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Electronic thermostat TE series

Protection to IP20 / IP40 / IP65
Version to EN 60 730

Technical description

The electronic thermostat Type TE is a temperature controller with ON/OFF action, in a housing for DIN rail or wall mounting.

The relay at the controller output switches in accordance with the temperature at the probe (process value x) and the value that has been selected as the setpoint (w).

The setpoint is selected as an analog value on a scale, by a knob on the front of the controller. The knob is fitted with an adjustable stop for restricting or limiting the range. An adjustable switching differential of the controller is a standard feature, as is zero adjustment.

Suitable probes that may be attached are platinum resistance sensors to IEC 751 (Pt100) with a positive temperature coefficient, in 2-wire or 3-wire circuit, or thermocouples (NiCr-Ni) to IEC-584-1.

The information that must be given when ordering is shown in *italics*.

General application

- HVAC technology
- Refrigeration plants
- Heating installations
- Ventilation

Type designation

TE-1wO-dl

- TE- electronic single-pole thermostat
- 1 temperature controller (TR)
setpoint adjustment by external knob
- w for use with Pt100 resistance thermometer in 2-wire circuit
- t for use with NiCr-Ni Type K thermocouple
- O break (n.c.) function (standard)
relay de-energized at $x \geq w$
- S make (n.o.) function
relay energized at $x > w$
- dl for use with Pt100 resistance thermometer in 3-wire circuit

Standard accessory

Operating Instructions B 60.5511

Extra codes

- /b3 front panel mounting
with 2 screws M3
- /r mounting rail
for wall mounting
- /ka terminal cover,
protection IP40
- /sw dust-tight and water-jet proof
housing, polycarbonate,
protection IP65

Technical data

Measurement input:
resistance thermometer, w

Control ranges

Range °C	Relay is de-energized at probe temperatures below
-50 + 30	- 85°C
-20 + 40	- 45°C
0 + 50	- 25°C
0 + 100	- 40°C
0 + 150	- 65°C
0 + 200	- 85°C
0 + 300	-130°C
0 + 400	-165°C
0 + 500	-225°C

Probe cable error

When using a 2-wire temperature probe with a cable that is different from the standard types (lead resistance $R_L = 165 \text{ m}\Omega$), there is an error of approx. 1°C per 0.39 Ω change in lead resistance. This means that if the probe cable is extended by using a 2-core copper cable, the following errors will occur:

Core cross-section	Temperature change per meter of cable
0.50 mm ²	0.18 °C/m
0.75 mm ²	0.12 °C/m
1.00 mm ²	0.09 °C/m
1.50 mm ²	0.06 °C/m

For 3-wire circuit, the probe cable length has no effect.



Sensing circuit monitoring

The resistance probe and the probe cable are monitored for break and short-circuit. In the event of a fault, the relay switches to the de-energized state.

Measurement input:
thermocouple, t

Control ranges

+200	+ 600°C
+400	+ 800°C
+600	+1000°C
+800	+1200°C

Sensing circuit monitoring

The thermocouple and the compensation cable are monitored for break.

Temperature compensation

provided as standard

General characteristics

Switching point accuracy

$\pm 2\%$ of range span

Switching differential

adjustable from 0.25 to 5%,
factory-set at minimum value

Zero point correction

enables the optimum matching of the switching point and the probe accuracy to the working point or working range.

Permissible ambient temperature

in use: -10 to +50°C
in storage: -40 to +75°C

Ambient temperature error

better than 0.5% per 10°C

Relay status indicator

The yellow LED at the front lights up when the relay is energized.

Supply

standard: 230 V AC ± 10%, 50/60 Hz
 115 V AC ± 10%, 50/60 Hz
 24 V DC ± 10%
 other voltages on request

Power consumption

3 VA max.

Electrical connection

by screw terminals,
 conductor cross-section: 1 x 4 mm² max.

