

ATHs-1



ATHf-70/g

Surface-mounting Thermostats Series ATH

B 60.3021.0

Operating Instructions

05.03/00073784

Please read these Operating Instructions before commissioning the instrument. Keep the manual in a place which is accessible to all users at all times. Please assist us to improve these operating instructions where necessary. Your suggestions will be welcome.

Phone	in Germany	0661 6003-716
	abroad	+49 661 6003-0
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	abroad	+49 661 6003-607

All necessary settings and possible adjustments inside the instrument are described in these operating instructions. However, if any problems should still arise during commissioning, you are asked not to carry out any unauthorized manipulations on the unit. You could endanger your rights under the instrument warranty! Please contact the nearest subsidiary or the main factory.

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1.1 Typographical conventions

1.1.1 Warnings



Danger

This symbol is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately!



Caution

This symbol is used when there may be **damage to equipment** if the instructions are disregarded or not followed accurately!

1.1.2 Note signs



Note

This symbol is used when your **special attention** is drawn to a remark.



Reference

This symbol refers to **further information** in other chapters or sections.

abc[1]

Footnote

Footnotes are notes which **refer to certain points** in the text. Footnotes consist of two parts:

Marking in the text and the footnote text.

The text markings are arranged as continuous superscript numbers.

The footnote text (in smaller typeface) is placed at the bottom of the page and starts with a superscript number.

*****

Action

This symbol indicates that an **action to be performed** is described.

The individual steps are marked by this asterisk, e.g.

***** Adjust setpoint

1 Introduction

1.2 Application

Surface-mounting thermostats Series ATH are approved as:

- ❏ Temperature controller (TR)
- ❏ Temperature monitor (TW)
- ❏ Temperature limiter (TB)
- ❏ Safety temperature limiter (STB)
- ❏ Safety temperature monitor STW (STB)
- ❏ Type examination to:
  - DIN 3440
  - Pressure Equipment Directive 97/23/EC



Cutting through or kinking the capillary will lead to permanent instrument failure !

1.3 Conformity



Surface-mounting thermostats Series ATH conform to VDE 0631.

1.4 Safety notes

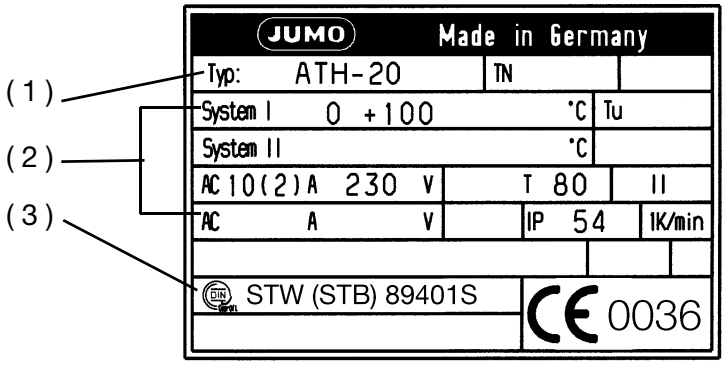
Physical and toxicological properties of the media which may escape in the event of a system fracture:

Range with top end of scale	Danger-ous reaction	Fire / explosion hazard		Water contami-nation	Toxicological data		
		Ignition temp. °C	Explosion limit % v/v		irritant	danger to health	toxic
liquid-filled							
< +200°C	no	+280°C	1.2 — 7.5	yes	yes	1)	no
≥ +200°C ≤ +350°C	no	+490°C	1.0 — 3.5	yes	yes	1)	no
gas-filled							
≥ +400°C ≤ +500°C	no						



1) The filling liquid may escape in the event of a measuring system fracture. At present there is no restrictive statement from the health authorities concerning any danger to health over short periods and at low concentrations, e.g. after a fracture of the measuring system.

2.1 Nameplate



(1) Type code / part number / serial number
(see type designation below)

