



Electronic Thermostat TE-1

Version according to EN 60 730

Brief description

The electronic thermostat TE-1 is a temperature controller with ON/OFF switching 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 for the controller is a standard feature, as is zero adjustment.

Suitable probes that may be attached are platinum resistance sensors to EN 60 584 (Pt100) with a positive temperature coefficient in 2-wire or 3-wire circuit, or thermocouples (NiCr-Ni) to EN 60 584.



Types

Types	for connection to	Switching action
TE-1wO	resistance thermometer Pt100 standard: 2-wire circuit	break (n.c.) (standard) relay de-energized at $x \geq w$
TE-1wS		make (n.o.) relay energized at $x > w$
TE-1tO	thermocouple NiCr-Ni K	break (n.c.) (standard) relay de-energized at $x \geq w$
TE-1tS		make (n.o.) relay energized at $x > w$

Extra codes	b3	front-panel mounting by 2 screws
	ka	terminal cover, enclosure protection IP40
	sw	dust-tight and waterjet-proof housing, polycarbonate, enclosure protection IP65

Technical data

Electrical data

Supply	standard:	230 V AC +10/-15%, 48 – 63 Hz 115 V AC +10/-15%, 48 – 63 Hz 24 V DC +10/-15% other voltages on request
Contact rating		10 A, 250 V AC, 10 A, 24 V DC
Power consumption		3 VA max.
Controller output		relay with floating changeover contact: for 3-wire circuit (1 break or 1 make contact only)
Electromagnetic compatibility		to EN 61 326
Electrical connection		by screw terminals, max. conductor cross-section 4 mm ²

Measurement input: Pt100 resistance thermometer

Control ranges	Control range °C	Relay is de-energized at probe temperatures below:
	-50 to + 30	- 85°C
	-20 to + 40	- 45°C
	0 to + 50	- 25°C
	0 to +100	- 40°C
	0 to +150	- 65°C
	0 to +200	- 85°C
	0 to +300	-130°C
	0 to +400	-165°C
	0 to +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 $RL = 165 \text{ m}\Omega$), there will be an error of approx. 1°C per 0.39Ω 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 is internally compensated.	
Measurement 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: NiCr-Ni thermocouple

Control ranges	Control range °C	
	+200 to + 600	
	+400 to + 800	
	+600 to +1000	
	+800 to +1200	
Measurement circuit monitoring	Thermocouple and compensating cable are monitored for break.	
Temperature compensation	provided as standard	

Operating data

Switching point accuracy	± 2% of control range span	
Switching differential	adjustable from 0.25 to 5%, factory-set to minimum value	
Zero point correction	enables the optimum matching of the switching point and probe accuracy to the respective working point or range	
Permissible ambient temperature	in operation -10 to +50°C	
Permissible storage temperature	-40 to +75°C	
Ambient temperature error	< 0.5% per 10°C	
Climatic conditions	relative humidity ≤ 75% annual mean, no condensation	
Permissible mechanical stress	vibration: 2 – 25 Hz; 1.6 mm 25 – 100 Hz; 40 m/sec ²	as per Guidelines of "Germanischer Lloyd", Section 5.2, Characteristic 2
	shock: 300 m/s ² ; 11 ms	to IEC 68, Part 2-27

Housing

Enclosure protection to EN 60 529	standard: IP20 with extra code ka: IP40 with extra code sw: IP65
Housing	plastic housing in polycarbonate; color: light gray RAL 7035
Relay status indication	The yellow LED on the front indicates that the relay is energized.
Mounting	standard: on rail to EN 50 022 - 35 x 7.5 mm
Operating position	unrestricted
Weight	approx. 200 g

Block diagram

Operation	<p>The sensor signal of the temperature probe (1) is linearized and amplified at the input stage (2) and reaches the comparator (3) as process value x. The comparator forms the difference between the process value x and the setpoint w that was set on the setpoint knob (4), resulting in the control deviation $x_w = x - w$.</p> <p>The contact action O or S is determined internally, through links (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 means of the potentiometer (9). The trigger output signal uses the transistor (11) to operate the relay, which has a floating changeover contact (12). In the case of type TE-1w in 3-wire circuit, only one make or one break contact is available. The "relay energized" status is indicated by the LED (10).</p> <p>The measurement circuit monitor (6), which comes as standard, checks the probe and the probe cable for break or short-circuit. The voltage required to operate the modules is generated and stabilized in the power supply (13).</p>

