Panel-mounted thermostats

EM Series

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

Operating Manual

60202100T90Z003K000

V4.00/EN/00073772/2022-02-02

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1.1 Warning symbols

WARNING!

This symbol in connection with the signal word indicates that **personal injury** may occur if the respective precautionary measures are not carried out.

CAUTION!

This symbol in connection with the signal word indicates that **material damage or data loss** will occur if the respective precautionary measures are not taken.

READ THE DOCUMENTATION!

This symbol, which is attached to the device, indicates that the associated **documentation for the device** must be **observed**. This is necessary to identify the nature of the potential hazard, and to take measures to prevent it.

DISPOSAL!

At the end of its service life, the device and any batteries present do not belong in the trash! Please ensure that they are **disposed of** properly and in an **environmentally friendly** manner.

1.2 Note symbols

NOTE!

This symbol refers to **important information** about the product, its handling, or additional benefits.

2 Introduction

2.1 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 temperatur 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).

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 cools 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.

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.

2.2 Intended use

Versions according to DIN EN 14597:

- Temperature controller TR
- Temperature monitor TW
- Temperature limiter TB
- Safety temperature monitor STW (STB)
- Safety temperature limiter STB

Type examination according to:

- DIN EN 14597
- Pressure Equipment Directive (only for types EM-20, EM-30, EM-40, EM-50)
- UL

You will find the Declarations of conformity at www.jumo.en.

- Products
- Temperature
- Monitor/Limiter
- Electromechanical
- Panel-mounting thermostats 602021
- Documentation
- Declaration of conformity/White Paper

Ask for them to be sent.

CAUTION!

Failure of the device

Cutting or kinking the capillary of the device leads to permanent failure of the functions!

Physical and toxicological properties of the expansion fluid that may escape in the event of a system fracture.

Control range with end of scale	Dangerous reactions	Fire and explosion hazard		Water contamination	Toxicological data		
		Ignition temperature	Explosion limit		Irritant	Danger to health	Toxic
< 200 °C	No	355 °C	0.6 to 8 % v/v	Yes	Yes	See note	No
≥ 200 °C ≤ 350 °C	No	490 °C	-	Yes	Yes	See note	No
> 350 °C ≤ 500 °C	No	No	No	No	No	No	No

NOTE!

At present, there is no restrictive statement from the health authorities concerning any danger to health over short periods and at low concentration, e.g. after a fracture of the measuring system.

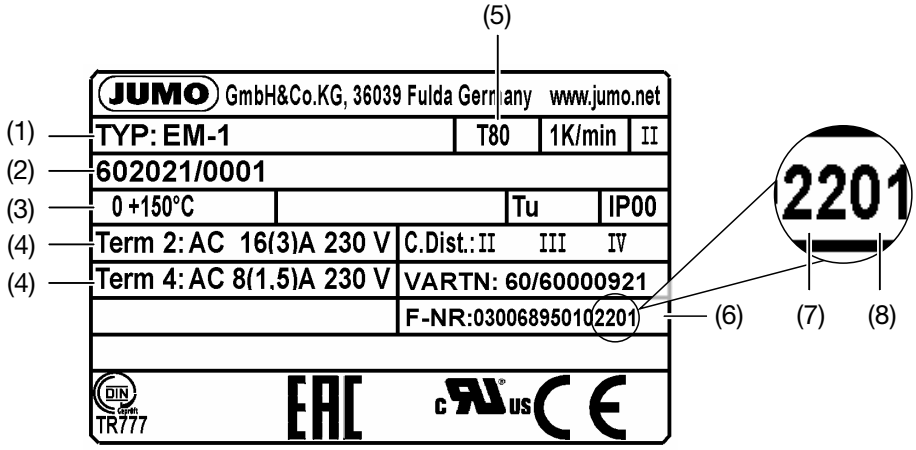
2.3 Identification marking

Depending on the version (for details see nameplate):

3 Identifying the device version

3.1 Nameplate

Exemplary marking on the device housing:



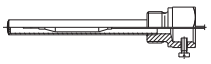
(1) Type
(2) Order code
(3) Regulating or limit value range/ambient temperature at which this thermostat was calibrated (option)
(4) Switching capacity
(5) Permissible ambient temperature
(6) Fabrication number
(7) Year of manufacture
(8) Week of manufacture

3.2 Order details

	(1)	Basic type	
603031		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	
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

3 Identifying the device version

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
	(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 mm²
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

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

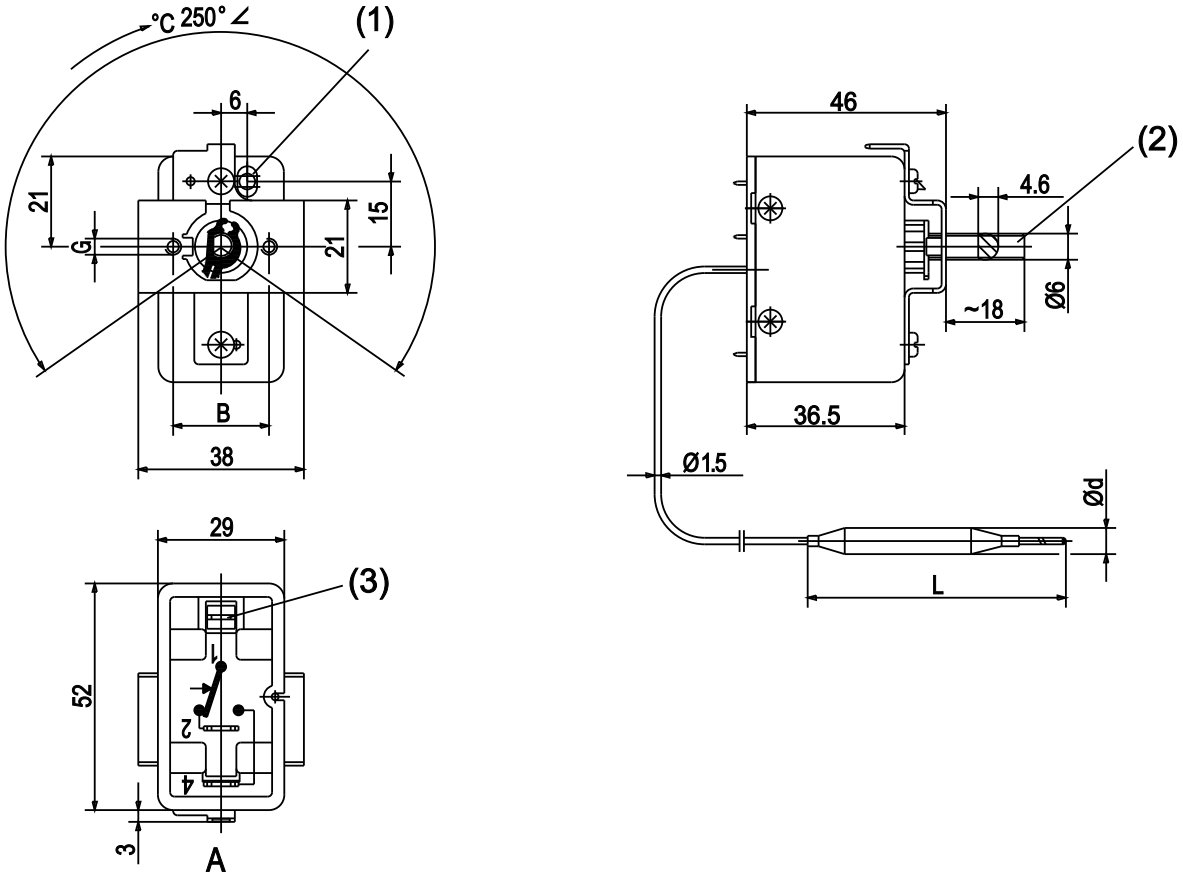
	(9)		(10)		(11)		(12)		(13)		(14)	
		-		-		-		-		/		, ...[a]
	00	-	00	-	000	-	00	-	6	/	574	

[a] List extra codes in sequence, separated by commas.

