

JUMO GmbH & Co. KG
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JUMO Instrument Co. Ltd.
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JUMO Process Control, Inc.
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Panel-Mounted Thermostats, EM Series

with 1, 2, 3, or 4 single-pole snap-action switches

Special features

- Available with 1, 2, 3 or 4 single-pole snap-action switches
- Approved according to the latest standards

Brief description

Thermostats control and monitor thermal processes. The devices of the EM series are available as temperature controllers TR, temperature monitors TW, temperature limiters TB, safety temperature monitors STW (STB), and safety temperature limiter STB. In the event of a malfunction, the STB switches the monitored machine to a safe operating status.

Panel-mounted thermostats operate according to the fluid expansion principle – a microswitch is used as an electrical switching element.

Switching functions

Temperature controller TR, temperature monitor TW, and safety temperature monitor STW

If the temperature on the temperature probe exceeds the setpoint value, the electrical circuit is opened or closed by a microswitch. If the temperature falls below the selected setpoint value (by the switching differential), the microswitch is reset to its initial position.

Temperature limiter TB and safety temperature limiter STB

If the temperature at the temperature sensor exceeds the set limit value, the electrical circuit is opened or closed by a microswitch.

After the temperature has fallen below the limit value by approx. 10 % of the scale range (approx. 15 % with setpoint setting >350 °C), the microswitch can be unlocked manually.

For set points above 120 °C, the set point adjusted on the STB must be secured against adjustment (e.g. with a lead seal).

Use of the safety temperature monitor STW as a safety temperature limiter STB

The circuitry used with the thermostat must comply with DIN EN 14597 and VDE 0631.

Self-monitoring for safety temperature limiter STB and safety temperature monitor STW (STB)

If the measuring system is destroyed (i.e. if the expansion fluid escapes) the pressure in the membrane of the STB and STW (STB) drops and permanently opens the electrical circuit. Unlocking is then no longer possible.

When the STW (STB) and STB sensors cool down to the negative temperature range, the circuit 1 to 2 opens, but must be unlocked manually by the restart knob when the temperature rises. The STW (STB) restarts automatically.



Approvals and approval marks (see technical data)



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Types and DIN registry numbers

DIN-tested up to max. 500 °C.

The DIN registry no. will become null and void if thermowells are used that are not specified in our data sheet 606710.

Version	Types	Switching function	DIN registry numbers
1 pole snap-action switches	EM-1	TR	TR777
	EM-2	TW	TW778
	EM-3 ^a	TW	TW778
	EM-4 ^a	TB	TB780
	EM-5	TB	TB780
2 single-pole snap-action switches	EM-13	TR/TW	TR777
	EM-23 ^a	TW/TW	TW778
	EM-33	TW/TW	TW778
	EM-14	TR/TB	TR777
	EM-24	TW/TB	TW778
	EM-44 ^a	TB/TB	TB780
3 single-pole snap-action switches	EMF-54	TB/TB	TB780
	EMF-133	TR/TW/TW	TR777
	EMF-134	TR/TW/TB	TR777
	EMF-233	TW/TW/TW	TW778
	EMF-234	TW/TW/TB	TW778
	EMF-333 ^a	TW/TW/TW	TW778
4 single-pole snap-action switches	EMF-444 ^a	TB/TB/TB	TB780
	EMF-544	TB/TB/TB	TB780
	EMF-1333	TR/TW/TW/TW	TR777
Fail-safe version	EMF-2333	TW/TW/TW/TW	TW778
	EMF-3333 ^a	TW/TW/TW/TW	TW778
	EM-40 ^a	STB	STB782
	EM-50	STB	STB782
	EM-20	STW (STB)	STW(STB)775S
	EM-30 ^a	STW (STB)	STW(STB)775S

^a Setpoint value or limit value permanently factory-set according to customer specifications.

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Technical data

Control ranges and probe table

For TR, TW, TB – liquid-filled

Control range/ limit value range °C	Switching differential %	Max. probe tem- perature °C	Max. switching head tempera- ture °C	Max. capillary length in mm	Max. sequence con- tact gap K	Probe length "L", probe Ø "d" in mm	
						Ø 6 (Standard)	Ø 8
-20 to +40	1	50	50	5000	5	245	145
	2.5	50			8	245	145
	5	95			25	138	91
	7	100			50	103	73
0 to 50	1	60	60		5	283	165
	2.5	60			10	283	165
	5	105			25	159	101
	7	110			50	117	80
20 to 90	1	115	80		7	210	127
	2.5	115			14	210	127
	5	140			35	121	82
	7	175			70	91	67
0 to 100	1	125	80	10	157	100	
	2.5	125		20	157	100	
	5	165		50	94	68	
	7	200		100	73	58	
30 to 110	1	135	80	8	188	116	
	2.5	135		16	188	116	
	5	170		40	110	76	
	7	200		80	84	63	
0 to 150	1	173	80	15	113	78	
	2.5	173		30	113	78	
	5	200		75	72	57	
0 to 200	1	230	80	20	113	78	
	2.5	230		40			
50 to 200	1	230	80	15	139	92	
	2.5	230		30			
50 to 250	1	288	80	20	105	70	
	2.5	288		40	105	70	
	5	300		100	64	49	
50 to 300	1	345	80	25	87	61	
	2.5	345		50			

For TR, TW, TB – gas-filled

Control range/ limit value range °C	Switching differential %	Max. probe tem- perature °C	Max. switching head tempera- ture °C	Max. capillary length in mm	Max. sequence con- tact gap K	Probe length "L", probe Ø "d" in mm	
						Ø 6 (Standard)	Ø 8
20 to 400	5	460	80	5000	75	237	137
	10	500			200	127	81
20 to 500	3/5	575	80		48	278	158
	6				95	276	106
	10				250	95	65

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Control ranges and temperature probes

For STB and STW (STB) – liquid-filled

Setting range °C	Scale range °Z	Max. probe temperature °C	Max. switching head temperature °C	Max. capillary length in mm	Limit value tolerance K	Probe length "L", probe Ø "d" in mm	
						Ø 6 (Standard)	Ø 8
75 to 100	78	125	80	5000	+0	84	63
85 to 110	78	135			-7		
120 to 150	77	173			+0	80	57
					-9		
160 to 200	79	230			+0	64	49
					-12		
210 to 250	71	288	+0	61	47		
			-13				
250 to 300	79	345	+0	55	-		
			-16				

For STB and STW (STB) – gas-filled

Setting range °C	Scale range °Z	Max. probe temperature °C	Max. switching head temperature °C	Max. capillary length in mm	Limit value tolerance K	Probe length "L", probe Ø "d" in mm	
						Ø 6 (Standard)	Ø 8
300 to 400	70	460	80	3000	+0	148	92
					-23		
350 to 500	72	575			+0	127	81
					-29		

When the switching points are permanently factory-set, the deactivation value must be specified in addition to the control range (e.g. control range 80 to 100 °C, permanently set to 95 °C).