Controller output

relay with floating changeover contact:
 for . . -dl: only 1 break or 1 make contact

Contact rating

10 A 250 V AC,
 10 A 24 V DC

Electromagnetic compatibility

to NAMUR recommendations:
 EN 50081 - 1;
 EN 50082 - 2

Climatic conditions

relative humidity 75% max. annual mean,
 no condensation.

Protection

to EN 60 529
 normally: IP20
 with extra code /ka: IP40
 with extra code /sw:IP65

Permissible mechanical stress

vibration: 2 – 25 Hz; 1.6 mm
 25 – 100 Hz; 40 m/sec²
 as per Guidelines of “Germanischer Lloyd”,
 Section 5.2, Characteristic 2
 shock: 300 m/sec²; 11 msec
 to IEC 68, Part 2-27

Housing material

polycarbonate

Housing color

light gray RAL 7035

Fixing

normally on rail to EN 50 022 - 35 x 7.5 mm
 extra code /r:
 mounting rail for wall mounting
 extra code /b3:
 front-panel mounting with 2 screws M3

Mounting position

any

Weight

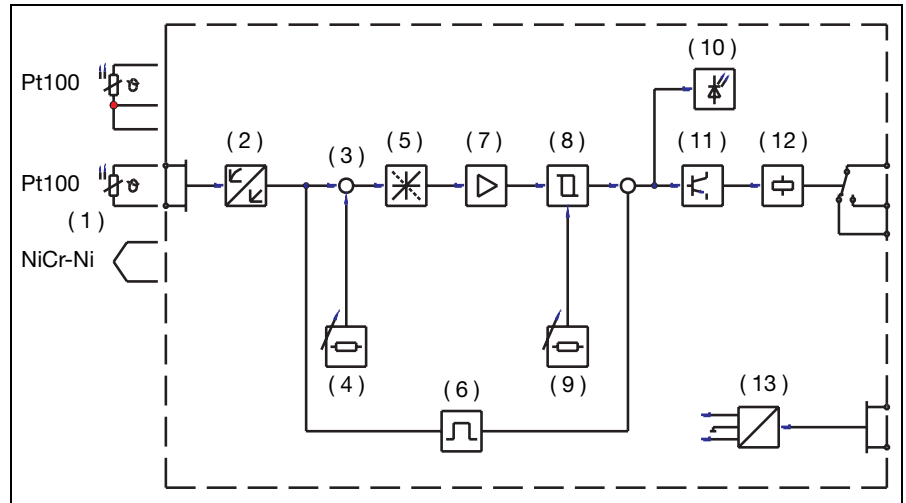
200 g approx.

Ordering examples

Electronic thermostat
 Type: TE-1wO
 Range: 0 to +100°C
 230 V AC

Electronic thermostat
 Type: TE-1tS / r /ka
 Range: +600 to +1000°C
 24 V DC

Block diagram



Function

The sensor signal of the temperature probe (1) is linearized and amplified at the input stage (2) and reaches the comparator (3) as the process value x. The comparator forms the difference between the process value x and the setpoint w that is set on the setpoint knob (4), resulting in the control deviation $x_w = x - w$.

The contact function O (break) or S (make) is determined internally by bridges (5). The difference signal produced during a control deviation acts through the integrated amplifier (7) on the subsequent trigger stage (8). The switching differential x_{sd} of the trigger stage is adjusted by the potentiometer (9). The trigger output signal acts through the transistor (11) to operate the relay, which has a floating changeover contact (12). For Type TE-1w . . -dl, only one make or one break contact is available. The “relay energized” status is indicated by the LED (10).

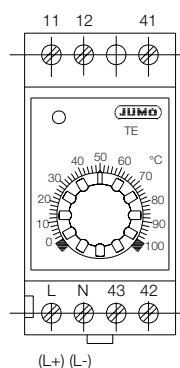
The sensing circuit monitor (6), which comes as standard, checks the probe and the probe cable for break or short-circuit. The supply required to operate the modules is generated and stabilized in the power supply (13).