4 Mounting

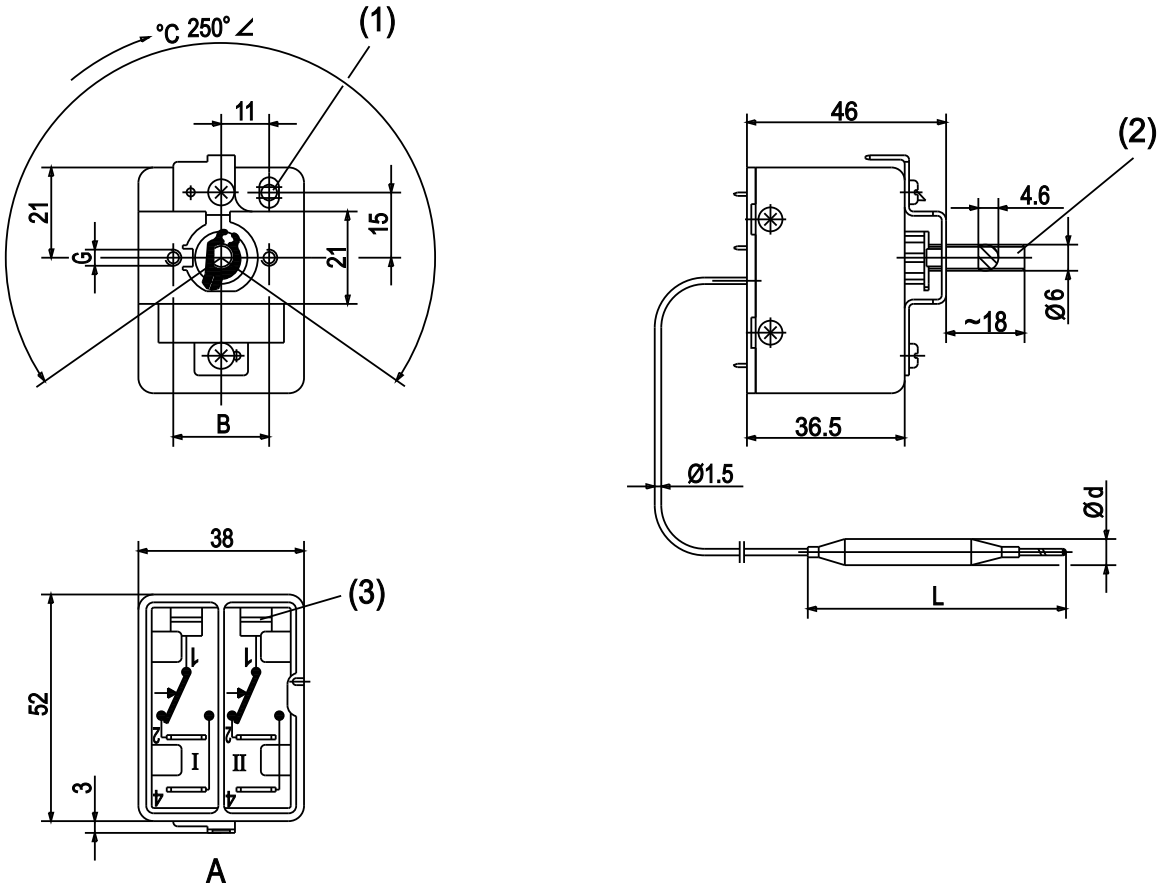
4.1 Dimensions

EM-1, EM-2, EM-3, EM-4, EM-5



(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

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

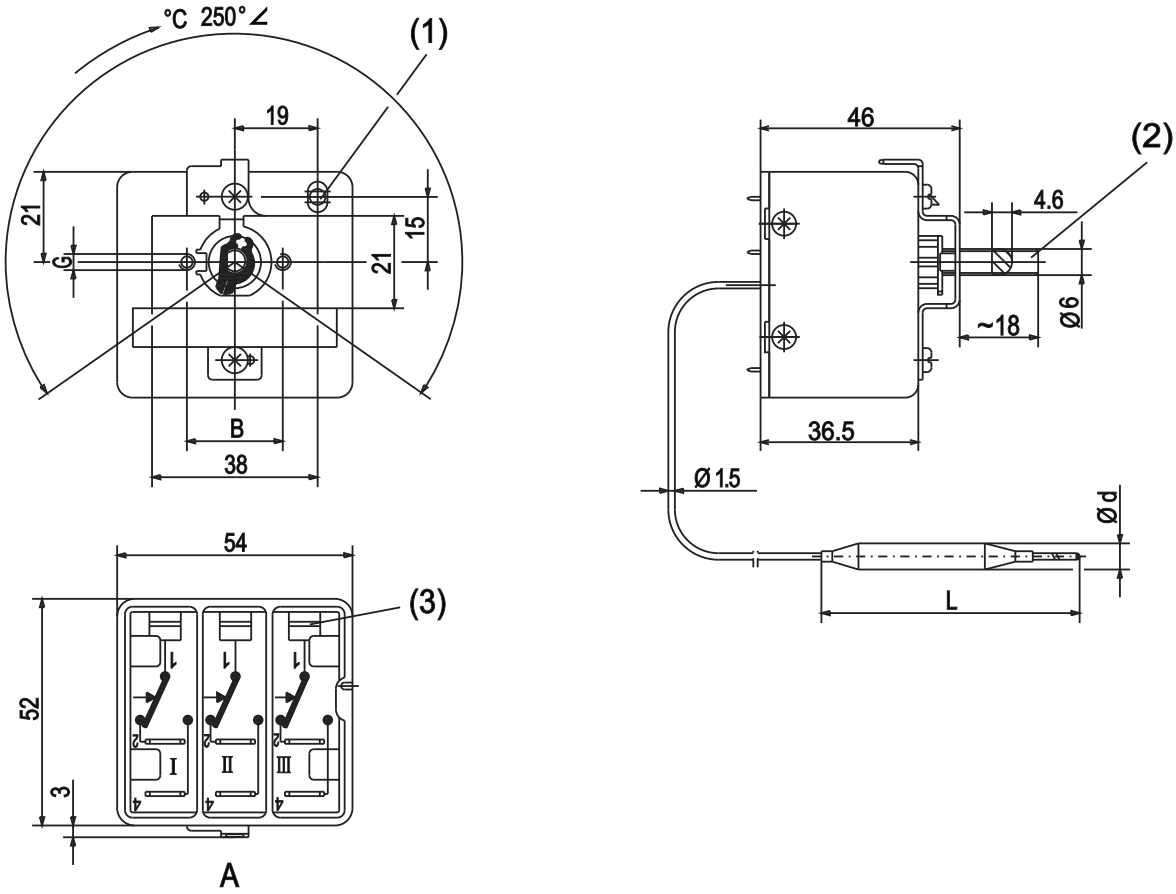
(2) Not applicable with abbreviation 2, 3, 4, 5, 20, 30, 40 and 50