Capillary and temperature probe

Type	Scale limit value	Capillary	Probe
EM-...	Up to 200 °C	Copper (Cu) Ø 1.5 mm Material no. Cu-DHP	Copper (Cu) Material no. Cu-DHP Hard soldered
	Up to 350 °C	Copper (Cu) Ø 1.5 mm Material no. Cu-DHP	Stainless steel (CrNi) Material no. 1.4571 Hard soldered
	Up to 500 °C	Stainless steel (CrNi) Ø 1.5 mm	Stainless steel (CrNi) Material no. 1.4571 Welded
	Up to 350 °C	Stainless steel (CrNi) Ø 1.5 mm	Stainless steel (CrNi) Material no. 1.4571 Welded (available at extra cost)
Capillary length	Standard 1,000 mm, max. 5,000 mm		
Min. bending radius of capillary	5 mm		

NOTE:

Upon request the capillary length can be increased up to a maximum of 5,000 mm if the allowable temperature on the sensor, capillary, and switching head is not reached.

Please let us know the actual temperature values to which the thermostat is exposed.

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Electrical data

Switching element 1, 2, 3, or 4 single-pole snap-action switches	EM-1, EM-2, EM-3, EM-20, EM-30	EM-4, EM-5, EM-40, EM-50	EM-4.../U, EM-5.../U, EM-40/U, EM-50/U
	Microswitch with changeover contact	Microswitch with N/C contact and restart lock	Microswitch with N/C contact, restart lock, and additional signal contact
Maximum switching capacity	Switching function Switching differential	N/C contact, terminal 2	N/O contact, terminal 4
	TR, TW, STB (STB) 2.5 %, 5 %, 6 %, 7 %, 10 %	AC 230 V +10 % 16 (3) A, cos φ = 1 (0.6) DC 230 V +10 %, 0.25 A	AC 230 V +10 % 8 (1.5) A, cos φ = 1 (0.6) DC 230 V +10 %, 0.25 A
	TB, STB	AC 230 V +10 % 16 (3) A, cos φ = 1 (0.6) DC 230 V +10 %, 0.25 A	AC 230 V +10 % 2 (1) A, cos φ = 1 (0.6) DC 230 V +10 %, 0.25 A
	TR, TW 1 %, 3 %	AC 230 V +10 %, 6 (2) A, cos φ = 1 (0.6), DC 230 V +10 %, 0.25 A	
	TR, TW 2.5 %	Microswitch with gold plating, extra code 702, AC/DC 24 V, 0.1 A	
Contact reliability	To ensure the greatest possible switching reliability we recommend a minimum load of: For silver contacts: AC/DC 24 V, 100 mA For gold-plated contacts (extra code 702): AC/DC = 10 V, 5 mA		
Rating surge voltage	2500 V (via the switching contacts 400 V)		
Overtoltage category	II		
Required fuse rating	See maximum switching capacity		
Electrical connection	Standard: Tab connector A 6.3 × 0.8 DIN 46244 Extra code 699: Screw connection up to 2.5 mm ² conductor cross section (available at extra cost), also suitable for retrofitting		

Operating data

Switching differential in % of control range/limit value range	Measuring system				
	Liquid-filled		Gas-filled		
	Nominal value	Possible actual value	Nominal value	Possible actual value	
Switching function TR, TW	2.5	Approx. 2.5 to 3.5	5	Approx. 5 to 11	Standard
	5	Approx. 5 to 6	6	Approx. 6 to 14	Upon request
	7	Approx. 7 to 8	10	Approx. 10 to 16	Upon request
	1	Approx. 1 to 2	3	Approx. 2.5 to 4	Extra cost
STW (STB)	5	Approx. 5 to 7	6	Approx. 6 to 16	Standard

Sequence contact gap on multi-pole versions	Switching differential	Sequence contact gap relative to scale range		Switching point accuracy of the sequence contact gaps from the scale range
		Minimum	Maximum	
	1 %	1 %	According to control range table	≤ 1 %
	2.5 %	1 %		≤ 1 %
	3 %, 5 %	2 %		≤ 1 %
6 %, 7 %, 10 %	3 %	≤ 1 %		
The sequence contact gap can be specified in °C in relation to the setpoint of contact I. (The contact track no. is stamped on the back of the housing par.)				
Prefix - = switching before reaching the setpoint value Prefix + = switching after reaching the setpoint value For the synchroized version, specify "0" as the sequence contact gap.				

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Switching point accuracy in % of control range/limit value range	Switching differential		In the upper third of the scale or limit value
	Liquid-filled	Gas-filled	
Switching function			
TR	1 %, 2.5 % 5 % 7 %	- 3 %, 5 % 6 %, 10 %	±1.5 % ±3 % ±4 %
TW	1 %, 2.5 % 5 % 7 %	- 3 %, 5 % 6 %, 10 %	±1.5 % ±3 % ±4 %
TB	-	-	+0 % -5 %
STW (STB)	See table for control ranges and probes		

Mid ambient temperature influence	Deviation of the ambient temperature at the switching head and/or capillary from the 22 °C calibration ambient temperature produces a switching point offset. Higher ambient temperature = low switching point Lower ambient temperature = higher switching point										
	TR, TW, TB			STW, STB	TR, TW, TB			STW, STB	TR, TW, TB, STW, STB		
For temperatures with scale limit value/limit value	< 200 °C				≥ 200 °C ≤ 350 °C				≥ 400 °C ≤ 500 °C		
Switching differential in %	1/2.5	5	7	7/-	1/2.5	5	7/-	3/5	6	10	
Ambient temperature influence on the switching head in %/°C	0.15	0.26	0.34	0.43	0.12	0.21	0.35	0.12	0.17	0.24	
Ambient temperature influence on the capillary in %/m	0.05 · °C · m		0.09 · °C · m		0.09 · °C · m		0.07 · °C · m	0.05 · °C · m			
Temperature compensation (TK)	For detailed information see diagram.										
Temperatures											
Admissible storage temperature	-50 to +50 °C										
Admissible ambient temperature for use	80 °C max.										
Nominal position (NL)	Any										
Operating medium	Water, oil, air, superheated steam										
Time constant $t_{0.632}$											
In water	≤ 45 s										
In oil	≤ 60 s										
In air or superheated steam	≤ 120 s										

