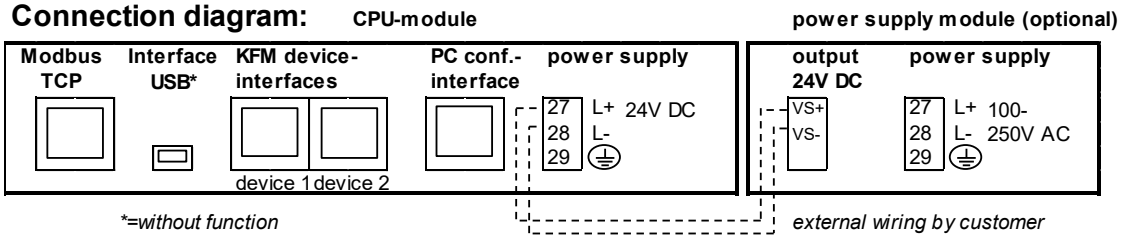


H= 99mm, * Version without or with power supply module:B = 22.5mm or 45mm, T = 116mm

Wiring example:



Connection diagram:



Regelungstechnik nach Maß

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Interface 99sp
Profibus interface

99sp E

The PROFIBUS serial fieldbus system helps to minimise the amount of cabling. Input and output modules, such as a PLC, become unnecessary. Instead of this, a bus cable is connected from one device to the next, and the entire communication between the individual control devices takes place over this bus line. All the PROFIBUS devices are addressed directly by the PROFIBUS controller card in the PLC or in the master computer.

In KFM controllers, the PROFIBUS interface replaces the cabling of external analogue signals (external set value inputs, actual values, set value outputs etc.).

TYPE 99spd: PROFIBUS-DP slave connection
The Profibus DP connection is implemented in accordance with EN 50170. The controller is connected directly to the bus line via a 9-pin D-SUB socket.

Technical data:

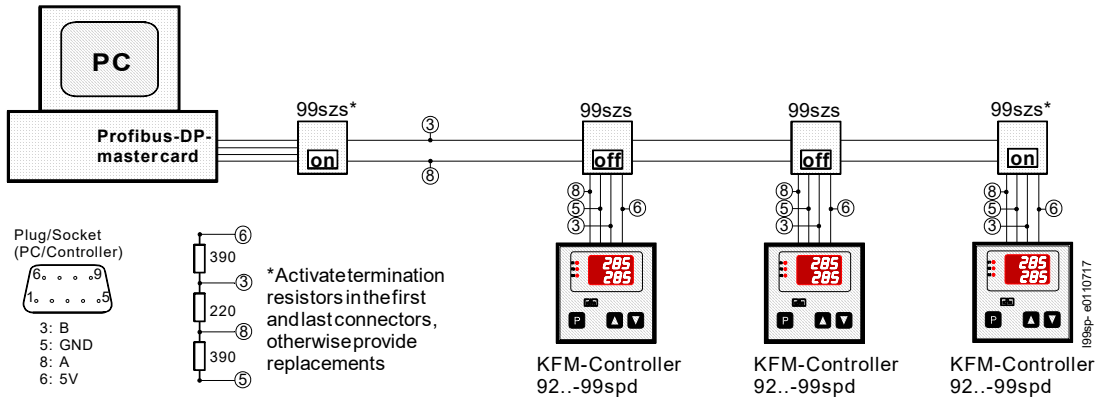
Protocol:	PROFIBUS-DP
Topology:	Linear bus with bus connections at each end
Interface:	RS 485
Addressing:	0...126 (can be set in the controller using a menu)
Max. number of devices:	32 per segment, can be increased to 127 with a repeater
Data format:	Modules for fixed or floating point data transmission
Baud rate:	Automatic baud rate detection up to max. 12 Mbaud

For other data, see the GSD file in the appendix

Pin-out of the 9-pin connector:

Pin no	Identification	Description
3	RxD / TxD-P	Receive/send data plus
4	CNTR-P	RTS control signal for optical fibres
5	DGND	Data reference potential for termination resistors
6	VP	5 V supply for termination resistors
8	RxD / TxD-N	Receive/send data minus

Wiring example:



Data modules:

The data to be transmitted are compiled in modules, data transmission is cyclical.
One module each is provided fixed decimal and floating decimal data transmission. The modules are selected via a configuration tool in the master assembly (e.g. COM profibus).

If no set values or actual values are available in the controller, the master must transmit the value 0 or the value 0 is sent from the controller

Fixed decimal data modules
Format A:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value	R	50
3	Control byte	W	20
4	External set value	W	60

Format C:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value 1	R	50
3	Actual value 2	R	50
4	Control byte	W	20
5	External set value 1	W	60
6	External set value 2	W	60

Format E:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Value 1, e.g. actual value 1	R	50
3	Value 2, " " 2	R	50
4	Value 3, " " 3	R	50
5	Control byte	W	20
6	Value 1, e.g. ext. set value 1	W	60
7	Value 2, e.g. ext. set value 2 or setting actual value 1*	W	60
8	Value 3, e.g. ext. set value 3 or 2FHi*	W	60

The values are displayed in the 16-bit fixed decimal - format with one decimal place (Fixpoint 1).
Range of values: -999.9 to +3200.0

Floating decimal data modules:
Format B:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value	R	D1
3	Control byte	W	20
4	External set value	W	E1

Format D:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value 1	R	D1
3	Actual value 2	R	D1
4	Control byte	W	20
5	External set value 1	W	E1
6	External set value 2	W	E1

Format F:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Value 1, e.g. actual value 1	R	D1
3	Value 2, e.g. actual value 2	R	D1
4	Value 3, e.g. actual value 3	R	D1
5	Control byte	W	20
6	Value 1, e.g. ext. set value 1	W	E1
7	Value 2, e.g. ext. set value 2 or setting actual value 1*	W	E1
8	Value 3, e.g. ext. set value 3 or EFHi (2Fhi)*	W	E1

The values are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

*= examples, other values on request; e.g.:
EFHi= external setting for parameter 2Fhi, displayed in the menu under EFHi
bLo/bHi = actual value setting: range boundaries can be adjusted via menu
- this setting is always valid and cannot be influenced by the associated status byte.-

Status byte: (from the controller)

Bit 8	Bit 7	Bit 6	Bit 5	Value 4	Value 3	Value 2	Value 1

Values 1 - 4: Message status measurement inputs
0 = measurement is error-free
1 = error on this measurement input
Example: ....1001 = Error measurement input with values 4 and 1

Bit 5 – 8: Status binary inputs, boundary values etc.; 0 = off, 1 = on

Control byte: (to the controller)

Bit 8	Bit 7	Bit 6	Bit 5	Value 4	Value 3	Value 2	Value 1

Values 1 - 4: Control unit external values
0 = value is not active, the internal value is effective (e.g. set value SP)
1 = value is active (e.g. ext. set value SPE)
Example: ....1010 = Values 4 and 2 are active, 3 and 1 are not active

Bit 5 – 8: Control unit binary outputs, additional relay etc.; 0 = off, 1 = on
Example: Bit 5 =: ...0.... = add. relay off; ...1.... = add. relay on

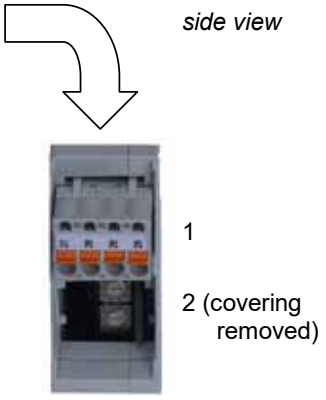
Setting the controller address:

The controller address "Adr" is the last parameter on the configuration level of the controller. The factory pre-setting is "126". If several users are connected to the bus, it should be ensured that all devices have separate addresses.
Note: A change of the controller address does not become effective until the controller supply voltage has been briefly turned off!

```
; GSD-file for product 9... - 99spd
; KFM-Regelungstechnik GmbH
; Version : 09.07.1998
; File : KFM_00EB.GSD
--------------------------------------------------------------------
#Profibus_DP
GSD_Revision          = 1
Vendor_Name           = "KFM-Regelungstechnik"
Model_Name            = "9...-99spd"
Revision              = "Rev. 1.01"
Ident_Number          = 0x00EB
Protocol_Ident        = 0 ; DP-Gerät
Station_Type          = 0 ; Slave
FMS_supp              = 0
Hardware_Release      = "HV V1.0"
Software_Release      = "SV V1.01"
9.6_supp              = 1
19.2_supp             = 1
45.45_supp            = 1
93.75_supp            = 1
187.5_supp            = 1
500_supp              = 1
1.5M_supp             = 1
3M_supp               = 1
6M_supp               = 1
12M_supp              = 1
MaxTsdr_9.6           = 60
MaxTsdr_19.2          = 60
MaxTsdr_45.45         = 60
MaxTsdr_93.75         = 60
MaxTsdr_187.5         = 60
MaxTsdr_500           = 100
MaxTsdr_1.5M          = 150
MaxTsdr_3M            = 250
MaxTsdr_6M            = 450
MaxTsdr_12M           = 800
Implementation        = "SPC3"
Bitmap_Device         = "KFM_9"
Redundancy            = 0
Repeater_Ctrl_Sig     = 2
; Slave-Specification:
OrderNumber           ="9...-99spd"
24V_Pins              = 0
Freeze_Mode_supp      = 1
Sync_Mode_supp        = 1
Auto_Baud_supp        = 1
Set_Slave_Add_supp    = 0
Min_Slave_Intervall   = 0x0032
Modular_Station       = 1
Max_Module            = 0x01
Max_Input_Len         = 32
Max_Output_Len        = 32
Max_Data_Len          = 64
; Module-Definitions:
Module = "Format A: Fixpoint1" 0x10,0x50,0x20,0x60
EndModule
Module = "Format B: Floating point" 0x10,0xD1,0x20,0xE1
EndModule
Module = "Format C: 2 x Fixpoint1" 0x10,0x50,0x50,0x20,0x60,0x60
EndModule
Module = "Format D: 2 x Floating point" 0x10,0xD1,0xD1,0x20,0xE1,0xE1
EndModule
Module = "Format E: 3 x Fixpoint1" 0x10,0x50,0x50,0x50,0x20,0x60,0x60,0x60
EndModule
Module = "Format F: 3 x Floating point" 0x10,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1
EndModule
```

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug PROFIBUS
4 Configuration interface (service) for PC connection





General description:
The connection of KFM devices to the PROFIBUS DP is realised by the external bus adapter 99spde, which is configured to the requested transmission data e.g. actual value, setpoint. The PROFIBUS interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits). The PROFIBUS-DP interface is carried out as RS 485 bus interface referring to EN50170. The PROFIBUS adapter has to be connected via a 9-pole D-SUB plug directly to the bus wiring. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. For the data transmission data modules for fixed and floating point operation are available. The baudrate is detected automatically up to 12 Mbaud. Further Information refer to the GSD file in the appendix.
An error bit makes it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

Types:

99spde04.	Adapter for 4 PROFIBUS values, power supply 24V DC
99spde12.	Adapter for 12 PROFIBUS values, power supply 24V DC
99spde28.	Adapter for 28 PROFIBUS values, power supply 24V DC

Device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies
..0b	Functional module with binary input 24V DC; terminal open: normal function / read and write possible, terminal closed: read only

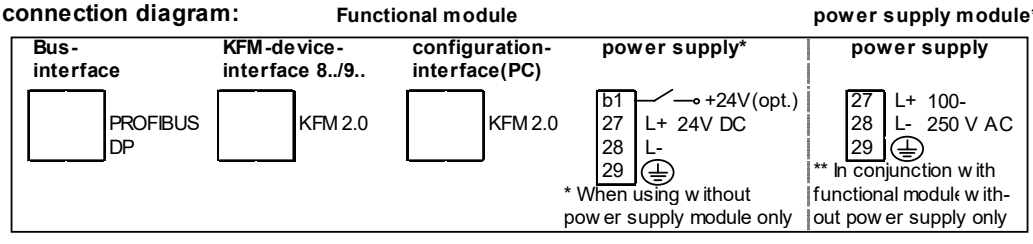
Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments except from the bus address, can easily be modified by a configuration program (WinPKS PC Software from version 1.9L).

		factory setting
Data word 1	Bus setpoint 1 (1060 ref. to protocoll KFM 2.0)	Bus setpoint 1
Data word 2	Actual value 1 (1010 " " ")	Actual value 1
Data word 3	Actual value 2* (1011 " " ")	
Data word 4	Control signal* (1020 " " ")	
	for further parameter codes refer to page 5 and 6	
	** = depending on type*	
Bus address	0..99, Coding switch, available after removing the covering below the power supply terminals	5
	Hint: In case of multiple bus participants different addresses have to be adjusted !	

connection diagram:



Installation note:

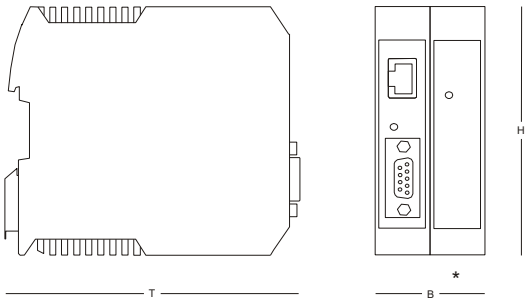
The modules must be locked on the designated mounting rail one after the other and then **pushed together**. The plug connectors connect the individual modules. Before removal, the modules must be **shifted apart** one after the other.

Commissioning:

Set the desired double-digit profibus-address by use of the two coding switches (available after removing the covering below the power supply terminals). Different addresses have to be configured on multiple adapters. Connect Profibus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.The LED on the front signalises the operating status:

yellow permanent*:	Normal operation
yellow flashing*:	Communication error between KFM device and PROFIBUS-DP adapter Hint: all transmitted values are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error PROFIBUS DP, PROFIBUS DP not active Hint: all transmitted values are set to “0“, the respective fault memory will be increased by 1.
red yellow* flashing:	Communication error PROFIBUS DP and KFM device Hint: all transmitted values are set to “0“, each fault memory will be increased by 1. *= alternative green, depending on version

Installation dimensions:

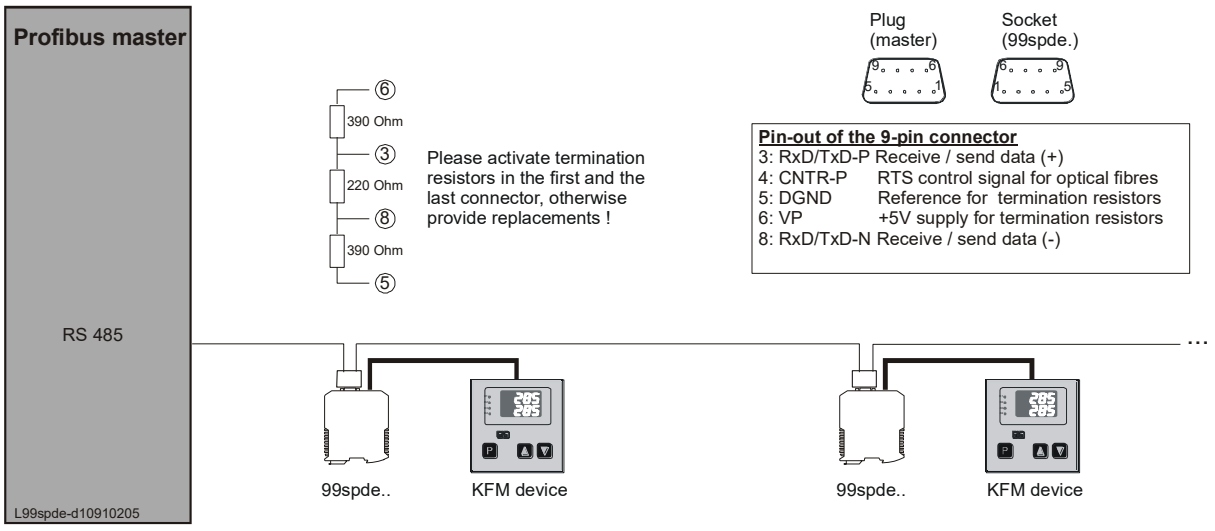


H= 99mm,
* version with or witout power supply module:
B = 22,5mm or 45mm, T = 116mm

Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA,
alternative 100-250V AC, about 12 VA

Wiring example:



Data transmission:
The data to be transmitted are compiled in modules, data transmission is cyclical.
One module each is provided for fixed decimal and floating decimal data transmission. The modules are selected via a configuration tool in the master assembly.

The different modules differ in the number of transmission values according to the following table. Control word 2, status word 2, status word 3 or transmit resp. receive values are configurable via WinPKS-PC-software for data transmission.

module	transmission mode	number of transmission values*
Format O	fixed decimal (fix point)	4
Format P	floating decimal (floating point)	4
Format K	fixed decimal (fix point)	12
Format L	floating decimal (floating point)	12
Format M	fixed decimal (fix point)	28
Format N	floating decimal (floating point)	28

The data frame always contains control- and status word 1. Furthermore, the structures for control word 2, status word 2 and 3 as well as the resp. number of transmission values are available in the data frames K to P for each KFM-device. Depending on configuration, the resp. values are transmitted in these structures. In the older data frames A to H, the structures for control word 2, status word 2 and 3 are not available.