(3) Tab connector DIN 46244-A6,3-0,8

(A) Rear view

4 Mounting

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



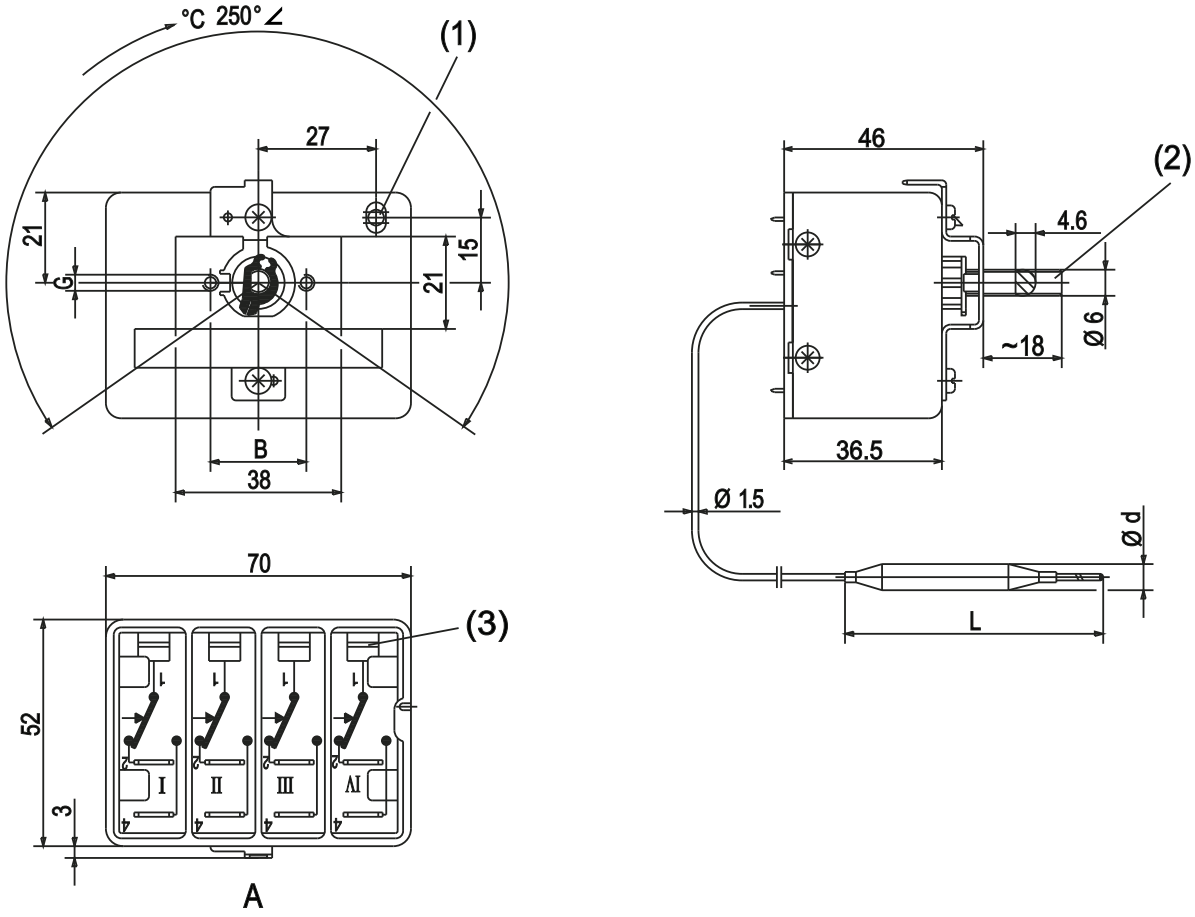
(1) Restart knob only with abbreviation 444, 544

(2) Not applicable with abbreviation 2, 3, 4, 5

(3) Tab connector DIN 46244-A6,3-0,8

(A) Rear view

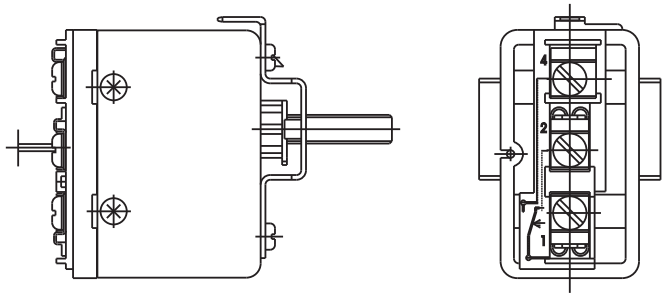
EMF-1333, EMF-2333, EMF-3333



(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



4 Mounting

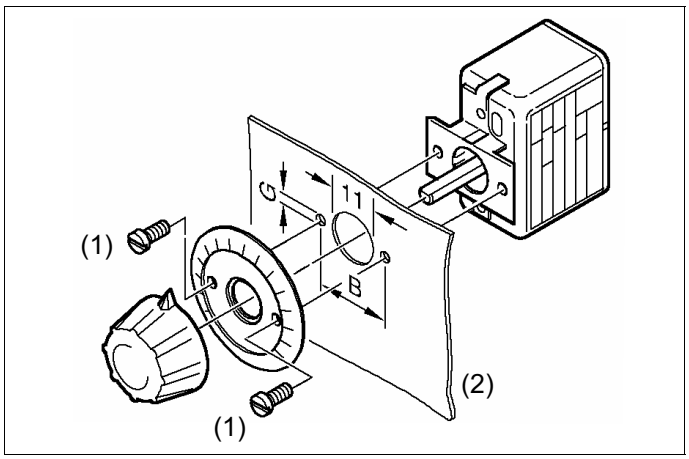
4.2 Fixing the panel-mounted thermostat

Operating position	Any

4.2.1 Mounting the switching head

EM-1

Mounting the switching head with 2 screws M3 on chassis (M4 with extra code 704).

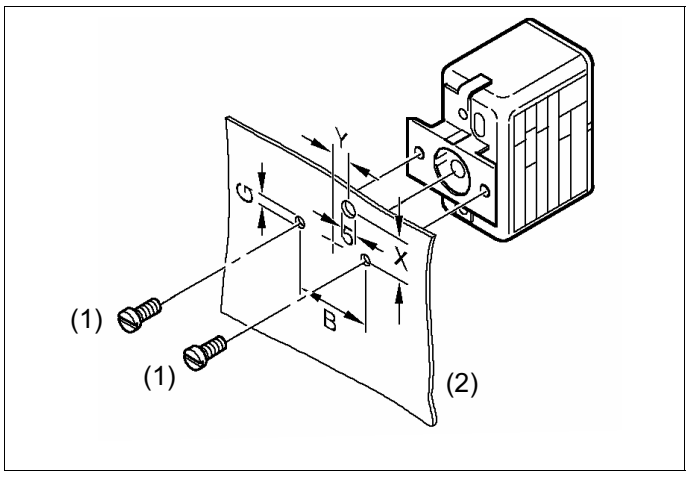


	Dim. (mm)	
	G	B
Standard	3,5	22
Extra code 704	4,5	28
Extra code 705	3,5	33

(1) Screw
(2) Panel

EM-2, EM-3, EM-4, EM-5, EM-20, EM-30, EM-30, EM-40, EM-44, EM-50, EMF-54, EMF-444, EMF-544

Mounting the switching head with 2 screws M3 on chassis (M4 with extra code 704).



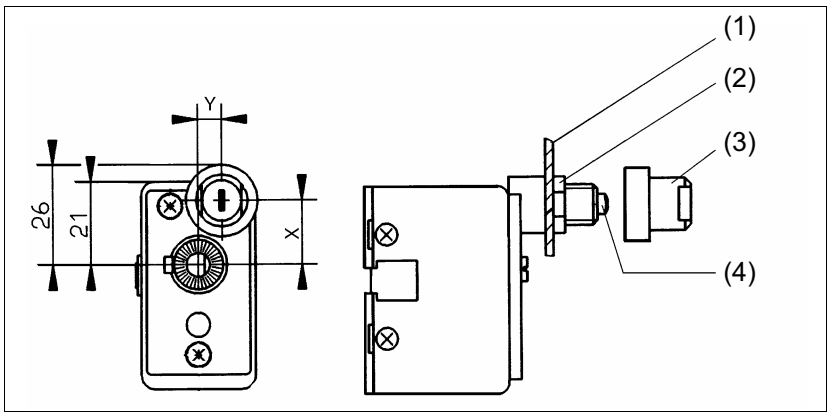
	Dim. (mm)	
	X	Y
EM-2, EM-3, EM-20, EM-30	-	-
EM-4, EM-5	15	6
EM-40, EM-50	15	11
EM-44, EMF-54	15	11
EMF-444, EMF-544	15	19

	G	B
Standard	3,5	22
Extra code 704	4,5	28
Extra code 705	3,5	33

(1) Screw
(2) Panel

EM-4, EM-5, EM-40, EM-50 with central mounting

Extra code 710



	Dim. (mm)	
	X	Y
EM-4, EM-5	16	6
EM-40, EM-50	16	11

(1) Panel
(2) Fixing nut M10 × 1 (13 a/f)
(3) Acorn nut M10 × 1 (10 a/f)
(4) Restart knob

4.3 Capillary, temperature probe and thermowell

4.3.1 General information

CAUTION!

Failure of the device

Cutting or kinking the capillary of the device leads to permanent failure of the functions!

The minimum permissible bending radius of the capillary is 5 mm.

The temperature probe must be mounted in a JUMO thermowell, otherwise the approval of the device becomes invalid.

NOTE!

The temperature probe must be completely immersed in the medium to be measured. The temperature probe or protection tube must **not** come into contact with the walls of the container or pipe.