Mode of operation	According to EN 60730-1, DIN EN 60730-2-9, DIN EN 14597
TR, TW	2 BL
TB	2 BFHLPV
STW (STB)	2 BKLNP
STB	2BFHKLNPV
	Declaration:
	2 Mode of operation type 2
	B Automatic mode of operation with micro disconnection
	F Only adjustable with tool
	H Release mechanism whose contacts can not be prevented from opening
	K With probe break protection
	L No auxiliary energy required
	P Mode of operation type 2, tested by declared temperature changes
	V Lockout

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Housing

Material	Galvanized sheet steel
Mounting	
Standard	With 2 M3 screws, spaced 22 mm
Extra code 704	Switching head mounting with 2 M4 screws, spaced 28 mm
Extra code 705	Switching head mounting with 2 M3 screws, spaced 33 mm
Extra code 710	Central mounting M10 × 1 with acorn nut (for TB and STB only)
Setpoint value setting	
TR	Switching point adjustable from outside with rotary knob.
TW, TB, STB, STW (STB)	Switching point adjustable with screwdriver.
Types EM-3, EM-4, EM-30, EM-33, EM-40, EM-44, EMF-444, EMF-3333	Permanently set at the factory to customer requirements.
Setpoint adjuster	See data sheet 606715
Scale range	Standard 250°∠ (for STB and STW (STB)), see table for control ranges and probes
Protection type	IP00 according to EN 60529
Weight	Approx. 300 g

Process connection

EM series with capillary	Plain cylindrical probe "10" (standard) Screw-in protection tube "20" (upon request) Screw-in sleeve with screw-in spigot G 1/2, form A, according to DIN 3852/2 and clamping piece with fixing screw for securing the probe
Material	
Protection tube up to 150 °C	CuZn (standard)
Protection tube above 150 °C	CrNi
Insertion length S	
Standard	100, 120, 150, 200 or 300 mm (other lengths upon request)
Protection tube Ø	D = 8 mm, D = 10 mm

For further process connections and protection tubes see data sheet 606710.

Approvals and approval marks

DIN	
Testing agency	DIN CERTCO/TÜV Süd
Certificates/certification numbers	TR777
Inspection basis	DIN EN 14597
Valid for	EM-1
DIN	
Testing agency	DIN CERTCO/TÜV Süd
Certificates/certification numbers	TW778
Inspection basis	DIN EN 14597
Valid for	EM-2, EM-3
DIN	
Testing agency	DIN CERTCO/TÜV Süd
Certificates/certification numbers	TB780
Inspection basis	DIN EN 14597
Valid for	EM-4, EM-5

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DIN Testing agency Certificates/certification numbers Inspection basis Valid for	DIN CERTCO/TÜV Süd STW(STB)775 S DIN EN 14597 EM-20, EM-30
DIN Testing agency Certificates/certification numbers Inspection basis Valid for	TÜV Süd B _{10d} = 250.000 ^a DIN EN ISO 13849-1 EM-20, EM-30, EM-40, EM-50
PED Testing agency Certificates/certification numbers Inspection basis Valid for	TÜV Süd Z-IS-TAF-MUC-18-06-2652099-07102504 2014/68/EU, DIN EN 14597 EM-20, EM-30, EM-40, EM-50
UL Testing agency Certificates/certification numbers Inspection basis Valid for	UL E66358 UL 873, CSA-22.2 No. 24 EM-...
UL Testing agency Certificates/certification numbers Inspection basis Valid for	UL MH45736 UL 353, CSA-22.2 No. 24 EM-4, EM-5, EM-14, EM-24, EM-40, EM-44, EM-50, EMF-54, EMF-134, EMF-234, EMF-444, EMF-544, EMF-1334, EMF-2334, EMF-4444, EMF-5444
EAC ^b Testing agency Certificates/certification numbers Inspection basis Valid for	Gost Norm AG TC RU C-DE.AB98.B.00348 Technical rules of the customs union Russia/Belarus/Kazakhstan EM-...
Railway application Testing agency Certificates/certification numbers Inspection basis Valid for	JUMO - EN 50155 EM-... with extra code 950

^a For detailed information please refer to safety manual JUMO EM602021, 602026

^b Russian documentation upon request.

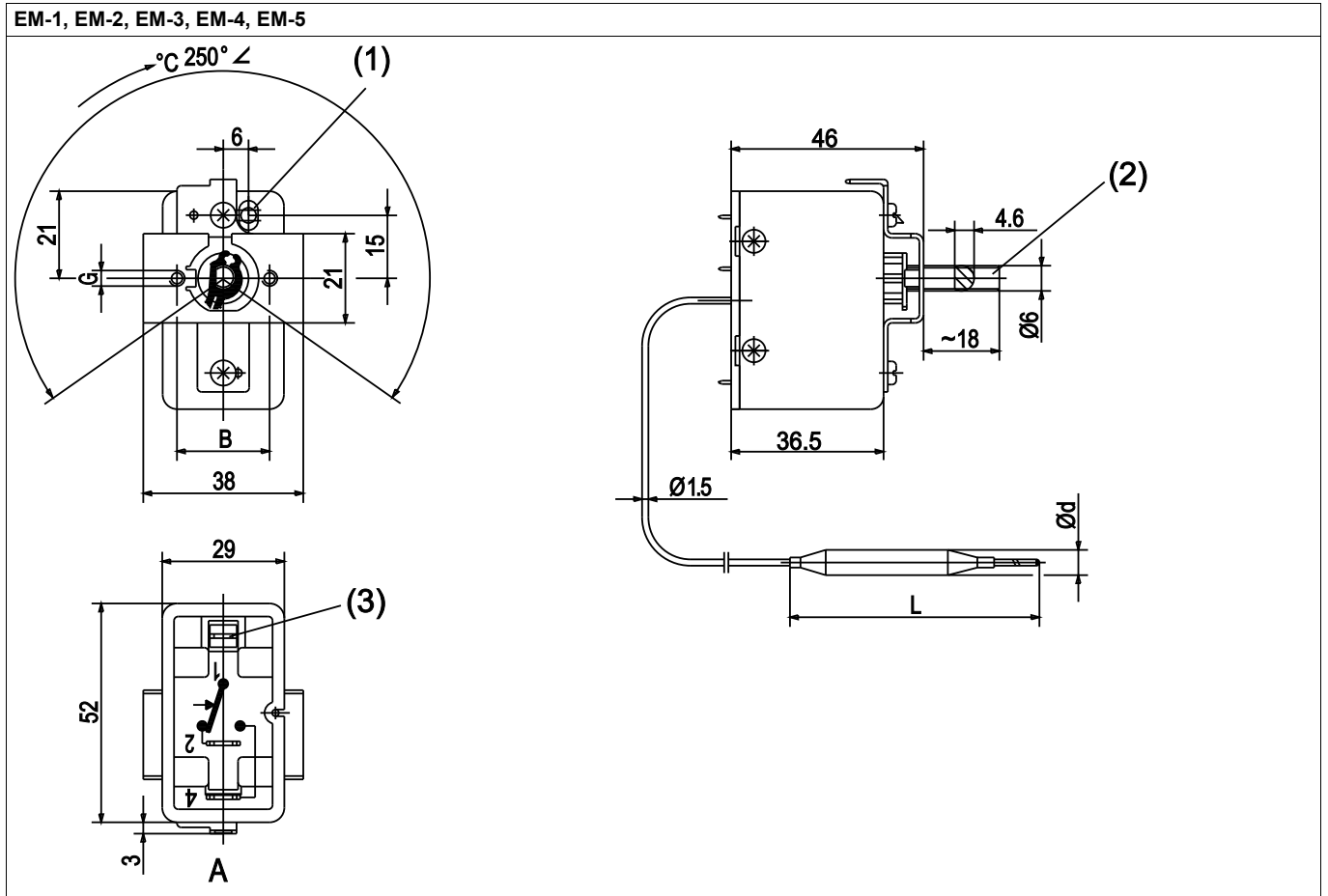
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Dimensions