Electrical connection

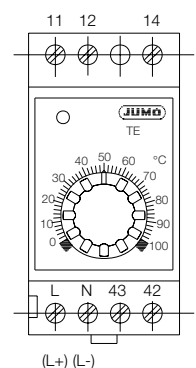
Connection for	Type	Ctrl. status	Terminals	
Relay output (with . . -dl: no 41)	O	$x \geq w^*$	41 (n.c.) break	
	S	$x \leq w$	42 common 43 (n.o.) make	
Supply	Code		L1 line	
	AC		N neutral	
	DC		L+ L-	
Resistance therm. in 2-wire circuit	w	(Pt100)	11 12	
Thermocouple	t	(NiCr-Ni)	11 12	
Resistance therm. in 3-wire circuit	w . . -dl	(Pt100)	11 12 14	

* x = process value, w = setpoint

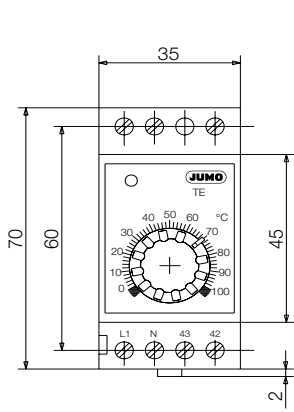
Type TE...



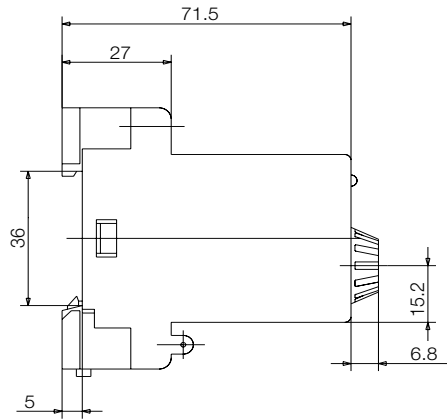
Type TE...-dl



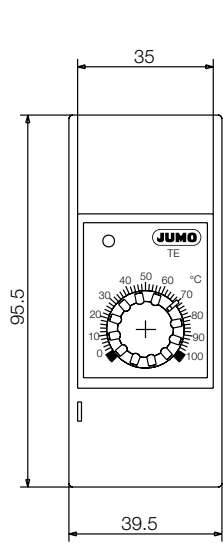
Dimensions



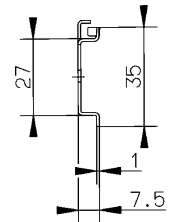
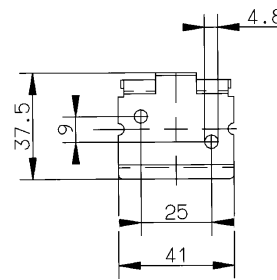
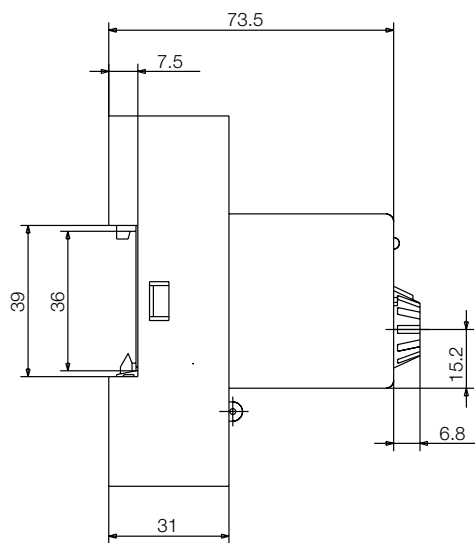
Type TE.