Data modules (fixed decimal / floating decimal):
Refer to the following table for construction of the data modules:
The transmit- and receive values of the fixed decimal data modules are displayed in the 16-bit fixed decimal - format with one decimal place (Fixpoint 1). Range of values: -999.9 to +3200.0

The transmit- and receive values of the *floating decimal data-modules* are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

The digital 8 bit modules (digital-SERin / SERout / module software, code 6210..19 resp. 6230..39) are transferred with values from 0..255.

	Read	**Value**
No	**Identification**	**Format fix.-/ float. dec.**
1	Status word 1 (1byte) #	0x10
2	Status word 2(5byte) # optional	0x14
3	Status word 3(5byte) # optional	0x14
4	Received value 1	0x50/ 0xD1
5	Received value 2	0x50/ 0xD1
6	Received value 3	0x50/ 0xD1
7	Received value 4	0x50/ 0xD1
..	Received value..*	0x50/ 0xD1
	Write	**Value**
No	**Identification**	**Format fix.-/ float. dec.**
1	Control word 1 (1byte) #	0x20
2	Control word 2(5byte) # optional	0x24
3	Transmitted value 1	0x60/ 0xE1
4	Transmitted value 2	0x60/ 0xE1
5	Transmitted value 3	0x60/ 0xE1
6	Transmitted value 4	0x60/ 0xE1
..	Transmitted value..*	0x60/ 0xE1

* = Number of receive-/ transmitt values depending on the selected data frame # = structure see page 4

Example: (complies to preadjusted parameters, format: floating point)
Data word 1 = bus-setpoint (1060) (write)
Data word 2 = actual value 1 (1010) (read)
Data word 3 = actual value 2 (1011) (read)

	Read	
No	**Value**	**Explanation**
1	0000 0000	Bit 1 = 0; Bit 2 = 0 measurements error-free
2	-	-
3	-	-
4	0x43 75 99 9A	actual value 1 = 245.6
5	0x43 46 19 9A	actual value 2 = 198.1
6	-	-
..	-	-

	Write	
No	**Value**	**Explanation**
1	0000 0001	Bit 1 = 1 bus-setpoint active
2	-	-
3	0x42 C8 00 00	bus-setpoint = 100.0
4	-	-
5	-	-
..	-	-

format of status and control words

read: (from KFM device)

status word 1 (8 ASCII-characters, generally existent)

char. 8	char. 7	char. 6	char. 5	char. 4	char. 3	char. 2	char. 1

ASCII- character 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
ASCII- character 8: status KFM-device-interface, 1 = normal operation, 0 = conn. error

status word 2 (0 - 40 ASCII-characters depending on existing binary inputs, only available if code 1002 (*for devices 9..*) is configured)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

ASCII-character 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

alternative:

status word 2 (10 ASCII-characters, only available if code 1005 (*for devices 8..*) is configured)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (0 - 40 ASCII-characters depending on existing additional contacts, only available if code 1005 is configured)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

ASCII-character 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (2 ASCII-characters, generally existent)

character 2				character 1			
bit 4	bit 3	bit 2	bit 1	bit 8	bit 7	bit 6	bit 5

bit 1 .. 4: control bus-setpoint 1 .. 4 (only series 902 / 93)
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (10 ASCII-characters, only available if code 1005 is configured)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = contact deactivated; 1 = contact activated

Diagnose:

Two resettable internal fault memorys are available for communication error analysis on the profibus- and KFM-service-interface. The number of communication faults is recorded by code 5281(communication fault to the profibus), 5282 (communication fault to the KFM-device). Both counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

Configuration level: (Usable parameter depending on the type, consider potential mutual interference !)

display	purpose	value range	CODE (HEX)
ConF	type of controller		013C
Cod1	code number	0...9999	0142
Cod2	code 2..4	0...9999	0161..63
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F
YE	switch-over SPE / YE	0=SPE,1=YE	114E
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D
REL_	switch.behaviour of step 1,step contr.	0=stat, 1=rel	1144
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A
(1) TE	switch-on delay per step, step controller	0...600	1(1)43
Cy"	cycle time	2...120	013D
(1) TP	pause time step controller	0...60	1(1)45
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C
dSLo	valve drop. minimum	0...50	1122
out	limitation selection (min / max)	0=Lo, 1=Hi	1127
dSHi	valve drop. maximum	50...100	1123
(1) ib	integration range limit channel 1	0...100	1(1)40
(1)YLo	low limit control output	0...Yhi	1(1)38
(1)YHl	limitation control output	-100...100	1(1)41
(1)YHi	high limit control output	YLo...100	1(1)39
(1) TY	control output slope	0...100	1(1)42
(1) DB	damping range	0...100	1(1)25
(1) D"	damping value	0...100	1(1)26
Gr1..2	gradient 1..2	0...100	1132..33
rF1..2	waiting window value 1..2	0.1...999.9	1134..35
td	dead range	0.0...10.0	113D
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F
(1)YAP	operating point	YLO...Yhi	1(1)37
YH	switch over control val. on / off	0=off,1=on	1148
YH	external control value	0...100	1149
d.SP	max. deviation actual value	0.1...200.0	0147
t"	tolerance period act.value (ser. interface)	1...100	014E
rEL1..8	function selection additional contact 1..8	0=LCA, 1=LCE, 2=SuA, 3=SuE, 4=SoA, 5=SoE, 6=StA, 7=USA, 8=USE, 11=OFF, 12=ON	2010..17
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F
Adr	controller address	1...255	0141
BAUD	baud rate	0=9600, 1=19200, 2=38400	2629
anSERin	analog input value (via interface)	-10000..10000	6200..09
digSERin	8-bit digital input value (via interface)	00 .. FF hex e.g. 0..255	6210..19
anSERout	analog output value (via interface)	-10000..10000	6220..29
digSERout	8-bit digital output value (via interface)	00 .. FF hex e.g. 0..255	6230..39

Operating indication:

display	purpose	value range	CODE (HEX)
-	status- / control words 1..5		1001..05
-	status word type 821H75s.		100F
IST1	actual value 1..6		1010..15
Y(1)..5	controller output channel 1..5	-100...100	1020..24
Y	active controller output (e.g. 99g8.)	-100...100	102A
D.W.	difference actual value 1 – actual value 2		1052
M.W.	average actual value 1 / 2		1051
Setpoint level:			
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34
SP..	actual program step set point		3002
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C
2SP	current sequential controller set point value		103F
P-CY	number of program cycles*	0...20	0148
Pro	actual program status	0=off,1=on,2=stop	3001
d15	density	500...1500	0152
Parameter level 1:			
FUE	guide controller on/off	0=off,1=on	014D
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F
Parameter level 2(Usable parameters depending on the type, consider potential mutual interference !)			
Unit	display unit °C / °F	0=°C, 1=°F	013F
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129
UNIT	viscosity	0=cst, 1=cP	0151
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A
1..6bLo	min. value range input 1..6	-999...bHi	010C..11
1..6bHi	max. value range input 1..6	blo...4000	0112..17
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C
(1..3)SHi	max. value range signal output	SLo...4000	0130..32
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128
FLo	low limit set point value guide controller	0... Fhi	1130
FHi	high limit set point value guide controller	Flo...400	1131
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d
1 Lo	low limit set point value	-999...bHi	112E
1 Hi	high limit set point value	blo...4000	112F
DT	allowed deviation actual val.(dt control)	0...400	1146
dSPL	lower display indication	0=OFF,1=SP,2=rSP,3=Y,4=°C, 5=°F,6=bar,7=%,8=Ist1,9=Ist2. .	0140
DSP1..4	indication display line 1..4	0=OFF,1=1 SP,10/11=IST1/2	0164..67
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B
Pr-S	number of program steps	0...20	0149
SP.1 .. 20	1...20. program setpoint val., program 1*	Lo...Hi	4101..14
H' 1.. 20	1...20. holding time, program 1*	0...6000	3101..14

* (transmission only with deactivated program function)