- (1) Restart knob only with abbreviation 4 and 5
- (2) Not applicable with abbreviation 2, 3, 4, 5
- (3) Tab connector DIN 46244-A6,3-0,8
- (A) Rear view

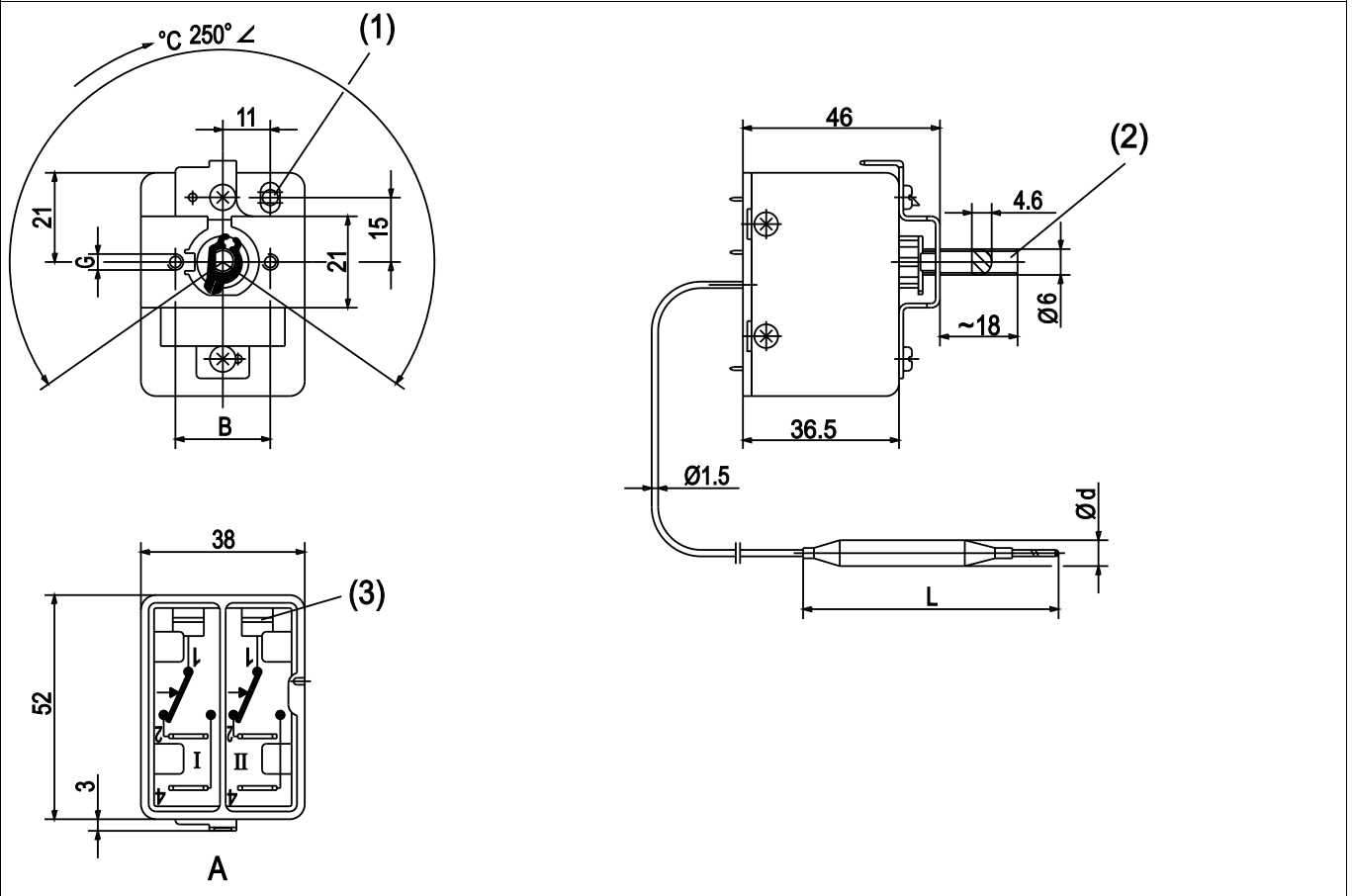
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EM-13, EM-14, EM-20, EM-23, EM-24, EM-30, EM-33, EM-40, EM-44, EM-50, EMF-54



- (1) Restart knob only with abbreviation 40, 44, 50 and 5
- (2) Not applicable with abbreviation 2, 3, 4, 5, 20, 30, 40 and 50
- (3) Tab connector DIN 46244-A6,3-0,8
- (A) Rear view

