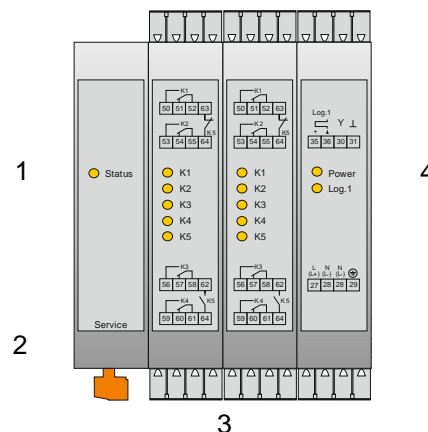


- 1 Status-LED (CPU-module)
- 2 Service interface for configuration (PC)
- 3 Relay modules
- 4 Power-LED (power supply module)



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 or 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.

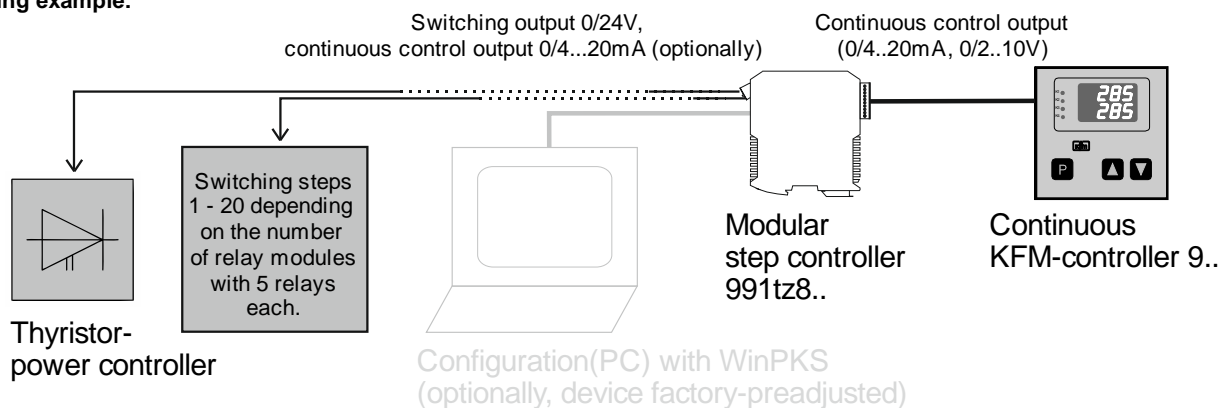
Type summary:

| | |
|-----------|----------------------------------------------------------------------------|
| 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 mm²
 - 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:

| | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| *ELo/*EHI | for voltage / current input: start / end of display range | <i>Factory setting</i> 0 / 100 |
| tE | Switch-on delay per step 1...60sec | 5sec |
| PY.. | <i>991t..p only:</i> 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 |
| <i>optional:</i> | | |
| 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 | <i>991t..z only:</i> function of the steps static ("stat") or automatic change-over of the steps ("auto") | auto |
| st.. | <i>991t..c only</i> switching step allocations to the hardware outputs (right character belongs to output1, character left to it to output 2, etc.). | St1=0001 St2=0010 St3=0011 St4=0100 St5=0101 St6=0110 St7=0111 |
| <i>A "1" means that the accordant hardware output is switched on, if the output signal is higher than the respective switching point.</i> | | |

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

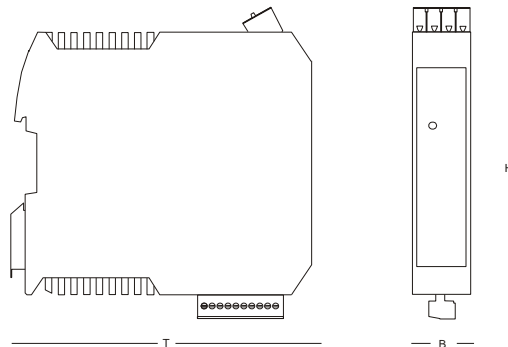
example with 5 steps:

| | 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*: | <i>Only with configuration 4..20mA/2..10V:</i> 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 between 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 between 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 between 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 \leq 500 Ω
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 \leq 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)