Printout GSD-file:

```
; GSD file for types 9... - 99spd
; Date : 07.04.2009
; File  : KFM_00EB.GSD
-----------------------------------------------------------------
#Profibus_DP
GSD_Revision  = 1
Vendor_Name   = "KFM"
Model_Name    = "9...-99spd"
Revision      = "Rev. 1.05"
Ident_Number  = 0x00EB
Protocol_Ident  = 0       ; DP-Gerät
Station_Type    = 0       ; Slave
FMS_supp        = 0
Hardware_Release      = "HV V1.0"
Software_Release      = "SV V1.01"
9.6_supp        = 1
19.2_supp       = 1
45.45_supp      = 1
93.75_supp      = 1
187.5_supp      = 1
500_supp        = 1
1.5M_supp       = 1
3M_supp                 = 1
6M_supp                 = 1
12M_supp        = 1
MaxTsdr_9.6     = 60
MaxTsdr_19.2    = 60
MaxTsdr_45.45 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500     = 100
MaxTsdr_1.5M  = 150
MaxTsdr_3M      = 250
MaxTsdr_6M      = 450
MaxTsdr_12M   = 800
Implementation = "SPC3"
Bitmap_Device = "KFM_9"
Redundancy      = 0
Repeater_Ctrl_Sig       = 2
; Slave-Specification:
Slave_Family    = 5       ; Controllers
24V_Pins        = 0
Freeze_Mode_supp      = 1
Sync_Mode_supp        = 1
Auto_Baud_supp        = 1
Set_Slave_Add_supp    = 0
Min_Slave_Intervall     = 0x0032
Modular_Station         = 1
Max_Module      = 0x01
Max_Input_Len = 128
Max_Output_Len          = 128
Max_Data_Len = 256
Max_Diag_Data_Len     = 64
```

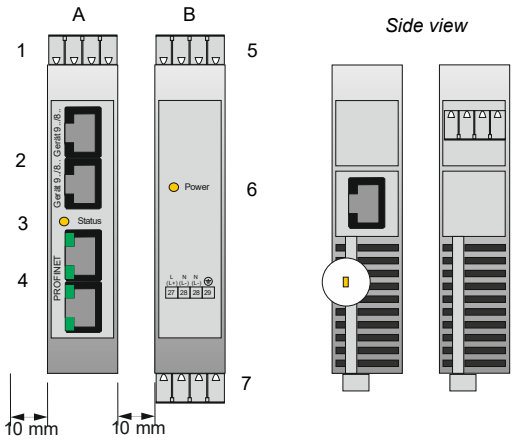
Continued on page 8 !

Printout GSD-file (continued from page 7):

```
; Module-Definitions:
Module = "Format A: Fixpoint1" 0x10,0x50,0x20,0x60
EndModule
Module = "Format B: Floating point" 0x10,0xD1,0x20,0xE1
EndModule
Module = "Format C: 2 x Fixpoint1" 0x10,0x50,0x50,0x20,0x60,0x60
EndModule
Module = "Format D: 2 x Floating point" 0x10,0xD1,0xD1,0x20,0xE1,0xE1
EndModule
Module = "Format E: 3 x Fixpoint1" 0x10,0x50,0x50,0x50,0x20,0x60,0x60,0x60
EndModule
Module = "Format F: 3 x Floating point" 0x10,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1
EndModule
Module = "Format G: 3/16 x Fixpoint1"
0x10,0x10,0x50,0x50,0x50,0x20,0x20,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x6
0,0x60,0x60,0x60
EndModule
Module = "Format H: 3/16 x Floating point"
0x10,0x10,0xD1,0xD1,0xD1,0x20,0x20,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1
,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format I: 4 x Fixpoint1" 0x10,0x50,0x50,0x50,0x50,0x20,0x60,0x60,0x60,0x60
EndModule
Module = "Format J: 4 x Floating point" 0x10,0xD1,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format K: 99spde12 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x6
0,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60
EndModule
Module = "Format L: 99spde12 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE
1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format M: 99spde28 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x5
0,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x60,0x60,0x60,0x60,0
x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60
,0x60,0x60
EndModule
Module = "Format N: 99spde28 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x
D1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE1,0xE1,0xE1,
0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE
1,0xE1,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format O: 99spde04 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x60,0x60
EndModule
Module = "Format P: 99spde04 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE1,0xE1,0xE1
EndModule
```

1 Terminals power supply voltage. 99spne..
2 RJ-45 device- connectors series 9../8..
3 Status LED bus adapter
4 RJ-45 connector PROFINET
5 Output voltage power supply module*
6 Power LED*
7 Terminals power supply voltage 99e500n*
8 Configuration interface (service) for PC connection
9 DCP- signal- service LED (Visible through the air vents)

A Profinet Adapter (99spne..)
B Power supply module* (99e500n)
*With supply 100-250V AC only



Note: Provide 10mm space on both sides for ventilation.

General description:
The PROFINET interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The connection of devices series 9../8.. to the PROFINET-IO is realised by the intelligent bus adapter 99spne... The bus adapter is configured to the addresses of 1 or 2 connected devices series 9.. or 8.. and the requested transmission data each e.g. actual value, setpoint and status word. The communication between the adapter and the service interface of the device / devices takes place by patch cables(1,5m), which are delivered with each adapter.

The PROFINET -connection is carried out as a standard-ethernet-interface (10 Base-T / 100 Base-TX; Baudrate: 10/100 MBit/s) in accordance with IEEE 802.3 and is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors. A DCP signal service LED is available for visual localization of the device in the field.

Data modules for floating point operation are available for the data transmission, GSDML- files in the XML-format are enclosed. Error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory. GSDML files in XML format are included, alternatively the files can be downloaded from the KFM website.

Depending on version PLC data blocks are available for the data transmission. A repository (file extension .zap15_1) is included, alternatively the file can be downloaded from the KFM website.

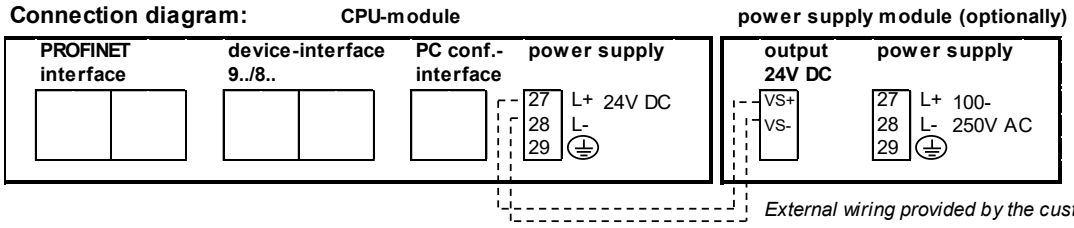
Types:

99spne408	Adapter for 12 PROFINET values, pow. supply 24V DC, two device connectors for series 9../8.. (4 binary-, 8 analogue values, also status- / control word)
99spne820	Adapter for 28 PROFINET values, pow. supply 24V DC, two device connectors for series 9../8.. (8 binary-, 20 analogue values, also status- / control word)

Power supply module (for supply of type 99spne.. optionally):

99e500n	Power supply module 100-250V AC

Connection diagram:



Adjustments:
The PROFINET- adapter is delivered preadjusted:

IP-address: 192.168.1.254 / device name: kfm99spne / MAC- address
Normally, the IP-address is managed dynamically by the Profinet-master.
In case of permanent changes to the IP-address or the device name, the preadjustments can easily be modificated with the supplied pc- configuration program EthDevCon.msi (Ethernet Device Configuration Tool) using the PROFINET- interface.
The MAC- address is readable on the type plate.

Transmission data: In accordance to the example from page 4 or custom specific.
In case of changes to the transmission data (for example actual-, setpoint value and status word) *the adjustments can easily be modificated with a configuration program* in the PKS -PC-software (from version 2.02.78) using the configuration interface (service).

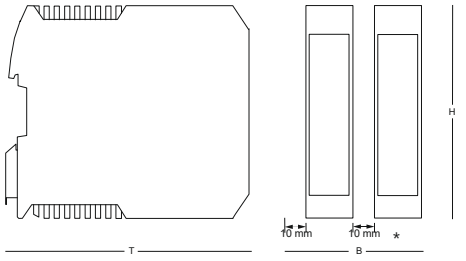
Commissioning:
The enclosed patch cable (1,5m) has to be connected with the service- interface of the device series 9../8.. and the RJ-45 connector "9../8.." of the bus adapter. The profinet connection takes place in- and optional output sided arbitrary at the ethernet- connectors.