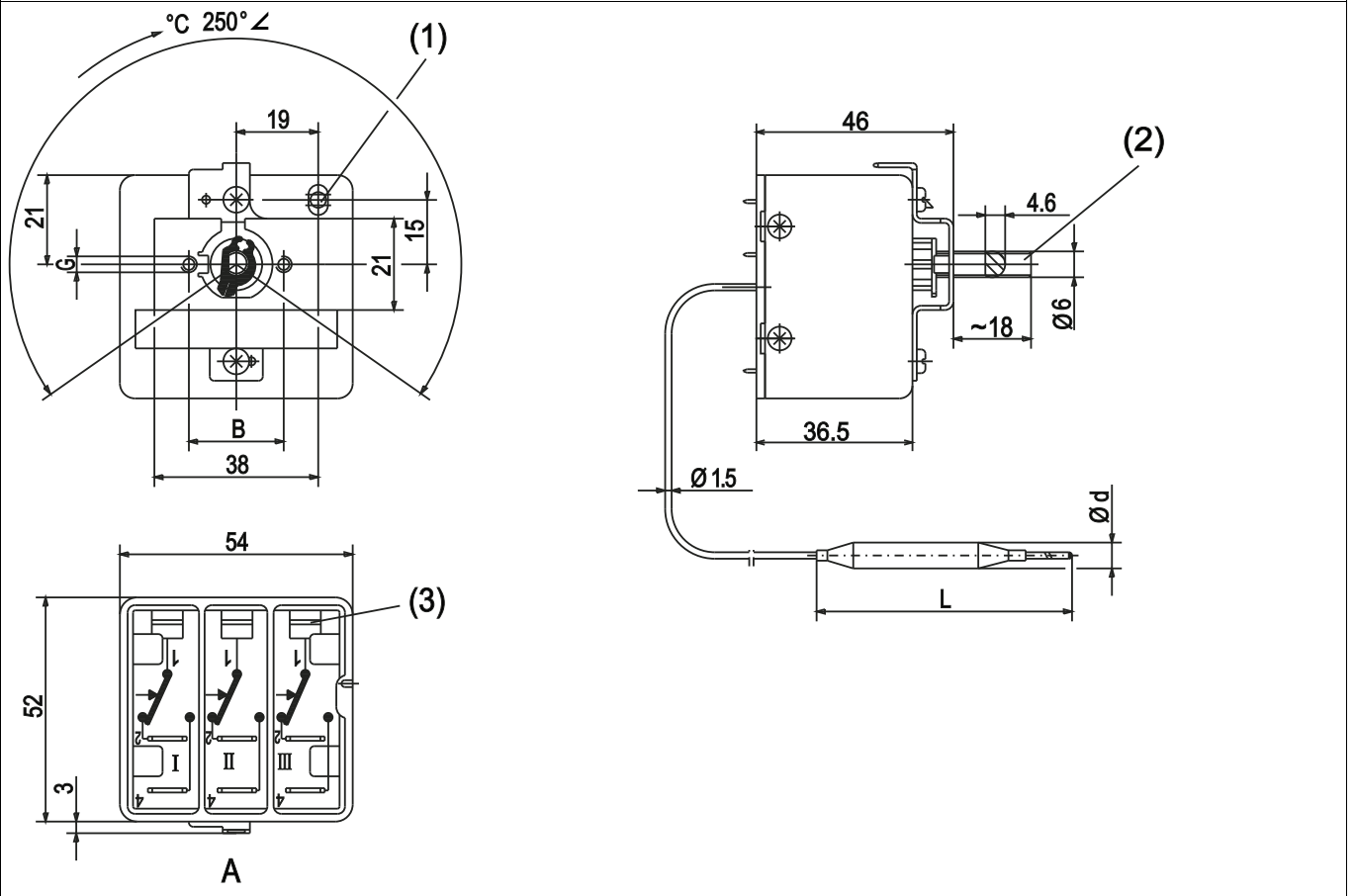
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EMF-133, EMF-134, EMF-233, EMF-234, EMF-333, EMF-444, EMF-544



- (1) Restart knob only with abbreviation 444, 544
- (2) Not applicable with abbreviation 2, 3, 4, 5
- (3) Tab connector DIN 46244-A6,3-0,8
- (A) Rear view