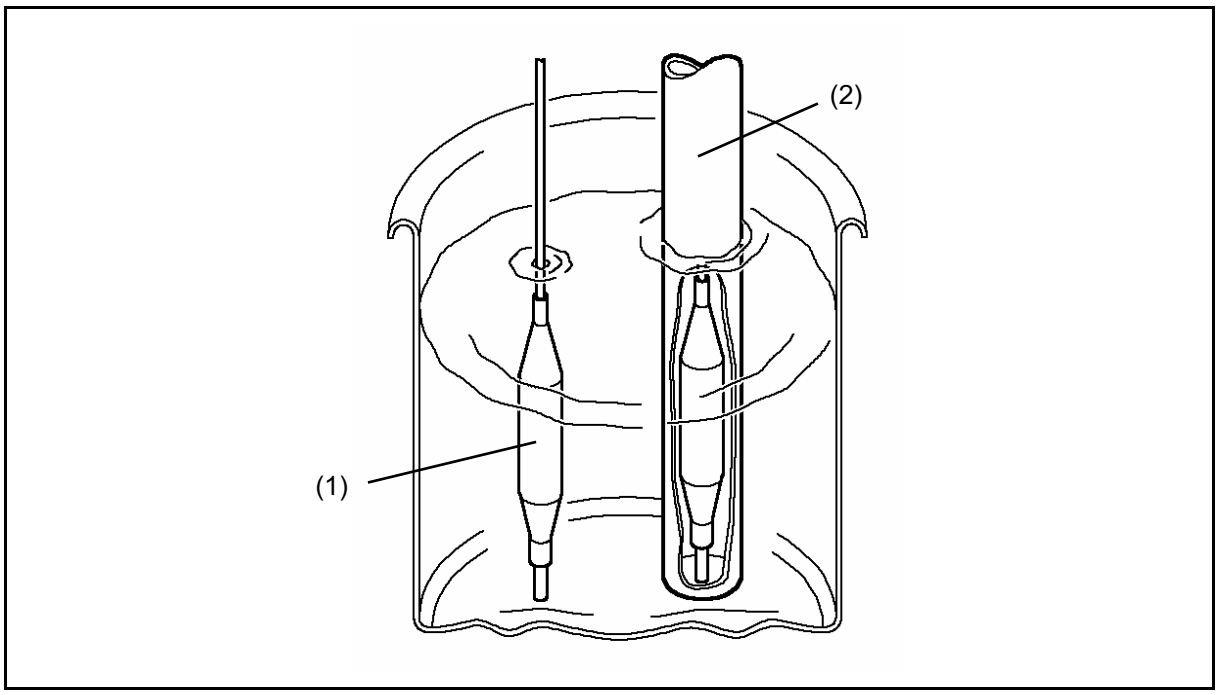
To ensure their overall accuracy, the thermostats must only be used together with the pockets supplied by the factory (diameter D = 8 or 10 mm).

Thermowells with diameter D = 10 mm may only be fitted with probes with diameter d = 8 mm.

Fitting several probes into a common thermowell is permissible with 2 or 3 cylindrical probes with diameter D = 6 mm and thermowells 15 × 0.75 mm. When fitting 2 probes in a common thermowell, the default-supplied pressure spring must be fitted in the thermowell.

For operation in air, process connection 10 (without thermowell) must be chosen.

In the case of thermowells 22, 41, 42, and 45, in materials St.35.8 I, the permissible operating life at operating temperatures above 420 °C is limited to 200,000 hours. The requirements of TRD 508 must be observed for operation in this range.



(1) Immersion tube
(2) Temperature probe

4.3.2 Approved process connections

NOTE!
For detailed information, refer to data sheet 606710.

4.4 Permissible pressure at the thermowell

4.4.1 Thermowells 20, 22/23, 40, and 41/42

CAUTION!

The values given below refer to the maximum loading on the probe mounting concerned. The maximum pressure which can be sealed depends on the mounting conditions and may possibly be lower.

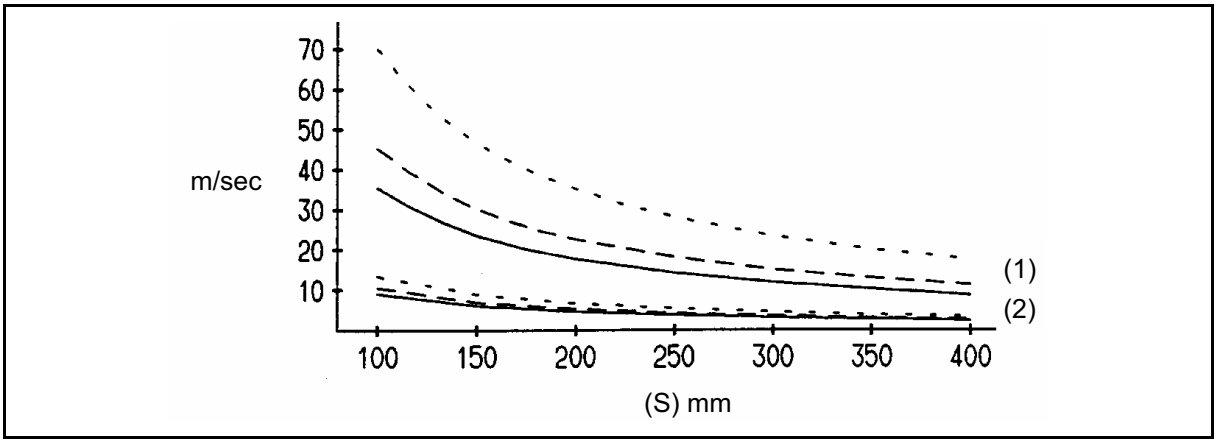
Steel thermowells 22, 23, 32, 41, 42 and 45

Material	
Pipe	St38.8 I
Screw-in nipple up to 300 °C	Steel 1.0038
Weld-in nipple	Steel 1.5415

Temperature in °C	Pipe diameter 8 × 0.75 mm or conical	Pipe diameter 10 × 0.75 mm	Pipe diameter 15 × 0.75 mm
	Maximum permissible pressure in bar		
100	89	72	48
150	83	67	45
200	78	63	42
300	59	47	32
350	50	40	27

Permissible incident flow velocity [m/s] at the maximum permissible pressure loading and different immersion tube length "S"

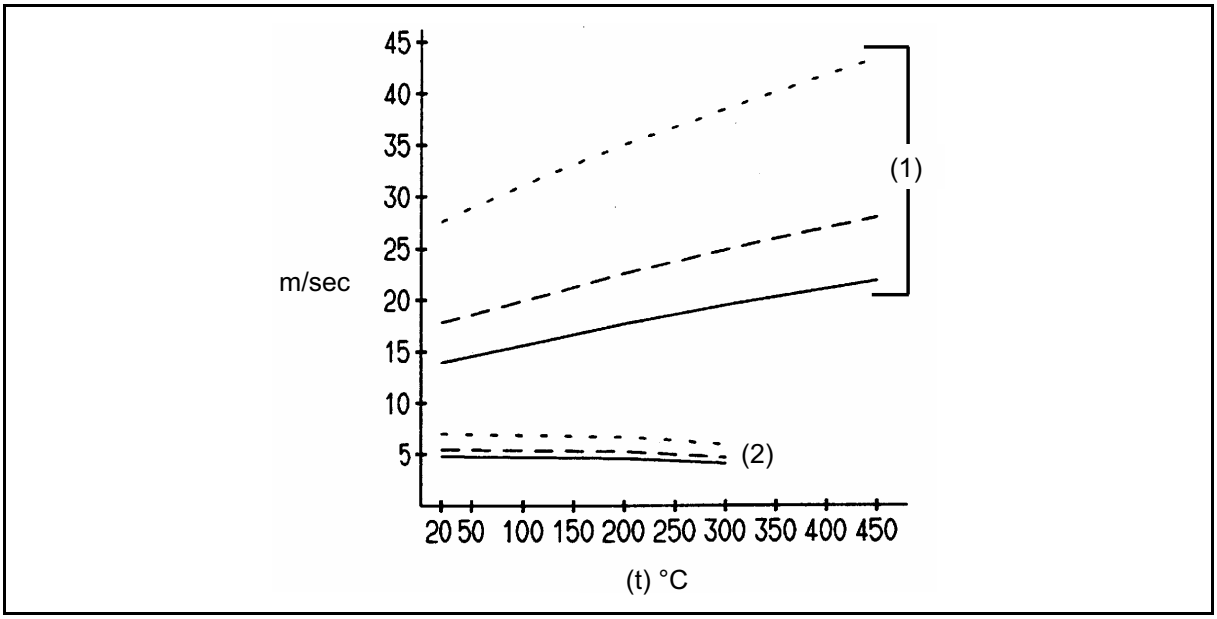
Material	St38.8 I
Temperature	200 °C
Heat transfer	Air, water, oil
Pipe diameter D	8 mm _____ 10 mm - - - - - - - 15 mm .....