(2) Control range / rating / permissible ambient temperature / protection

(3) Mark of conformity

2.2 Type designation

Type designation

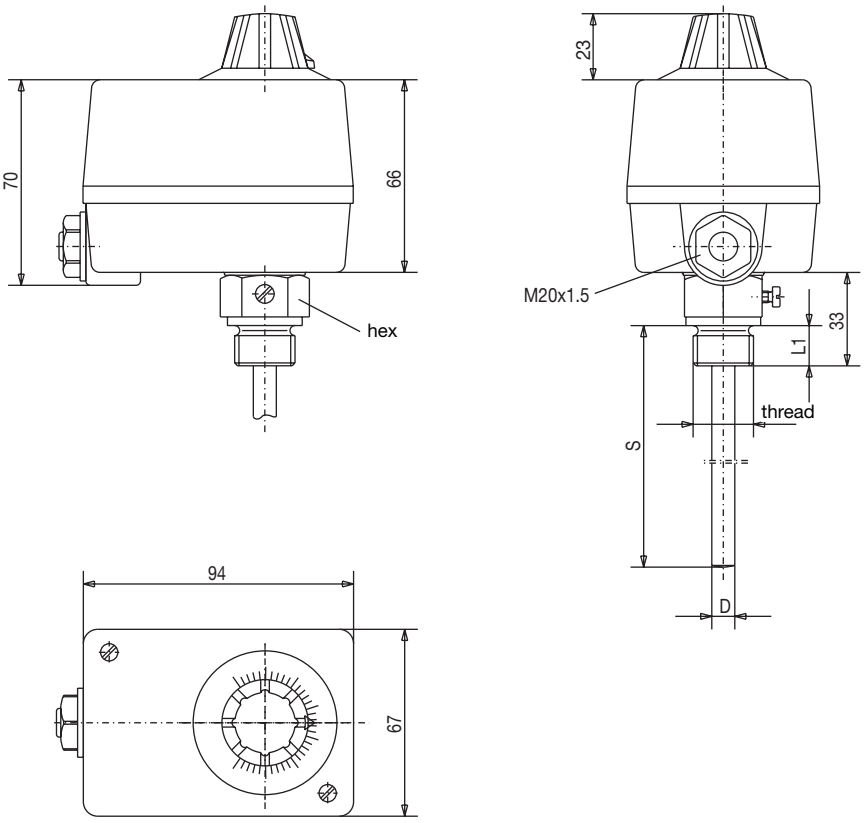
ATH . - . ./

ATH	surface-mounting thermostat with microswitch
s	with screw-in pocket attached to the case (rigid stem) (pocket U or UZ)
f	with capillary (pocket U)
-1	temperature controller (TR) with changeover contact
-2	temperature monitor (TW) with changeover contact
-7	temperature limiter (TB) with n.c. (break) contact
-20	safety temperature monitor STW (STB) with changeover contact
-70	safety temperature limiter (STB) with n.c. (break) contact and lock-out
/au	snap-action switch, gold-plated contacts
/U	only for TB and STB. Microswitch with n.c. (break) contact, lock-out and additional signal contact