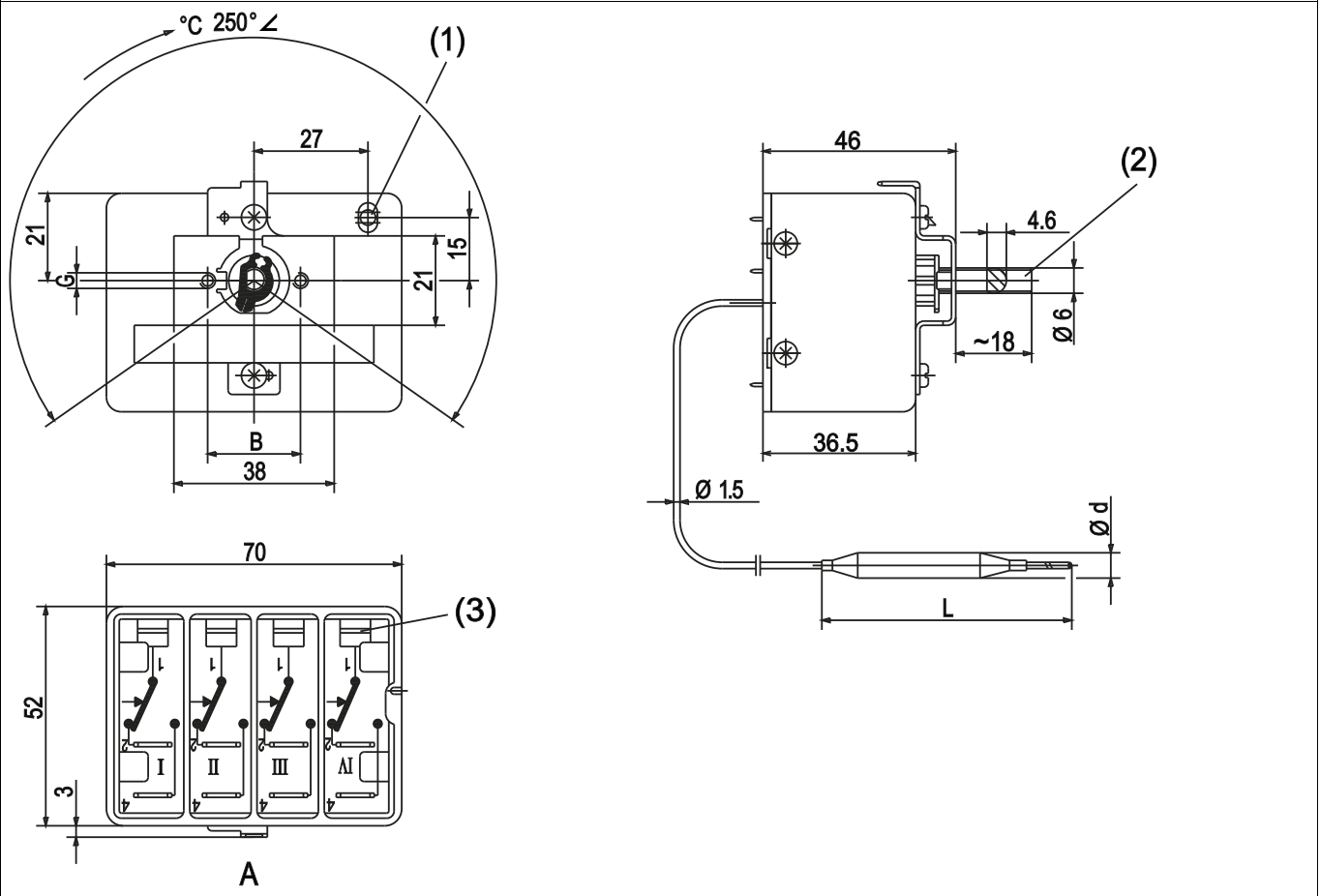
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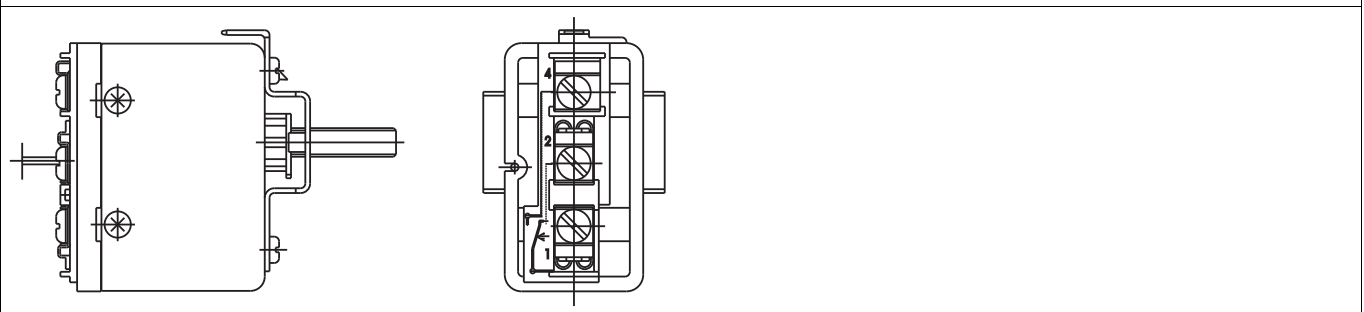
EMF-1333, EMF-2333, EMF-3333



- (1) Restart knob only with abbreviation 4444
- (2) Not applicable with abbreviation 2, 3, 4, 5
- (3) Tab connector DIN 46244-A6,3-0,8
- (A) Rear view

	B	G
Standard	22	M3
Extra code 704	28	M4
Extra code 705	33	M3

Screw connection EM-1, extra code 699



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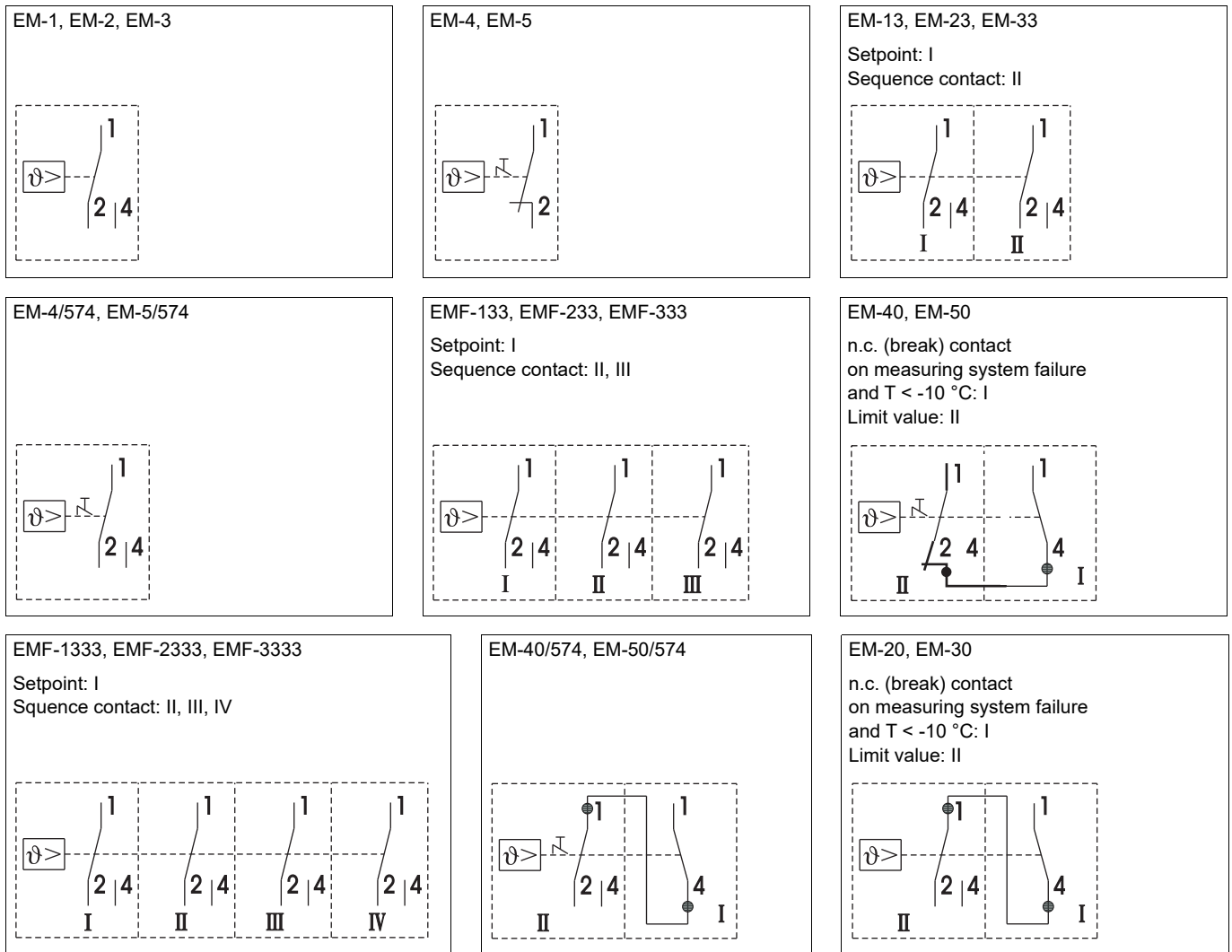
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Connection diagram

The connection diagram in the data sheet provides information on product selection.