The LEDs signalise the operating status:

LED	display	meaning
PROFINET-adapter, LED "status"	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between device 9../8.. and bus adapter
	red flashing	*Communication error* between bus adapter and profinet
	red yellow flashing	*Communication error* between device 9../8.. and bus adapter as well as between bus adapter and profinet
	red permanent	*Fault* when loading the parameter, please send the device for repair
PROFINET-adapter, LED "DCP-service"	off	*Normal operation*
(Visible behind the air vents)	yellow flashing (1Hz, 3 seconds)	*DCP signal service is triggered via the bus.*
Power supply module, power LED	yellow permanent	*Power supply connected to the power supply module*

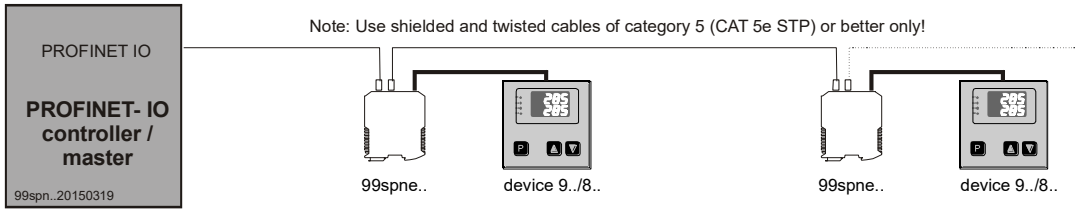
Technical data:
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply:, 24V DC about 12 VA,
alternative 100-250V AC, about 12 VA

Installation dimensions:



H= 99mm,* Version without or with power module:
B= 22,5mm(+ 10mm ventilation on both sides) or
45mm(+ 10mm ventilation on both sides),T=116mm

Wiring example :



Data transmission:

The data to be transmitted are compiled in modules, data transmission is cyclical.
Modules are provided for floating decimal data transmission. The modules are selected via a configuration tool in the master assembly.

The different modules differ in the number of transmission values according to the following table. Control word 2, status word 2, status word 3 or transmit resp. receive values are configurable via WinPKS-PC-software for data transmission.

GSDML-file*	transmission mode	number of transmission values*
GSDML-<*version*>-KFM-99spne408-820-<*Date*>.xml	binary + floating point	12 (4 binary + 8 floating point) or 28 (8 binary + 20 floating point)

The data frame always contains control- and status word 1. Furthermore, the structures for control word 2, status word 2 and 3 as well as the resp. number of transmission values are available. Depending on device and configuration, the resp. values are transmitted in these structures.

**= The name of a GSDML file follows the following scheme:*
GSDML-<version> <manufacturer> <device name> <date>.xml

<version> actual version: for example: "V2.3" <manufacturer> "KFM" <device name> for example: "99spne408-820"<date> consisting of <year(JJJJ) month(MM) day(TT)> for example: "20160106"

Structure data modules (99spne408 / 99spne820):

The transmit and receive values of the binary data modules are displayed as 8-bit values. Wertebereich 0 ..FF hex. The transmit- and receive values of the *floating decimal data-modules* are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

99spne408

	Read	
Byte	**Identification**	**Device**
n+0	Status word 1 (1Byte)*	Device 1
n+1	Status word 1 (1Byte)*	Device 2
n+2	dig. receiv. value 1 (1Byte)	Device 1/2
n+3	dig. receiv. value 2	Device 1/2
n+4	dig. receiv. value 3	Device 1/2
n+5	dig. receiv. value 4	Device 1/2
n+6..10	Status word 2 (5Byte)*	Device 1
n+11..15	Status word 2 (5Byte)*	Device 2
n+16..20	Status word 3 (5Byte)*	Device 1
n+21..25	Status word 3 (5Byte)*	Device 2
n+26..29	ana. receiv. value 1(4Byte)	Device 1/2
n+30..33	ana. receiv. value 2	Device 1/2
n+..	ana. receiv. value..	Device 1/2
n+54..57	ana. receiv. value 8	Device 1/2

	Write	
Byte	**Identification**	**Device**
n+0	Control word 1 (1Byte)*	Device 1
n+1	Control word 1 (1Byte)*	Device 2
n+2	dig. Trans. value 1(1Byte)*	Device 1/2
n+3	dig. Trans. value 2	Device 1/2
n+4	dig. Trans. value 3	Device 1/2
n+5	dig. Trans. value 4	Device 1/2
n+6..10	Control word 2 (5Byte)*	Device 1
n+11..15	Control word 2 (5Byte)*	Device 2
n+16..19	ana. trans. value 1(4Byte)	Device 1/2
n+20..23	ana. trans. value 2	Device 1/2
n+..	ana. trans. value..	Device 1/2
n+44..47	ana. trans. value 8	Device 1/2

99spne820

	Read	
Byte	**Identification**	**Device**
n+0	Status word 1 (1Byte)*	Device 1
n+1	Status word 1 (1Byte)*	Device 2
n+2	dig. receiv. value 1 (1Byte)	Device 1/2
n+3	dig. receiv. value 2	Device 1/2
n+..	dig. receiv. value..	Device 1/2
n+9	dig. receiv. value 8	Device 1/2
n+10..14	Status word 2 (5Byte)*	Device 1
n+15..19	Status word 2 (5Byte)*	Device 2
n+20..24	Status word 3 (5Byte)*	Device 1
n+25..29	Status word 3 (5Byte)*	Device 2
n+30..33	ana. receiv. value 1(4Byte)	Device 1/2
n+34..37	ana. receiv. value 2	Device 1/2
n+..	ana. receiv. value..	Device 1/2
106..109	ana. receiv. value 20	Device 1/2

	Write	
Byte	**Identification**	
n+0	Control word 1 (1Byte)*	Device 1
n+1	Control word 1 (1Byte)*	Device 2
n+2	dig. Trans. value 1(1Byte)	Device 1/2
n+3	dig. Trans. value 2	Device 1/2
n+..	dig. Trans. value..	Device 1/2
n+9	dig. Trans. value 8	Device 1/2
n+10..14	Control word 2 (5Byte)*	Device 1
n+15..19	Control word 2 (5Byte)*	Device 2.
n+20..23	ana. trans. value 1 (4Byte)	Device 1/2
n+24..27	ana. trans. value 2	Device 1/2
n+..	ana. trans. value..	Device 1/2
94..97	ana. trans. value 20	Device 1/2

**= Structure see last page*

Example, single controller: (equal to the preadjusted parameters)
device 1 = address 5
device 2 = address 0

READ

received value 1 from address 5, controller 9..	*actual value 1*	(parameter 1010)
received value 2 from address 5, controller 9..	*actual value 2*	(parameter 1011)

WRITE

transmit. value 1 to address 5, controller 9..	*bus-setpoint*	(parameter 1060)

	read		
Byte	**Value**	**Device**	**Explanation**
n+0	1000 0000	device 1	Bit 1, 2... = 0 Measurements error-free Bit 8 = 1 Interface normal operation
n+1	0000 0000	device 2	-
n+2	0x00	device 1	-
n+3	0x00	device 1	-
n+4	0x00	device 1	-
n+5	0x00	device 1	-
n+6..10	0x00 00 00 00 00	device 1	-
n+11..15	0x00 00 00 00 00	device 2	-
n+16..20	0x00 00 00 00 00	device 1	-
n+21..25	0x00 00 00 00 00	device 2	-
n+26..29	0x43 75 99 9A	device 1	actual value 1 = 245.6
n+30..33	0x43 46 19 9A	device 1	actual value 2 = 198.1

	Write		
Byte	**Value**	**Device**	**Explanation**
n+0	0000 0001	device 1	Bit 1 = 1 Bus-setpoint value aktive
n+1	0000 0000	device 2	-
n+2	0x00	device 1	-
n+3	0x00	device 1	-
n+4	0x00	device 1	-
n+5	0x00	device 1	-
n+6..10	0x00 00 00 00 00	device 1	-
n+11..15	0x00 00 00 00 00	device 2	-
n+16..19	0x43 96 00 00	device 1	Bus- setpoint value = 300.0

format of status and control words

read: (from Profinet adapter)

status word 1 (*1 byte*, generally existent)

bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1

bit 1..7: status measuring inputs 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
bit 8: status device-interface, 1 = normal operation, 0 = conn. error

status word 2 (*5 byte*, only available if code 100F (*for devices 8..*) or code 1002 (*for device 82.. and 9..*) is configured)

byte 5				..	..	..	..	byte 1			
bit 40	..	bit34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1 .. 40: status binary inputs 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (*5 byte*, only available if code 1005 is configured)

byte 5				..	..	..	..	byte 1			
bit 40	..	bit34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to Profinet adapter)

control word 1 (*1 byte*, generally existent)

bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1

bit 1 .. 4: control bus-setpoint 1 .. 4 (only series 902 / 93)
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (*5 byte*, only available if code 1005 is configured)

byte 5				..	..	..	..	byte 1			
bit 40	..	bit 34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = deactivate contact
1 = activate contact

Diagnosis:

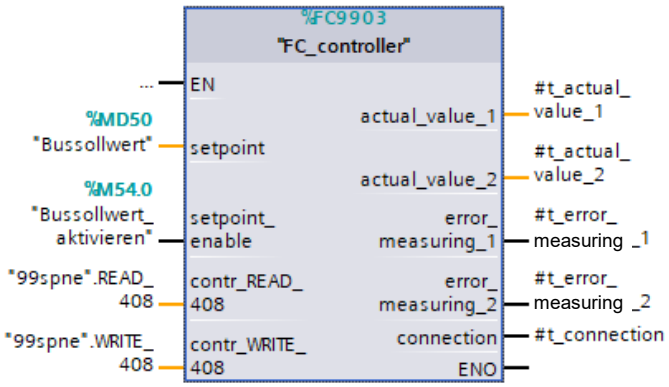
Three resettable internal fault memorys are available for communication error analysis on the Profinet- and service-interface. The number of communication faults is recorded by code 5281(communication fault to the Profinet), 5282 (communication fault to the device 1 / controller 9..) and 5283 (communication fault to the device 2 / malfunction device, control 8..). All counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

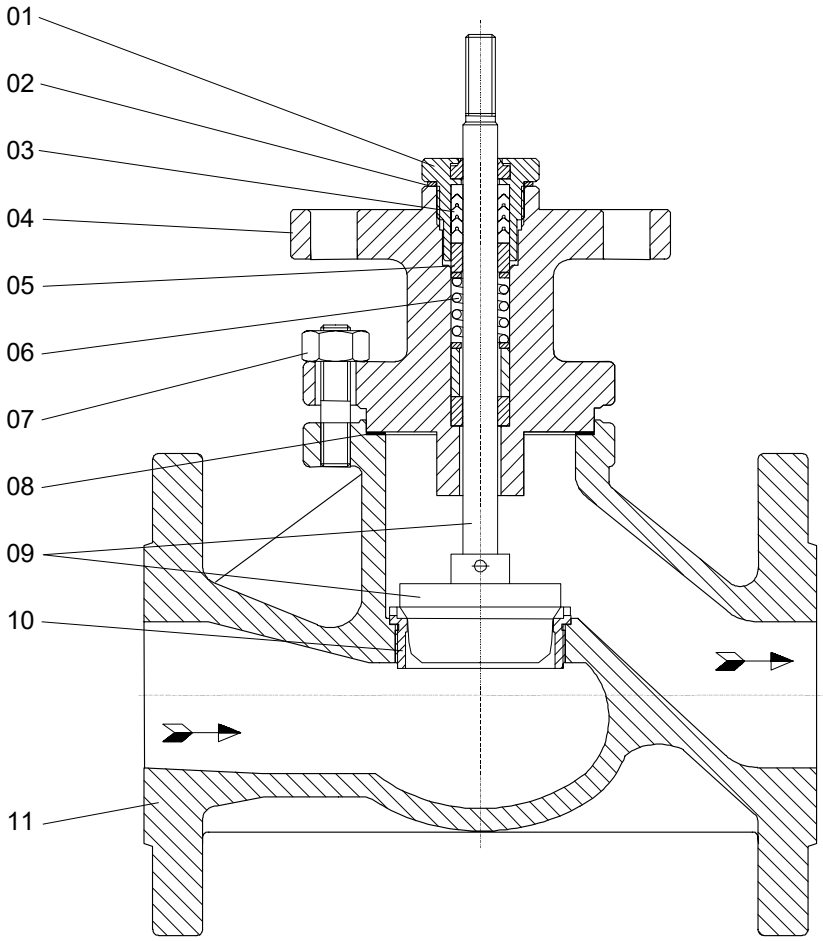
PLC program blocks

Depending on the version, data blocks are prepared for the transmission data in the PLC. A project archive (file extension .zap15_1) is included, alternatively the file can be downloaded from the KFM website.

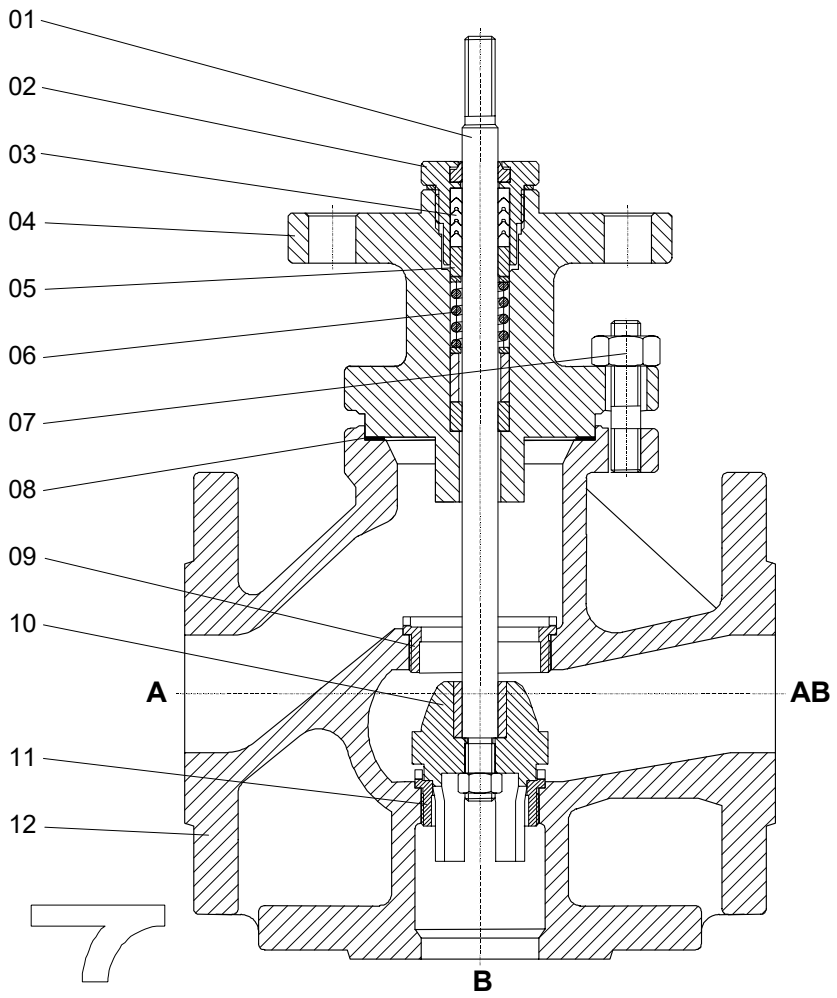
Program block	*Brief description*
FC_99spne408	For complete readout of the Profinet adapter type 99spne408
FC_99spne820	For complete readout of the Profinet adapter type 99spne820
FC_controller	Standard module for single controllers for reading actual value 1, actual value 2 and writing the bus setpoint (corresponds to factory setting, type 99spne408 and 99spne820). See example.
FC_DCS4	Custom specific block
FC_DCS5	Custom specific block
FC_DIG_RECEP	Read digital received values according to input configuration (type 99spne408)
FC_R_STW_DIG	Read status word 2 and 3 according to input configuration (type 99spne408)
FC_W_STW2_REL	Set relay according to input configuration (type 99spne408)

Example: FC_controller: (corresponds to factory setting of single controller, type 99spne408 and 99spne820)

