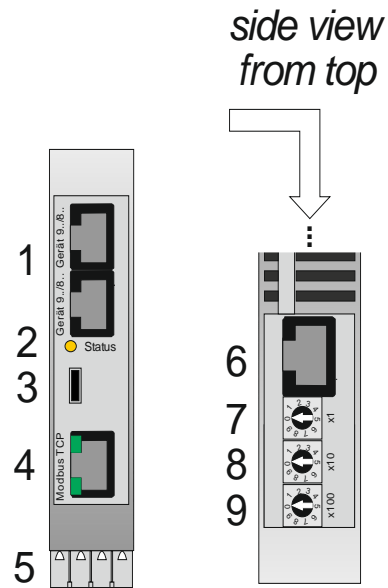


- 1 RJ-45 KFM device connectors
- 2 Status LED bus adapter
- 3 Without functions (mikro- USB connector)
- 4 RJ-45 connection Modbus TCP
- 5 Connection power supply. 24V DC
- 6 RJ-45 service- connection for PC
- 7 Coding switch IP- address adjustment x1
- 8 Coding switch IP- address adjustment x10
- 9 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.

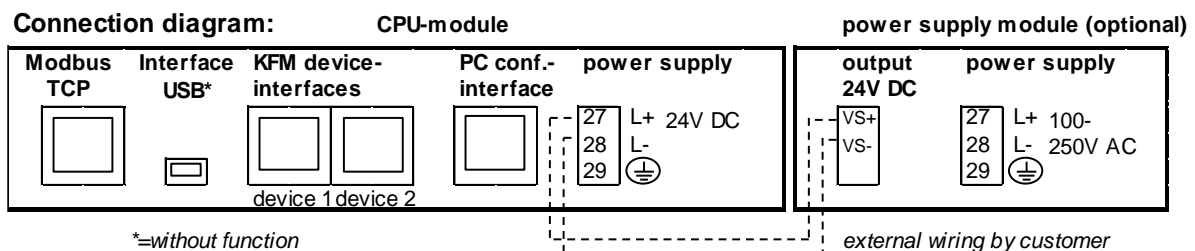
Versions:

99smt408 Adapter for 12 Modbus TCP transmission values (binary, analog values, status and control word: (99smt12) up to two device connections, power supply 24V DC

99smt820 Adapter for 28 Modbus TCP transmission values (binary, analog values, status and control word: (99smt28) up to two device connections, power supply 24V DC

Power supply module (optional for supplying type 99smt..):

99e500n power supply module 100-250V AC



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

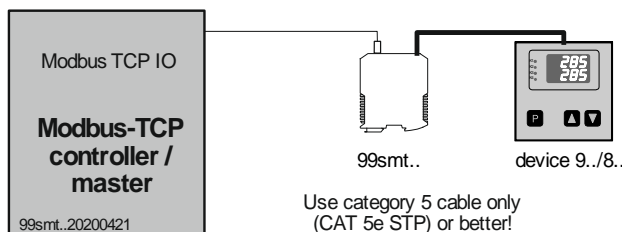
Mounting position: any; protection class: IP20 according to EN 60529

Perm. ambient temperature: 0..60°C; nominal temperature: 20°C

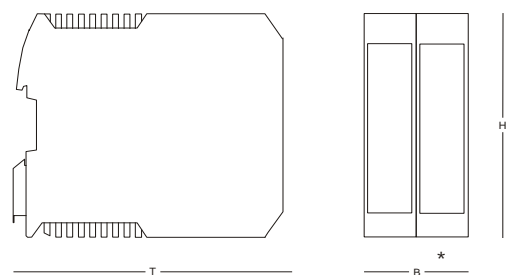
Power supply: 24V DC, approx. 12 VA, aging 100-250V AC, approx. 12 VA

Modbus interface : Ethernet 10Base-T or 100Base-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

Data transmission:

The preconfigured transmission values are updated cyclically between the bus adapter and the connected CFM device. 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.

Note: Each desired KFM parameter code (see page 4 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	Parameter code	Parameter 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 4

*** 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) see page 4

Transmission data (View from PKS- PC Software)

Example single controller: (corresponds to preset parameters)

99smt12
✕

Source: 99smt12

Label: Kunde:
Anlage:
Regler:
Ort:

Device 1, KFM adr.: 903K 903701

Device 2, KFM adr.: Off Deactivation device 2 = addr 0

IP address*: MAC adr.

Subnetmask: Port: Slave Adr.: Monitoring time, sec:

*A change in the IP address is only effective after a restart

Device	KFM Parameter	Save Address	Function	Label	Modbus values	HEX	DEC
Dev. 1	1001	10	Read, 1 Word	Input status	<input type="checkbox"/>	<input type="text" value="00"/> <input type="text" value="83"/>	
Off				###	<input type="checkbox"/>		
Dev. 1	1004	30	Write, 1 Word	Steuerwort Bus-Sollwert	<input checked="" type="checkbox"/>	<input type="text" value="00"/> <input type="text" value="00"/>	
Off				###	<input type="checkbox"/>		
Dev. 1	1060	50	Write, 2 Word	Bus-Sollwert		<input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="0.00"/>	
Dev. 1	1010	60	Read, 2 Word	Istwert 1		<input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="0.00"/>	
Dev. 1	1011	70	Read, 2 Word	Istwert 2		<input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="00"/> <input type="text" value="0.00"/>	
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			
Off				###			

99smt ONLINE / Modbus ONLINE

Important: A changed or loaded data set (display 99smt ONLINE, highlighted in orange) must be sent to the device with the "send" button (display 99smt ONLINE, highlighted in green) to activate and display the Modbus values.

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)

Structure of the status and control words

Read: (from adapter)

Status word 1 (1 byte, always present)

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 = Measurement is error-free; 1 = Error at the corresponding measuring input
 Bit 8: Device interface status, 1 = normal operation; 0 = connection error

Status word 2 (5 bytes, only available if code 100F (for devices 8..) or Code 1002 (configured for devices 82.. and 9..))

Byte 5				..	..	..	..	Byte 1			
Bit 40	..	Bit 34	Bit 33	..	..	..	..	Bit 8	..	Bit 2	Bit 1

Bit 1 ... 40: Status of binary inputs 1 ... 40
 0 = binary input is off; 1 = binary input is on

Status word 3 (5 bytes, 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: Status additional contact 1..40
 0 = contact is off; 1 = contact is on

Writing: (to adapter)

Control word 1 (1 byte, always present)

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 for types 902 / 93)
 0 = Bus setpoint is not active, internal setpoint (SP) is effective
 1 = Bus setpoint is active (SPB)

Control word 2 (5 bytes, 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 configured in the controller for "Bus"
 0 = Switch off contact; 1 = Switch on contact

Diagnosis:

For error analysis, three resettable internal error counters are available for recording connection errors on the fieldbus and device interfaces are available.
 Under Code 5281 (Connection error to fieldbus), 5282 (Connection error to 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.

Operating indication:

<u>display</u>	<u>purpose</u>	<u>value range</u>	<u>CODE (HEX)</u>
-	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 !)

<u>display</u>	<u>purpose</u>	<u>value range</u>	<u>CODE (HEX)</u>
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



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