For the electrical connection, only use the installation instructions or the operating manual.



Example EMF-1334

For additional type variants, the connection diagrams are combined appropriately.



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Temperature compensation

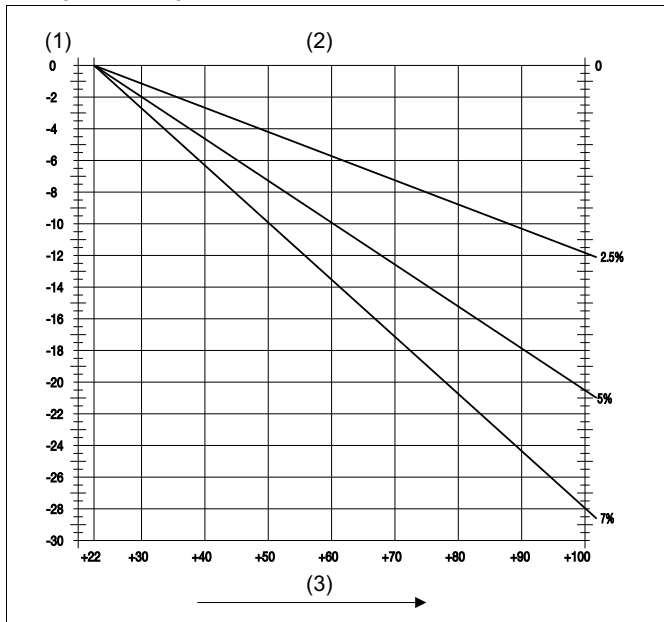
Any change in the temperature at the switching head from the 22 °C calibration ambient temperature will produce a deviation of the switching point. For ambient temperatures that fluctuate strongly, it is advisable to use thermostats with temperature compensation ("TK"; extra code 707).

The switching point deviation depends on the ambient temperature at the switching head and takes the switching differential into consideration. **The temperature influence on the capillary is not yet taken into account and can result in an additional error.**

Version **without** temperature compensation

Scale limit value < 200 °C

EM 1-pole, EM 2-pole

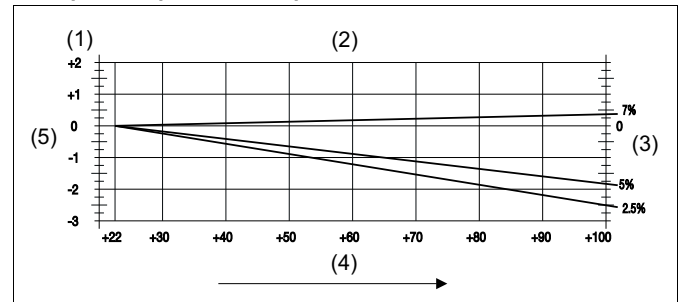


- (1) % of the control range
- (2) **Without temperature compensation**
- (3) Ambient temperature [°C]

Version **with** temperature compensation

Scale limit value < 200 °C

EM 1-pole temperature compensation TK



Note:

Additional graphs of the temperature compensation TK with higher scale limit values and for the EM 2-pole version are available upon request.

- (1) % of the control range
- (2) **With temperature compensation**
- (3) Switching differential
- (4) Ambient temperature [°C]
- (5) Switching setpoint deviation

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Order details

	(1) Basic type	
602021	Panel-mounted thermostats, EM Series	
	(2) Basic type extensions	
0001	EM-1	Temperature controller (TR), 1-pole
0002	EM-2	Temperature monitor (TW), 1-pole
0003	EM-3	Temperature monitor (TW), permanently set, 1-pole
0004	EM-4	Temperature limiter (TB), permanently set, 1-pole
0005	EM-5	Temperature limiter (TB), 1-pole
0013	EM-13	Temperature controller (TR/TW), 2-pole
0014	EM-14	Temperature controller (TR/TB), 2-pole
0020	EM-20	Safety temperature monitor (STW (STB))
0023	EM-23	Temperature monitor (TR/TB), 2-pole
0024	EM-24	Temperature monitor (TW/TB), 2-pole
0030	EM-30	Safety temperature monitor (STW (STB)), permanently set
0033	EM-33	Temperature monitor (TW/TW), 2-pole
0040	EM-40	Safety temperature limiter (STB), permanently set
0044	EM-44	Temperature limiter (TB/TB), 2-pole
0050	EM-50	Safety temperature limiter (STB)
0054	EMF-54	Temperature limiter (TB/TB), 2-pole
0133	EMF-133	Temperature controller (TR/TW/TW), 3-pole
0134	EMF-134	Temperature controller (TR/TW/TB), 3-pole
0233	EMF-233	Temperature monitor (TW/TW/TW), 3-pole
0333	EMF-333	Temperature monitor (TW/TW/TW), 3-pole
0444	EMF-444	Temperature limiter (TB/TB/TB), 3-pole
0544	EMF-544	Temperature limiter (TB/TB/TB), 3-pole
1333	EMF-1333	Temperature controller (TR/TW/TW/TW), 4-pole
2333	EMF-2333	Temperature monitor (TW/TW/TW/TW), 4-pole
3333	EMF-3333	Temperature monitor (TW/TW/TW/TW), 4-pole
	(3) Control range (TW)	
000	For permanently set limit value	
013	-20 to +40 °C	
021	0 to 50 °C	
025	0 to 100 °C	
027	0 to 150 °C	
028	0 to 200 °C	
041	20 to 90 °C	
045	20 to 400 °C	
046	20 to 500 °C	
052	30 to 110 °C	
062	50 to 200 °C	
063	50 to 250 °C	
064	50 to 300 °C	
075	75 to 100 °C	
085	85 to 110 °C	
090	120 to 150 °C	
091	160 to 200 °C	
092	210 to 300 °C	
094	250 to 300 °C	
095	300 to 400 °C	