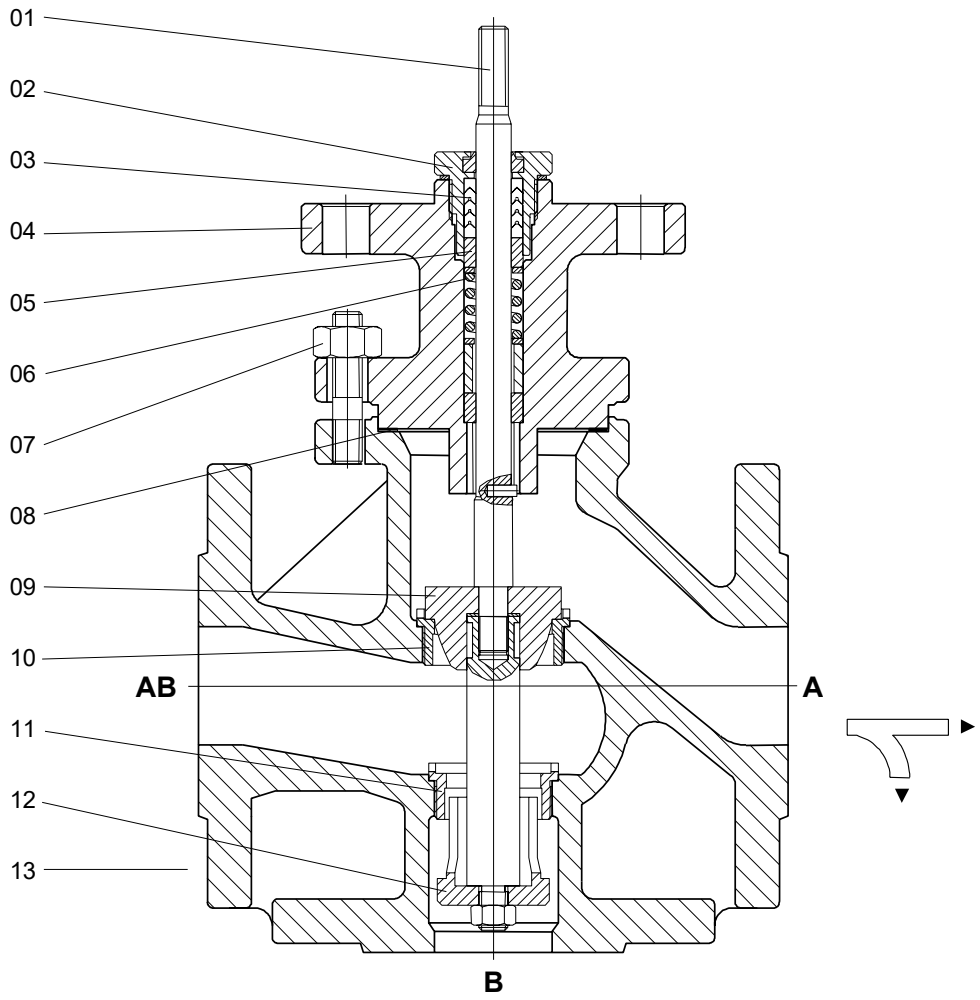




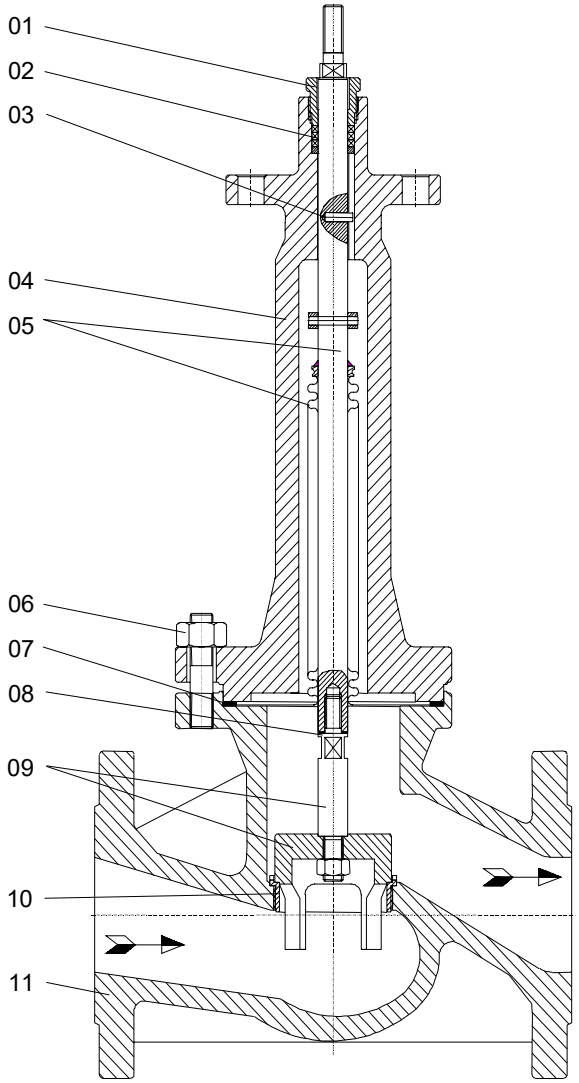
No.	Designation
01	Screw joint with scaper
02	Screw joint gasket
03	V-rings
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Cover gasket
09	Plug with spindle
10	Seat ring
11	Valve body



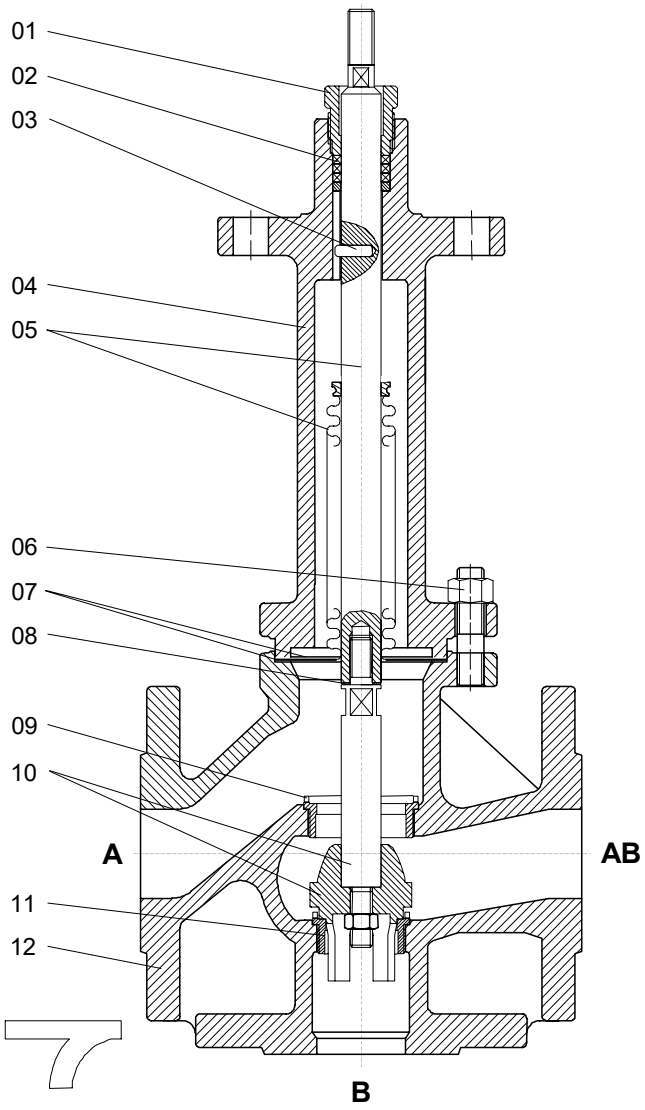
No.	Designation
01	Spindle
02	Screw joint with scaper
03	V-rings
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Cover gasket
09	Upper seat ring
10	Plug
11	Lower seat ring
12	Valve body



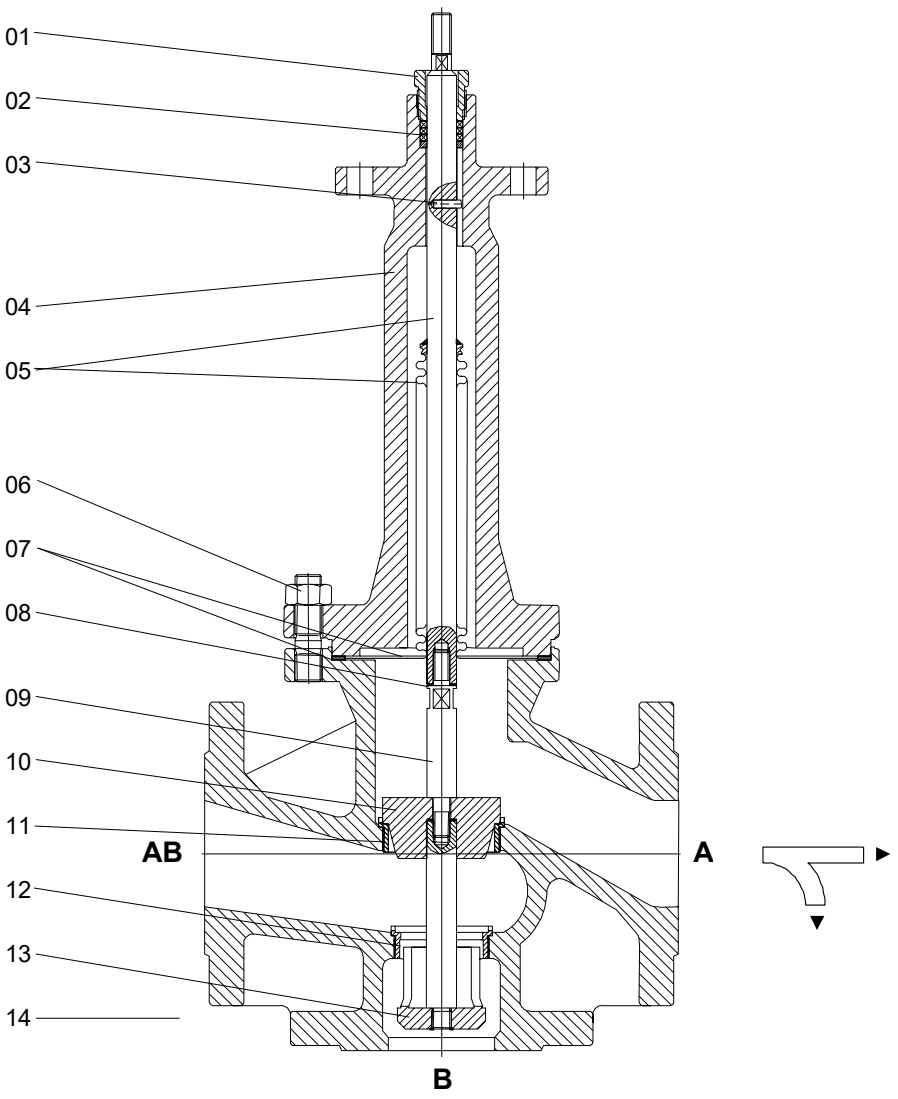
No.	Designation
01	Spindle
02	Screw joint with scaper
03	V-ring-unit
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Cover gasket
09	Upper plug
10	Upper seat ring
11	Lower seat ring
12	Lower plug with spindle
13	Valve body complete