(1) Air
(2) Water, oil

Permissible incident flow velocities [m/s] at maximum permissible pressure load and different immersion tube temperature "t"

Material	St38.8 I
Immersion tube length S	200 mm
Heat transfer	Air, water, oil
Pipe Diameter	8 mm _____ 10 mm - - - - - - - 15 mm .....



(1) Air
(2) Water, oil

Stainless steel thermowells 20, 22, 40 and 41/42

Material Pipe and nipple	Stainless steel (1.4571)

Temperature in °C	Pipe diameter 8 × 0.75 mm or conical	Pipe diameter 10 × 0.75 mm	Pipe diameter 15 × 0.75 mm
	Maximum permissible pressure in bar		
100	92	74	50
150	88	71	48
200	83	67	45
300	72	58	39
400	67	54	36

Brass thermowells 20 and 40

Material Pipe and nipple	CuZn

Temperature in °C	Pipe diameter 8 × 0.75 mm	Pipe diameter 10 × 0.75 mm	Pipe diameter 15 × 0.75 mm
	Maximum permissible pressure in bar		
100	50	40	27
150	48	39	26

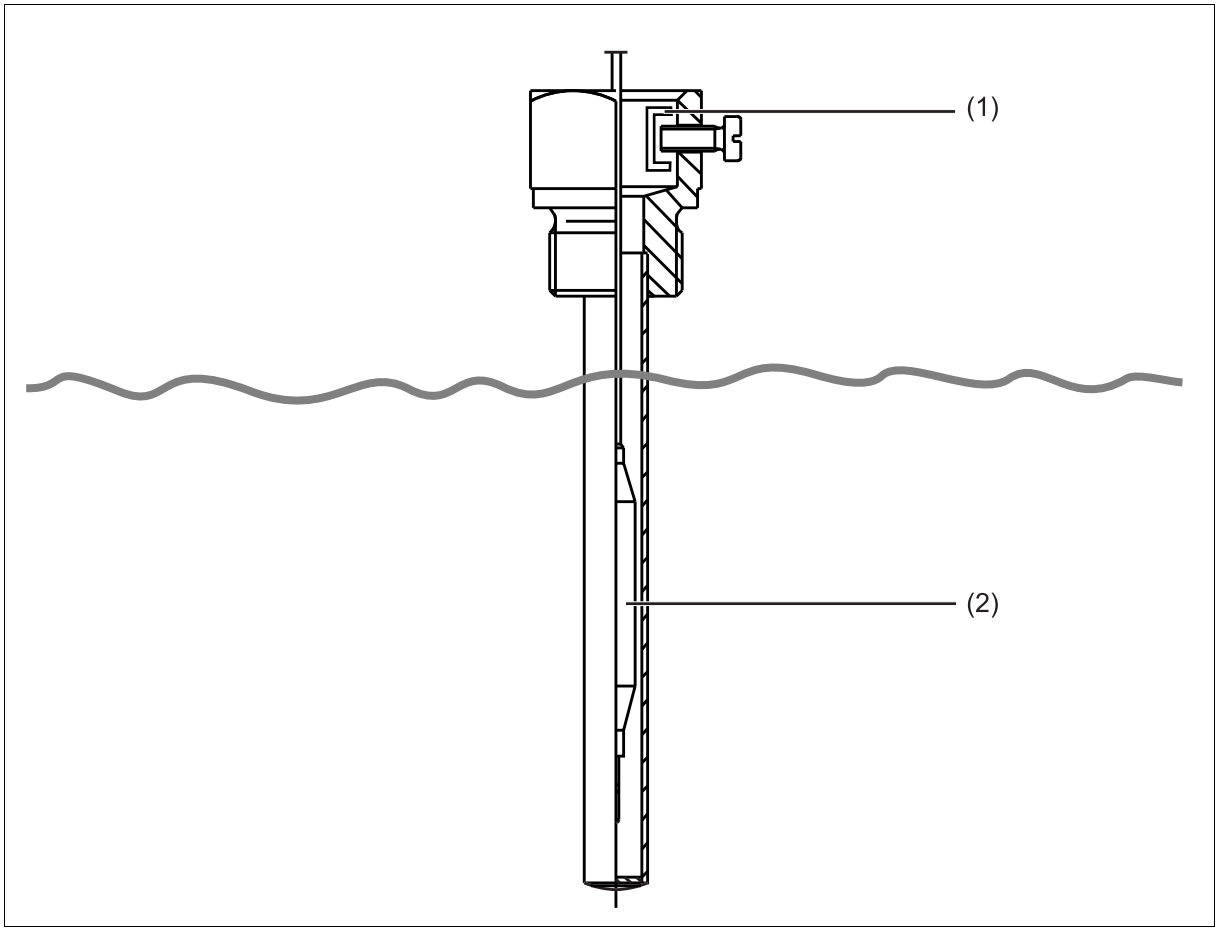
Probe connections 50, 52 and 54

Material Pipe	CuZn	Steel (1.0038)	Stainless steel (1.4571)
Temperature	200	300	400

Probe material	Ø mm	Switching function	
		TR, TW, TB	STB, STW (STB)
		bar	bar
Cu-DHP	4	6	2
	5	5	2
	6	4	2
	7	3	2
	8	3	2
	9	3	2
	10	3	2
St35 (1.4571)	4 to 10	10	2

CAUTION!

Types 10, 15, 21, 60 and 65 may only be used in unpressurized media.



(1) Clamping piece
(2) Temperarture probe

NOTE!

The temperature probe must be immersed in the medium for its entire length, otherwise there will be appreciable deviations from the switching point.

For connection types 20, 21 and 22/23, the temperature probe is fixed in the protective sleeve with the clamping piece.

NOTE!

If you determine an external defect – also a mechanical way – the differential pressure transmitter has to be sent for repair to the manufacturer.

5.1 Installation notes

CAUTION!

The electrical connection must only be made by qualified personnel.

The choice of cable, the installation and the electrical connection must conform to the requirements of VDE 0100 „Regulations for the installation of power circuits with nominal voltages below 1000 V“, or the appropriate local regulations..

If contact with live parts is possible while working on the unit, it must be completely disconnected from the supply.

Earth the instrument at the PE terminal to the protective conductor. This cable must have a cross-section that is at least as large as the supply cables. Earth cables must be run in a star configuration to a common earth point which is connected to the protective earth of the supply. Do not loop earth cables, i.e. do not run them from one instrument to another.

Apart from faulty installation, incorrect settings on the thermostat can affect the proper functioning of the following process or lead to damage. Setting up must therefore be restricted to qualified personnel. Please observe the appropriate safety regulations in this respect.

5.2 Electrical connection

- Terminals and connections are suitable for internal conductors
- Connection joints are suitable for permanently installed lines
- Cable supply takes place without strain relief
- Device complies with protection class I

WARNING!