Electrical connection

Type TE-1 as standard	Type TE-1w 3-wire circuit	Connection for	Type	Control status	Terminals	
		Relay output (41 not applicable with 3-wire circuit)	O	$x \geq w^*$	41 break (n.c.) 42 common 43 make (n.o)	
			S	$x \leq w$		
		Supply		Code	L1 line N neutral	
				AC		
				DC	L+ L-	
		Resistance thermometer in 2-wire circuit (Pt100)	w		11 12	
		Thermocouple (NiCr-Ni)	t		11 12	
		Resistance thermometer in 3-wire circuit (Pt100)	w...-dl		11 12 14	

* x = process value, w = setpoint

Dimensions

Type TE-1 is standard	
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Extra code

ka with terminal cover	
b3 for front-panel mounting	
SW housing, polycarbonate IP65 protection	

Temperature probe	see Data Sheet 60.5521; see sectional catalog 90 "Transducers" for additional temperature probes and styles
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Order details for the Electronic Thermostat TE-1

Stock items:

(delivery 3 working days after receipt of order)

Supply voltage 230 V AC +10/-15%, 48 – 63 Hz

Sales No.	Type	Control range °C	Probe input
60/60001962	TE-1w O	-50+30	Pt100 in 2-wire circuit
60/60001923	TE-1w O	-20+40	
60/60001924	TE-1w O	0+50	
60/60001925	TE-1w O	0+100	
60/60001953	TE-1w O	0+150	
60/60001954	TE-1w O	0+200	
60/60001955	TE-1w O	0+300	
60/60001956	TE-1w O	0+400	
60/60001961	TE-1w O	0+500	
60/60002137	TE-1t O	+200+600	
60/60002138	TE-1t O	+400+800	Thermocouple NiCr-Ni (Type K)
60/60002139	TE-1t O	+600+1000	
60/60002140	TE-1t O	+800+1200	

Non-stock items:

Order code	(1) Basic type		
605501	TE-1		
	(2) Basic type extension		
11	TE-1 wO with break action	for Pt100 in 2-wire circuit	standard
12	TE-1 wS with make action	for Pt100 in 2-wire circuit	standard
21	TE-1 wO with break action	for Pt100 in 3-wire circuit	
22	TE-1 wS with make action	for Pt100 in 3-wire circuit	
31	TE-1 tO with break action	for thermocouples NiCr-Ni	
32	TE-1 tS with make action	for thermocouples NiCr-Ni	
	(3) Control ranges		
11	-50 to 30°C		
13	-20 to 40°C		
21	0 to 50°C		
25	0 to 100°C		
27	0 to 150°C	only with	
28	0 to 200°C	Pt100 resistance thermometer	
30	0 to 300°C		
31	0 to 400°C		
32	0 to 500°C		
86	200 to 600°C		
87	400 to 800°C	only with NiCr-Ni thermocouple	
88	600 to 1000°C		
89	800 to 1200°C		
	(4) Supply		
02	230 V AC +10/-15%, 48 – 63 Hz		
05	115 V AC +10/-15%, 48 – 63 Hz		
29	24 V DC +10/-15%		
	(5) Extra codes		
706	b3 front-panel mounting by 2 screws M3		
717	ka terminal cover, IP40 protection		
718	sw dust-tight and waterjet-proof housing, IP65 protection		

Order code

(1)	(2)	(3)	(4)	(5)
605501	/	..	-	..

Order example

605501	/	11	-	25	-	02	/	706
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TE-1 wO with break action, for Pt100 in 2-wire circuit
 control range 0 to +100°C
 230 V AC +10/-15%, 48 – 63 Hz
 front-panel mounting by 2 screws M3