No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Cover gasket
08	Lock washer
09	Lower spindle with plug
10	Seat ring
11	Valve body



No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Cover gasket
08	Lock washer
09	Upper seat ring
10	Lower spindle with plug
11	Lower seat ring
12	Valve body



No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Cover gasket
08	Lock washer
09	Spindle middle part
10	Upper plug
11	Upper seat ring
12	Lower seat ring
13	Lower plug with spindle
14	Valve body complete

Terms and conditions of sale and delivery

1. General

The following terms and conditions of sale and delivery apply to all deliveries and services provided by KFM Regelungstechnik GmbH (hereinafter “KFM”).

Every order requires written confirmation by KFM.

These terms and conditions of sale and delivery also apply to all future contractual relationships with the respective customer without them being expressly agreed again.

Any deviating contractual terms and conditions of the customer shall not apply to the business relationship, even if KFM has not expressly contradicted to them.

2. Offer

All offers by KFM are based on these terms of sale and delivery. Offers are always non-binding. An order is only considered accepted when it is confirmed in writing by KFM.

All agreements between KFM and the customer are part of the offer and the written order confirmation. The documents included in the offer, such as illustrations, drawings and weight information, are only approximate, unless KFM expressly designates such information as binding. Changes to the content of the contract at the request of the customer require subsequent written confirmation by KFM.

The contract is concluded subject to the suspensive condition of a successful credit check of the purchaser/positive confirmation from our trade credit insurer.

3. Prices

Prices are ex works, excluding packaging, uninsured, plus VAT at the applicable statutory rate.

4. Payment

Payments are to be made without deduction as follows:

a) For an order volume up to €10,000.00 net: 14 days net

b) For an order volume of over €10,000.00:
- 30% of the order amount after sending of the order confirmation
- 30% upon notification of readiness for dispatch,
- the remaining balance within 14 days net after delivery

International orders are generally only processed against advance payment.

KFM reserves the right to agree on different payment terms with the customer and, if necessary, to request advance payments or installment payments in individual cases.

The customer can only offset or exercise a right of retention if the counterclaims asserted have been legally established, recognized by KFM or are undisputed. In addition, the customer can generally only assert a right of retention if the counterclaim arises from the same contractual relationship.

If the goods are initially placed in storage for reasons for which KFM is not responsible, the day of completion shall be deemed to be the day of dispatch.

If the payment deadline is exceeded, KFM will charge interest at a rate of 8 percentage points above the applicable base interest rate (Section 247 of the German Civil Code). KFM's ability to prove higher damages caused by the delay remains unaffected.

5. Delivery time

The information about delivery and assembly times that are not expressly agreed as binding are purely non-binding information. The delivery period begins with the acceptance of the order by sending the order confirmation and fulfillment of all preliminary services and cooperation obligations of the customer with regard to documents to be delivered and, if necessary, transmission of further required information, subject to any agreed advance payment services.
If the customer fails to comply with his obligation to cooperate or only does so with delay, the delivery period will not be started or will be extended by the duration of the delay for which the customer is responsible.

In cases of force majeure, KFM is released from its obligation to perform within the framework of the underlying contractual obligation for the duration and to the extent of the hindrance from the time at which the force majeure event prevents the performance of the contractual service. The same applies to KFM's liability for compensation for damages or satisfaction of other claims of the customer due to breach of contract.

Contractually agreed delivery periods shall be extended appropriately, taking into account the event of force majeure.

Force majeure particularly occurs in the event of strikes, lockouts, natural disasters, war, riots, as well as epidemics and pandemics.

KFM will inform the customer immediately about the occurrence of a force majeure event; the same applies to the time at which a corresponding event ceases to exist.

6. Transfer of risk and shipping

The risk passes to the customer as soon as the goods have left the factory. This also applies if KFM has to provide additional assembly services.

If the dispatch or delivery of the goods is delayed due to circumstances for which the customer is responsible, the risk shall pass to the customer at the time KFM notifies the customer that the goods are ready for dispatch.

7. Retention of title

KFM reserves title to the delivery item until all current and future claims arising from the underlying delivery contract and from ongoing business relationships have been settled in full.

As long as the retention of title exists, the customer may neither pledge the goods nor assign them as security.

The customer is not entitled to assign his claims to third parties. He is entitled to sell the delivery item to a third party within the scope of proper business operations. In this case, the customer hereby assigns his claim from the sales contract to KFM until all payments from the customer from the contract and the ongoing business relationship have been received. If the delivered items are combined with other movable items or if processing takes place, the customer hereby assigns his claims from this to KFM, including any co-ownership of the new item in the ratio of the acquisition value of the reserved goods and the other item connected to them at the time of processing. The processing or combination of the reserved goods by the customer takes place exclusively for KFM.

The Purchaser shall immediately notify KFM of any attachments, confiscations or other dispositions by third parties with regard to the delivery item delivered under retention of title.

If the customer breaches the contract, particularly in the event of late payment, the customer is obliged, after KFM has withdrawn from the contract, to return the delivery item delivered under retention of title to KFM. In this case, KFM has the right to either request the customer to deliver the delivery item to KFM's place of business at its own risk and expense or, if KFM has unhindered access to the delivery item, to collect the delivery item and, if necessary, dismantle it.

8. Warranty

The customer is obliged to examine the delivery item immediately and to report any defects in the delivery item to KFM immediately. In the case of a hidden defect, the customer must report the defect immediately after it is discovered. If the customer fails to comply with his obligation to examine and report the defect, the delivery item is deemed to have been approved and the customer loses his warranty claim with regard to any defects in this regard.
In the event of justified warranty claims being asserted, KFM is entitled, at its own discretion, to repair the delivery item or to make a new delivery.

The warranty period is generally 24 months from delivery. The warranty period is reduced to 12 months, calculated from the time of commissioning, as soon as the delivery item is further processed in the customer's business operations. If the delivery item is used in shift operations as a result of commissioning, the warranty period is reduced to 6 months from commissioning.

The purchaser's warranty claims expire if defects in the delivery item arise due to modifications, improper use or handling, excessive stress or natural wear. The same applies to improper maintenance, unsuitable operating materials and inadequate preliminary work by the purchaser. Warranty claims for valves with electric drives or electric signaling structures expire if they are used contrary to the KFM operating instructions, in particular if the connection of such fittings etc. is not carried out by an approved specialist company and the installation is not carried out in accordance with KFM's regulations and in compliance with the PTB test conditions.

9. Liability

Liability of KFM in the event of simple negligence on the part of its bodies, legal representatives, employees or other vicarious agents is excluded unless it involves a breach of essential contractual obligations.

KFM's liability is limited to foreseeable damage or to damage that was objectively foreseeable when exercising due care. Liability for damage and consequential damage resulting from defects in the delivery item only exists to the extent that damage is typically to be expected when the delivery item is used in accordance with the contract.

In the event of simple negligence, KFM's liability for damages to property and any resulting financial losses is limited to an amount of €250,000.00 per claim. This limitation of liability also applies if there is a breach of a contractual obligation.

The limitations of liability in this section (Section 9) do not apply in the case of liability for grossly negligent or intentional acts, within the framework of guarantee declarations and furthermore not in the case of injury to life, body or health.

10. Final provisions

The contractual relationship is subject exclusively to the law of the Federal Republic of Germany, excluding the UN Convention on Contracts for the International Sale of Goods (CISG).

The place of jurisdiction is – depending on the value of the matter – the District Court of Herford or the Regional Court of Bielefeld.

Should any provision of these terms and conditions of sale and delivery be or become invalid, this shall not affect the validity of the remaining provisions. The provision that is wholly or partially invalid shall be replaced by a provision that is as economically close as possible to the invalid provision.

In the event of a legal dispute, the German version of the terms and conditions of sale and delivery shall apply.