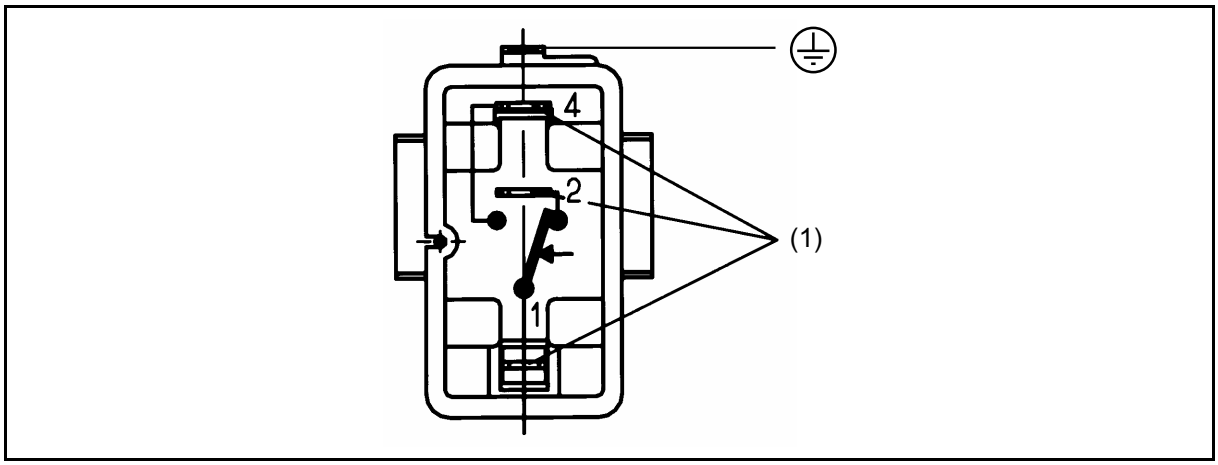
Capillary tube without protection conductor function

The user must provide the required protection against electric shock for the probe and the capillary tube.

5 Installation

Plug connection

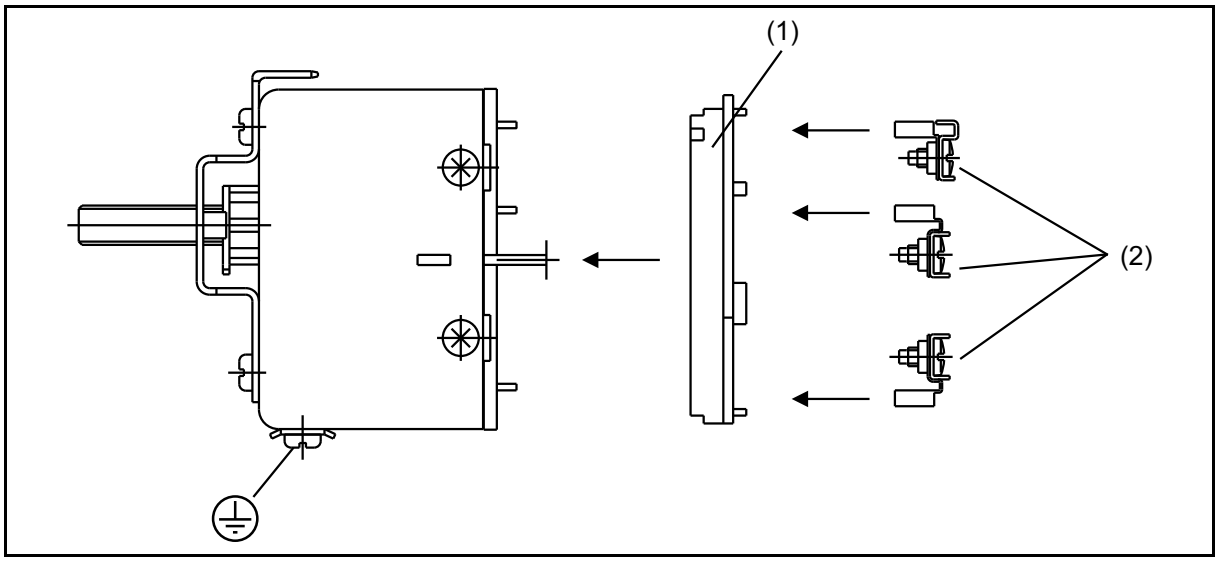
Standard



(1) Tab connector DIN 46244-A, 6,3 × 0,8

Screw connection

Extra code 699

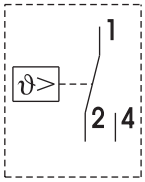


(1) Plug-in sleeve 6.3 with connection screw, suitable for conductor cross-sections up to 2.5 mm^2, attachment type X, no special tools

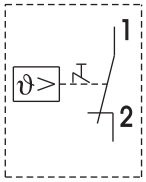
(2) Terminal strip

5.3 Connection diagram

EM-1, EM-2, EM-3

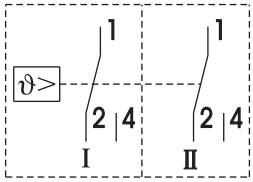


EM-4, EM-5

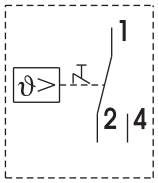


EM-13, EM-23, EM-33

Setpoint: I
Sequence contact: II

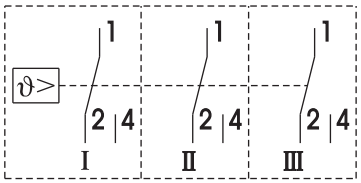


EM-4/574, EM-5/574



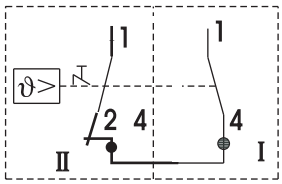
EMF-133, EMF-233, EMF-333

Setpoint: I
Sequence contact: II, III



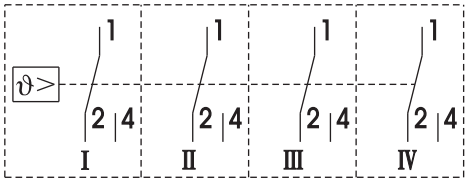
EM-40, EM-50

n.c. (break) contact
on measuring system failure
and T < -10 °C: I
Limit value: II

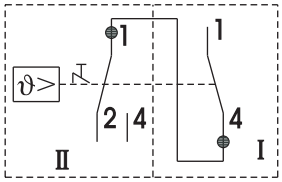


EMF-1333, EMF-2333, EMF-3333

Setpoint: I
Squence contact: II, III, IV

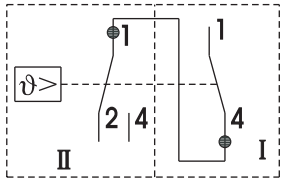


EM-40/574, EM-50/574



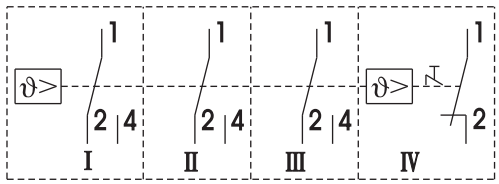
EM-20, EM-30

n.c. (break) contact
on measuring system failure
and T < -10 °C: I
Limit value: II