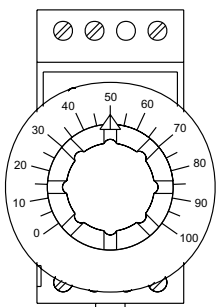
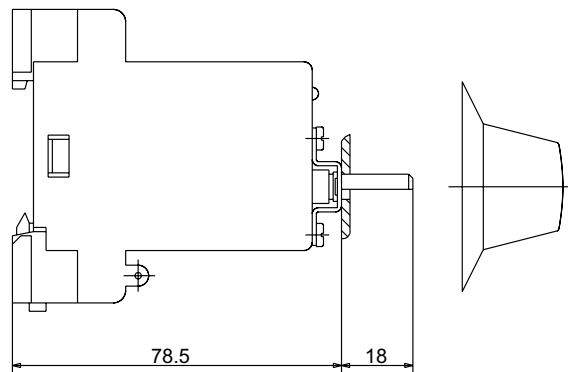
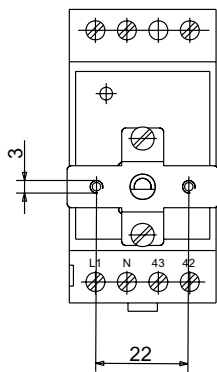
Extra codes



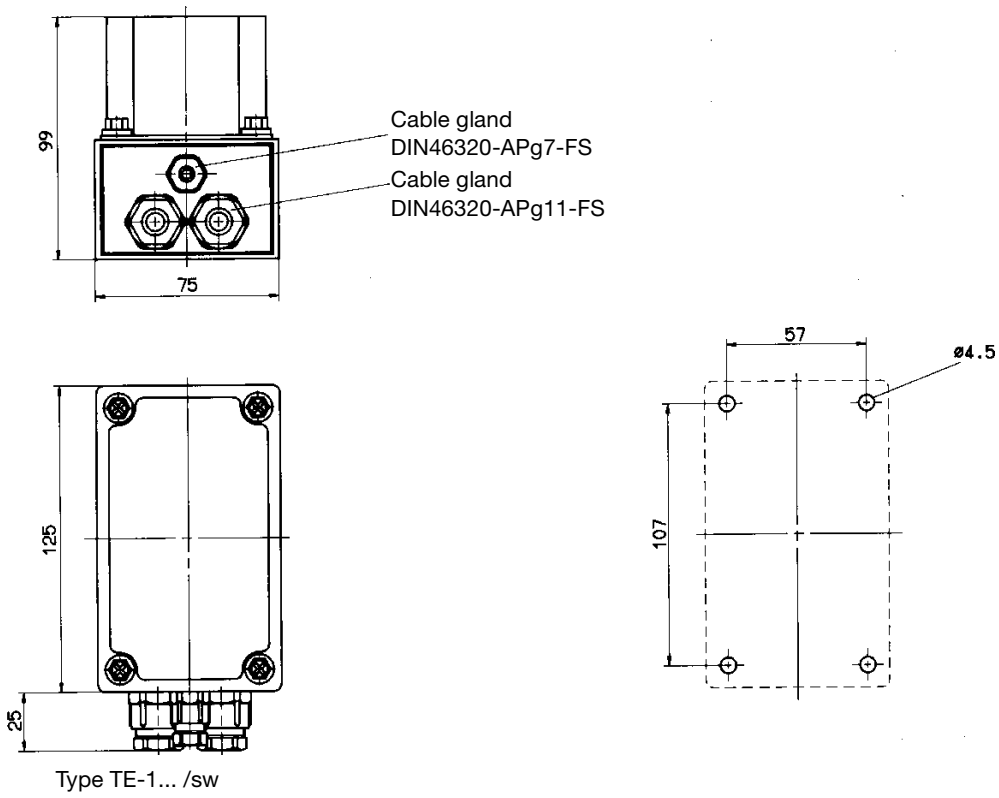
Type TE. /ka



Extra code /r



Type TE. /b3



Temperature probe

see Data Sheet 60.5521

For additional temperature probes and designs,
see Sectional Catalog "Transducers".