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096	350 to 500 °C	
	(4) Limit value (STW/STB)	
000	For adjustable control range	
100	100 °C	
95	95 °C	
	(5) Switching differential	
00	None	
	With liquid-filled measuring system	
10	1 %	Only with TR and TW
25	2.5 %	Only with TR and TW
50	5 %	Only with TR, TW and STW
70	7 %	Only with TR, TW and STW
	With gas-filled measuring system	
30	3 %	Only with TR and TW
50	5 %	Only with TR, TW and STW
60	6 %	Only with TR and TW
01	10 %	Only with TR and TW
	(6) Capillary length	
0	None	
1000	1,000 mm	
2000	2,000 mm	
3000	3,000 mm	
4000	4,000 mm	
5000	5,000 mm	
	(7) Capillary material	
20	CrNi (stainless steel)	
40	Cu (copper)	
	(8) Process connection	
10	Plain cylindrical probe	
20	Screw-in protection tube	
	(9) Thread of process connection	
00	None	
13	G 1/2	
	(10) Process connection material	
00	None	
20	CrNi (stainless steel)	
40	CuZn (brass)	
	(11) Insertion length	
000	None	
100	100 mm	
120	120 mm	
150	150 mm	
200	200 mm	
300	300 mm	
	(12) Protection tube diameter	
00	None	
10	10 mm	
8	8 mm	



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(13) Probe diameter	
6	6 mm
8	8 mm
(14) Extra codes	
000	None
025	Central mounting M10 × 1, metall
574	Microswitch with N/C contact, restart lock, and additional signal contact (only for TB and STB)
699	Screw connection up to 2.5 mm ²
702	Snap-action contact, gold-plated
704	Switching head mounting with 2 M4 screws, spaced 28 mm
705	Switching head mounting with 2 M3 screws, spaced 33 mm
707	Temperature compensation
710	Central mounting M10 × 1, standard
950	Railway application

Order code **(1)** **(2)** **(3)** **(4)** **(5)** **(6)** **(7)** **(8)**
 [] / [] - [] - [] - [] - [] - [] - [] - [] -
Order example 602021 / 0005 - 052 - 000 - 00 - 2000 - 40 - 10 -

(9) **(10)** **(11)** **(12)** **(13)** **(14)**
 [] - [] - [] - [] - [] / [], ...^a
 00 - 00 - 000 - 00 - 6 / 574

^a List extra codes in sequence, separated by commas.

Sequence contact gap for 2-pole, 3-pole, and 4-pole devices: Specify in plain text (e.g. +2 °C, +5 °C, +8 °C)

Further process connections and protection tubes see data sheet 606710.

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Stock versions

Order code	Control range (TW)	Capillary length	Probe-Ø	Part no.
602021/0001-013-000-25-2000-40-10-00-00-000-00-6/000	-20 to +40 °C	2,000 mm	6 mm	60001231
602021/0001-021-000-25-1000-40-10-00-00-000-00-6/000	0 to 50 °C	1,000 mm	6 mm	60000492
602021/0001-041-000-70-1000-40-10-00-00-000-00-6/000	20 to 90 °C	1,000 mm	6 mm	60000493
602021/0001-025-000-25-1000-40-10-00-00-000-00-6/000	0 to 100 °C	1,000 mm	6 mm	60000494
602021/0001-025-000-25-2000-40-10-00-00-000-00-6/000	0 to 100 °C	2,000 mm	6 mm	60000219
602021/0001-052-000-70-1000-40-10-00-00-000-00-6/000	30 to 110 °C	1,000 mm	6 mm	60000285
602021/0001-027-000-25-1000-40-10-00-00-000-00-6/000	0 to 150 °C	1,000 mm	6 mm	60000921
602021/0001-027-000-25-2000-40-10-00-00-000-00-6/000	0 to 150 °C	2,000 mm	6 mm	60000217
602021/0001-028-000-25-1000-40-10-00-00-000-00-6/000	0 to 200 °C	1,000 mm	6 mm	60001141
602021/0001-028-000-25-2000-40-10-00-00-000-00-6/000	0 to 200 °C	2,000 mm	6 mm	60000220
602021/0001-064-000-25-1000-40-10-00-00-000-00-6/000	50 to 300 °C	1,000 mm	6 mm	60000495
602021/0001-064-000-25-2000-40-10-00-00-000-00-6/000	50 to 300 °C	2,000 mm	6 mm	60000923
602021/0001-046-000-50-1000-20-10-00-00-000-00-8/000	20 to 500 °C	1,000 mm	8 mm	60002083
602021/0002-021-000-25-1000-40-10-00-00-000-00-6/000	0 to 50 °C	1,000 mm	6 mm	60000214
602021/0002-027-000-25-1000-40-10-00-00-000-00-6/000	0 to 150 °C	1,000 mm	6 mm	60000497
602021/0002-027-000-25-2000-40-10-00-00-000-00-6/000	0 to 150 °C	2,000 mm	6 mm	60000213
602021/0002-028-000-25-1000-40-10-00-00-000-00-6/000	0 to 200 °C	1,000 mm	6 mm	60001263
602021/0002-064-000-25-1000-40-10-00-00-000-00-6/000	50 to 300 °C	1,000 mm	6 mm	60001380
602021/0002-046-000-50-1000-20-10-00-00-000-00-8/000	20 to 500 °C	1,000 mm	8 mm	60002084
602021/0002-046-000-50-2000-20-10-00-00-000-00-8/000	20 to 500 °C	2,000 mm	8 mm	60002112
602021/0005-027-000-25-1000-40-10-00-00-000-00-6/000	0 to 150 °C	1,000 mm	6 mm	60000924
602021/0005-028-000-25-1000-40-10-00-00-000-00-6/000	0 to 200 °C	1,000 mm	6 mm	60000929
602021/0005-064-000-25-1000-40-10-00-00-000-00-6/000	50 to 300 °C	1,000 mm	6 mm	60000211
602021/0005-046-000-50-1000-20-10-00-00-000-00-8/000	20 to 500 °C	1,000 mm	8 mm	60002085
602021/0050-095-000-00-1000-20-10-00-00-000-00-6/025, 574	300 to 400 °C	1,000 mm	6 mm	60002244
602021/0050-096-000-00-1000-20-10-00-00-000-00-6/025, 574	350 to 500 °C	1,000 mm	6 mm	60002245