Example EMF-1334

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



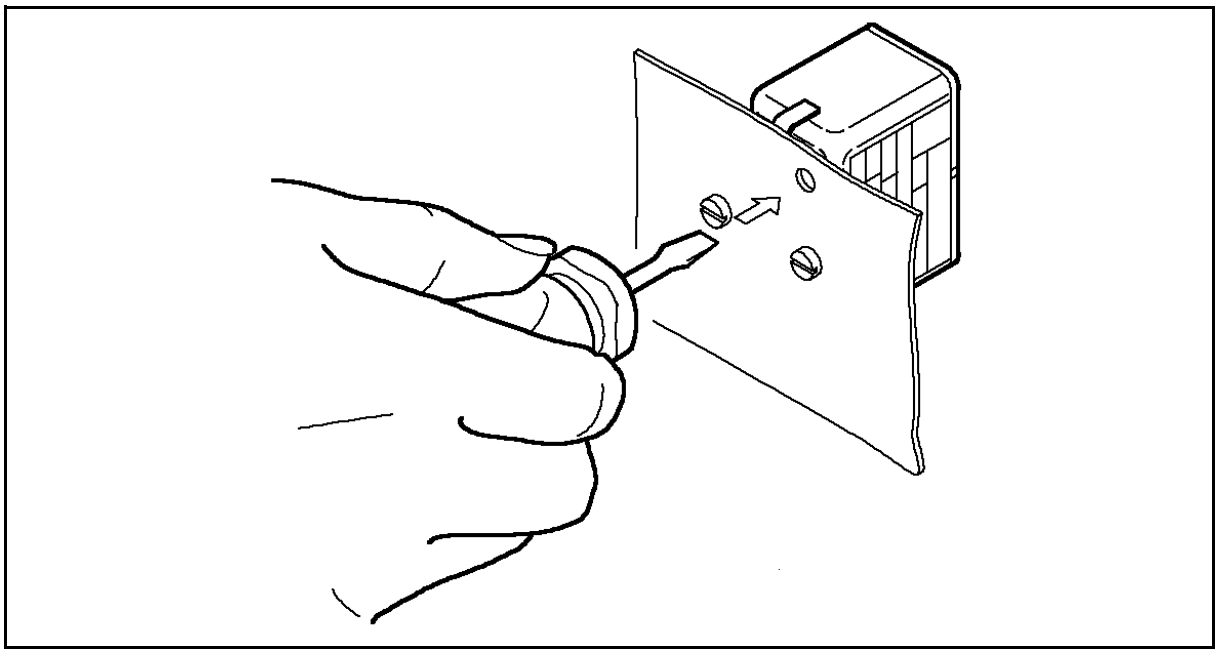
6 Settings

6.1 Unlocking the TB or STB

EM-4, EMF-4.., EM5-, EMF-5.., EM-40, EM-50 with switching head mounting

Extra code 704, 705

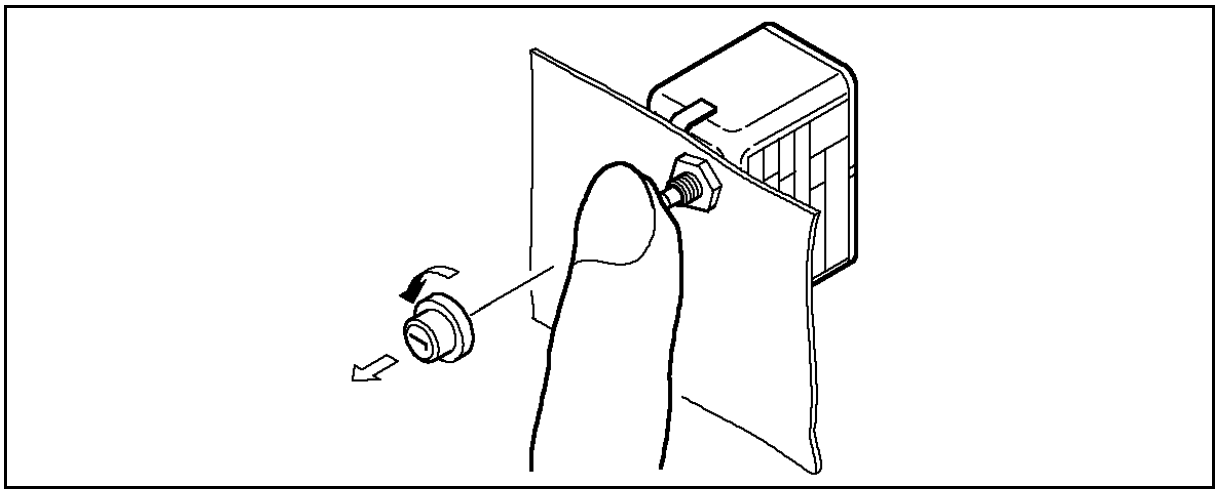
After the temperature has dropped by about 10 % of span below the set limit(critical temperature), the microswitch can be reset.



1. Push the reset button using a small screwdriver.

EM-4, EMF-4.., EM5, EMF-5.., EM-40, EM-50 with central mounting

Extra code 710

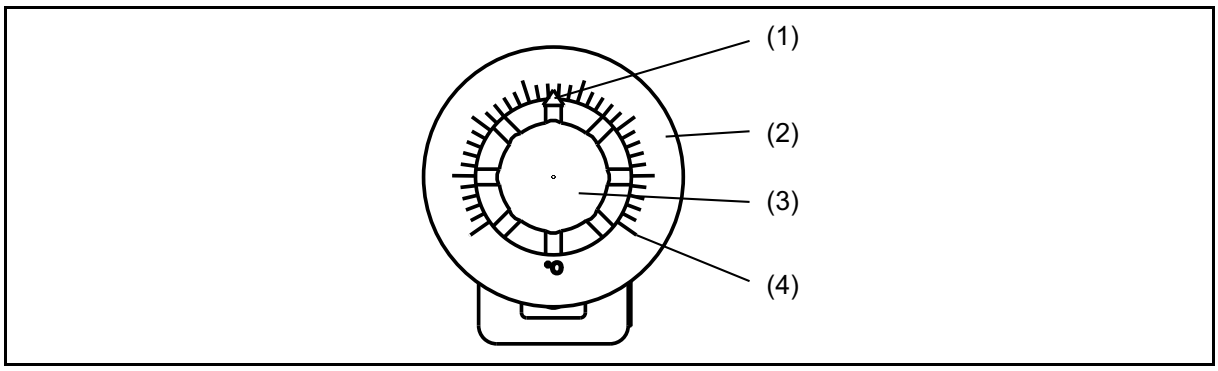


1. Unscrew cap.
2. Press reset button.
3. Screw cap back into position.

6.2 Setpoint adjustment

EM-1, EMF-1..

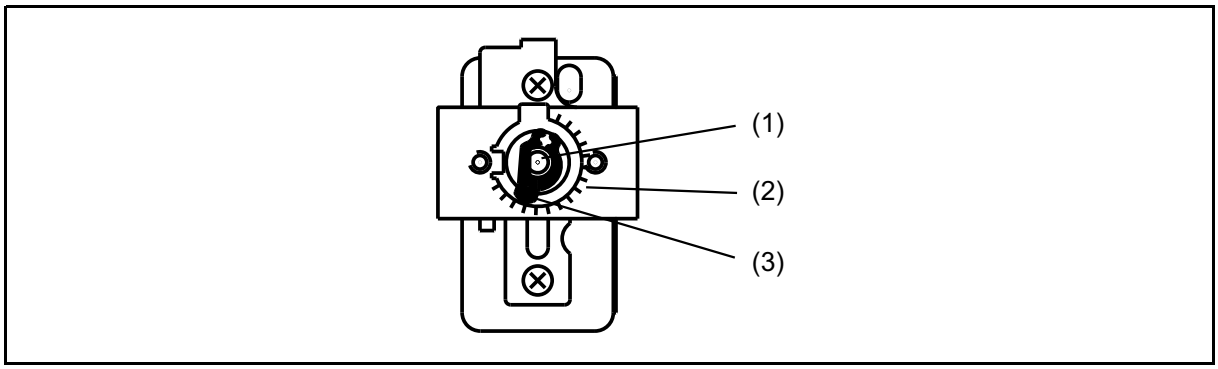
1. Rotate the setpoint knob by hand over the external scale.



(1) Setpoint marker
(2) External scale
(3) Setpoint knob
(4) Scale graduation

EM-2, EMF-2.., EM-5, EMF-5.., EM-20, EM-50

1. Rotate the setpoint spindle over the internal scale using a screwdriver.



(1) Setpoint spindle
(3) Scale graduation
(4) Setpoint marker

EM-3, EMF-3.., EM-4, EMF-4.., EM-30, EM-40

NOTE!

The limit value setting is fixed at the factory and sealed. It must subsequently **not** be adjusted.

6.3 Self-monitoring on the STB and STW (STB)

NOTE!

If the measuring system fails, i.e. if the expansion liquid has leaked, then the pressure under the diaphragm drops and the circuit is permanently open. It is **no longer** possible to reset the system.

The electrical circuit opens when cooling the probe of STW (STB) and STB down to the negative temperature range, but it then closes again if the temperature rises. The STB must be unlocked manually if the minimum probe temperature is exceeded.

The STW unlocks itself automatically.

6.4 Use of the STW (STB) as STB

CAUTION!

The lock-out facility to DIN EN 14597 must be ensured by the subsequent circuit. This circuit must comply with VDE 0116.

7.1 Control ranges and probe table

For TR, TW, TB – liquid-filled

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

For TR, TW, TB – gas-filled

Control range/limit value range	Switching differential	Max. probe temperature	Max. switching head temperature	Max. capillary length	Max. sequence contact gap	Probe length "L", probe Ø "d" in mm	
°C	%	°C	°C	in mm	K	Ø 6 (Standard)	Ø 8
20 to 400	5 10	460 500	80	5000	75 200	237 127	137 81
20 to 500	3/5 6 10	575	80	1000 5000 5000	48 95 250	278 276 95	158 106 65

7 Technical data

7.2 Control ranges and temperature probes

For STB and STW (STB) – liquid-filled

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

For STB and STW (STB) – gas-filled

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

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).

7.3 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.

7.4 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)		
Overvoltage 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		

7 Technical data

7.5 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 setupoint value For the synchrozized version, specify "0" as the sequence contact gap.			

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 %	-	±1.5 %
	5 %	3 %, 5 %	±3 %
	7 %	6 %, 10 %	±4 %
TW	1 %, 2.5 %	-	±1.5 %
	5 %	3 %, 5 %	±3 %
	7 %	6 %, 10 %	±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

7 Technical data

7.6 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

7.7 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.

7.8 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
DIN	
Testing agency	DIN CERTCO/TÜV Süd
Certificates/certification numbers	STW(STB)775 S
Inspection basis	DIN EN 14597
Valid for	EM-20, EM-30
DIN	
Testing agency	TÜV Süd
Certificates/certification numbers	B_{10d} = 250.000[a]
Inspection basis	DIN EN ISO 13849-1
Valid for	EM-20, EM-30, EM-40, EM-50
PED	
Testing agency	TÜV Süd
Certificates/certification numbers	Z-IS-TAF-MUC-18-06-2652099-07102504
Inspection basis	2014/68/EU, DIN EN 14597
Valid for	EM-20, EM-30, EM-40, EM-50
UL	
Testing agency	UL
Certificates/certification numbers	E66358
Inspection basis	UL 873, CSA-22.2 No. 24
Valid for	EM-...
UL	
Testing agency	UL
Certificates/certification numbers	MH45736
Inspection basis	UL 353, CSA-22.2 No. 24
Valid for	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	Gost Norm AG
Certificates/certification numbers	TC RU C-DE.AB98.B.00348
Inspection basis	Technical rules of the customs union Russia/Belarus/Kazakhstan
Valid for	EM-...
Railway application	
Testing agency	JUMO
Certificates/certification numbers	-
Inspection basis	EN 50155
Valid for	EM-... with extra code 950

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

[b] Russian documentation upon request.

8 Maintenance, cleaning and returns

8.1 Maintenance

The device is maintenance-free.

In case of repair, please return the device clean and complete. Use the original packaging for the return.

8.2 Cleaning

NOTE!

Avoid damage to the device due to improper cleaning.

Do not damage the device, especially the wetted parts.
Cleaning agents must not attack the surface and seals.

8.3 Returns

WARNING!

Personal injury, property damage, environmental damage

Residual medium on the removed product can cause damage to persons, the environment and equipment.

▶ Take adequate precautionary measures.

NOTE!

The device may only be disassembled in a safe and voltage-free state of the plant by qualified personnel.

NOTE!

All information necessary for return is included in the Supplementary sheet for product returns.

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Internet: www.jumo.net

More than sensors + automation

EU-Konformitätserklärung

EU declaration of conformity / Déclaration UE de conformité

Dokument-Nr. *Document No. / Document n°.*	CE 639
Hersteller *Manufacturer / Etabli par*	JUMO GmbH & Co. KG
Anschrift *Address / Adresse*	Moritz-Juchheim-Straße 1, 36039 Fulda, Germany

Produkt
Product / Produit

Name *Name / Nom*	**Typ** *Type / Type*	**Typenblatt-Nr.** *Data sheet no. / N° Document d'identification*
Einbau-Thermostat EM	602021	602021

Produktbeschreibung
Product description / Description du produit

Elektromechanischer Einbau-Thermostat.

Wir erklären in alleiniger Verantwortung, dass das bezeichnete Produkt die Anforderungen der Europäischen Richtlinien erfüllt.

We hereby declare in sole responsibility that the designated product fulfills the requirements of the European Directives.

Nous déclare sous notre seule responsabilité que le produit remplit les Directives Européennes.

9 Declaration of conformity

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1. Richtlinie
Directive / Directive

Name *Name / Nom*	EMC 2014/30/EU
Konformitätsbewertungsverfahren *Conformity assessment procedure / Procédure d'évaluation de la conformité*	Mod. A
Datum der Erstanbringung des CE-Zeichens auf dem Produkt *Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit*	1996

Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Referenz *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
EN 60730-1	2016+A1:2019	The edition 2011 is met for presumption of conformity
EN 60730-2-9	2019+A1:2019+A2:2020	The edition 2010 is met for presumption of conformity

Gültig für Typ
Valid for Type / Valable pour le type
602021/...

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2. Richtlinie
Directive / Directive

Name *Name / Nom*	LVD 2014/35/EU
Konformitätsbewertungsverfahren *Conformity assessment procedure / Procédure d'évaluation de la conformité*	Mod. A
Datum der Erstanbringung des CE-Zeichens auf dem Produkt *Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit*	1995

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Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Referenz *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
EN 60730-1	2016+A1:2019	The edition 2011 is met for presumption of conformity
EN 60730-2-9	2019+A1:2019+A2:2020	The edition 2010 is met for presumption of conformity

Gültig für Typ
Valid for Type / Valable pour le type
602021/...

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3. Richtlinie
Directive / Directive

Name *Name / Nom*	PED 2014/68/EU
Konformitätsbewertungsverfahren *Conformity assessment procedure / Procédure d'évaluation de la conformité*	Mod. B(B)+D
Datum der Erstanbringung des CE-Zeichens auf dem Produkt *Date of first application of the CE mark to the product / Date de 1ère application du sigle sur le produit*	1996

Gültig für Typ
Valid for Type / Valable pour le type
602021/...

3.1 EU-Baumusterprüfbescheinigung
EU type examination certificate / Certificat d'examen de type UE

Zertifikatsnummer *Certificate number / Numéro de certificat*	Z-IS-TAF-MUC-18-06-2652099-07102504
Notifizierte Stelle *Notified Body / Organisme notifié*	TÜV SÜD Industrie Service GmbH, Westendstraße 199, 80686 München, Germany

9 Declaration of conformity

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More than sensors + automation

Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Referenz *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
DIN EN 14597	2015-02	

Qualitätssicherung bezogen auf den Produktionsprozess
Quality assurance of the production process / L'assurance de la qualité de la production

Zertifikatsnummer *Certificate number / Numéro de certificat*	DGR-0036-QS-989-20 Rev.1
Notifizierte Stelle *Notified Body / Organisme notifié*	TÜV SÜD Industrie Service GmbH, Westendstraße 199, 80686 München, Germany
Kennnummer *Identification no. / N° d'identification*	0036

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4. Richtlinie
Directive / Directive

Name *Name / Nom*	RoHS 2011/65/EU
Konformitätsbewertungsverfahren *Conformity assessment procedure /* *Procédure d'évaluation de la conformité*	Mod. A
Datum der Erstanbringung des CE-Zeichens auf dem Produkt *Date of first application of the CE mark to the product /* *Date de 1ère application du sigle sur le produit*	2017

Angewendete Normen/Spezifikationen
Standards/Specifications applied / Normes/Spécifications appliquées

Referenz *Reference / Référence*	**Ausgabe** *Edition / Édition*	**Bemerkung** *Comment / Remarque*
VDK Umweltrelevante Aspekte bei der Produktentwicklung und -gestaltung	V1	

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More than sensors + automation

Gültig für Typ
Valid for Type / Valable pour le type
602021/...

Aussteller
Issued by / Etabli par
JUMO GmbH & Co. KG

Ort, Datum
Place, date / Lieu, date
Fulda, 2021-10-06

Rechtsverbindliche Unterschriften
Legally binding signatures /
Signatures juridiquement valable

Bereichsleitung Globaler Vertrieb
i. V. Markus Belmer

Qualitätsbeauftragter und Leiter Qualitätswesen
i. V. Harald Gienger

10 China RoHS

	JUMO More than sensors + automation
产品组别 Product group: 602021	产品中有害物质的名称及含量 China EEP Hazardous Substances Information
部件名称 Component Name	

	铅 （Pb）	汞 （Hg）	镉 （Cd）	六价铬 （Cr(VI)）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
外壳 Housing (Gehäuse)	X	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	○	○	○	○	○	○
螺母 Nuts (Mutter)	○	○	○	○	○	○
螺栓 Screw (Schraube)	○	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。
This table is prepared in accordance with the provisions SJ/T 11364.
○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
Indicate the hazardous substances in all homogeneous materials' for the part is below the limit of the GB/T 26572.

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
Indicate the hazardous substances in at least one homogeneous materials' of the part is exceeded the limit of the GB/T 26572.

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