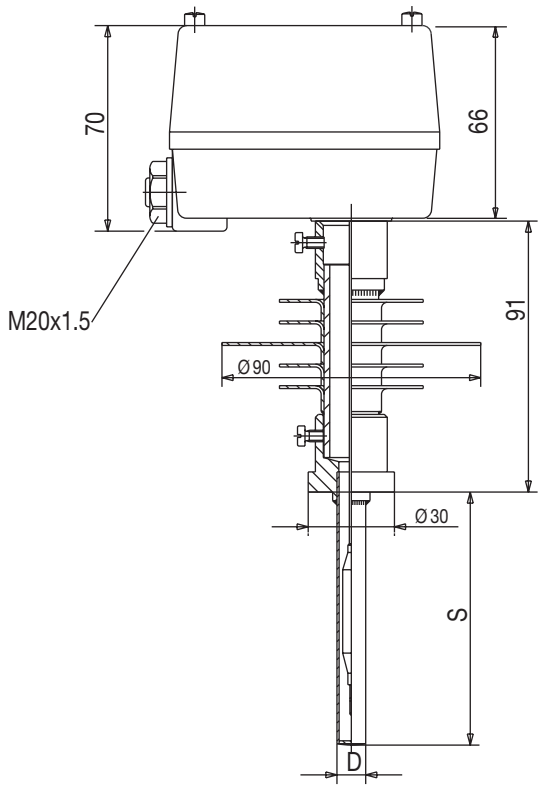
3 Mounting

3.1 Dimensions

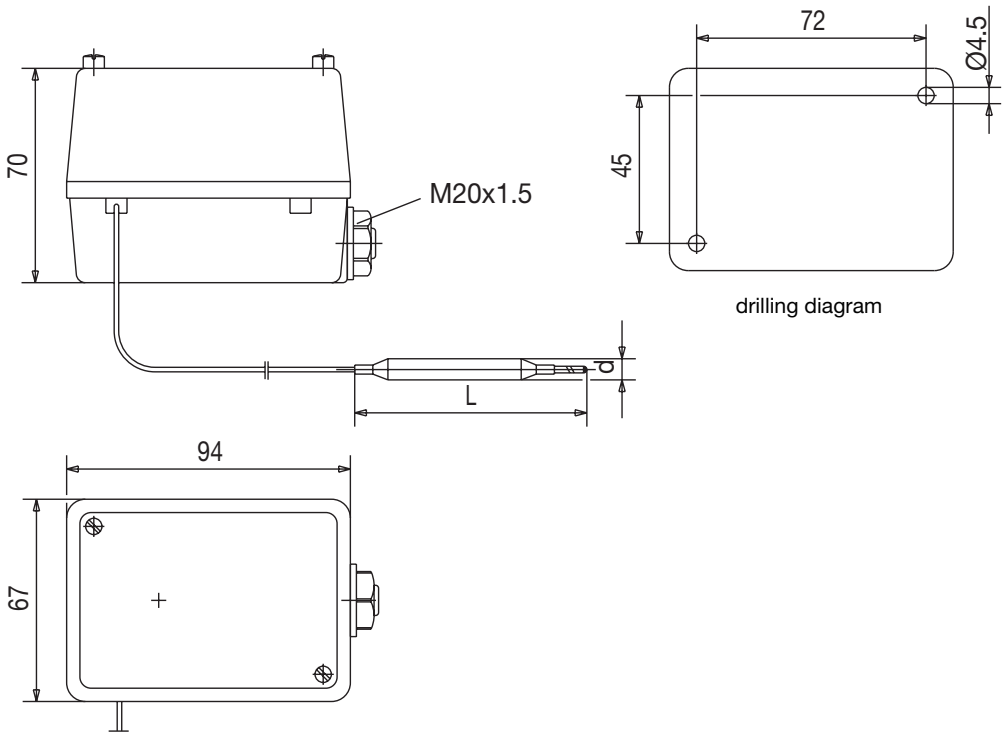
ATHs-1,
with pocket U



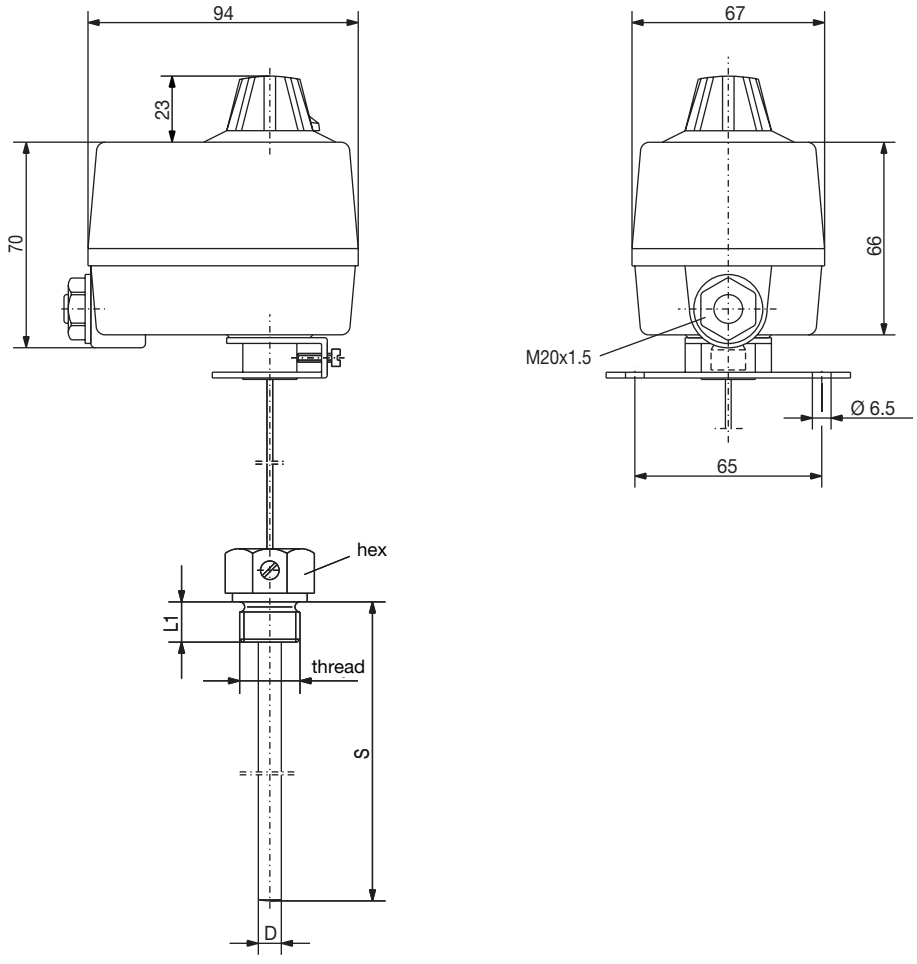
ATHs-2,
ATHs-20
with pocket
UZS



ATHf-2/r, ATHf-20/r with plain cylindrical probe A, no pocket

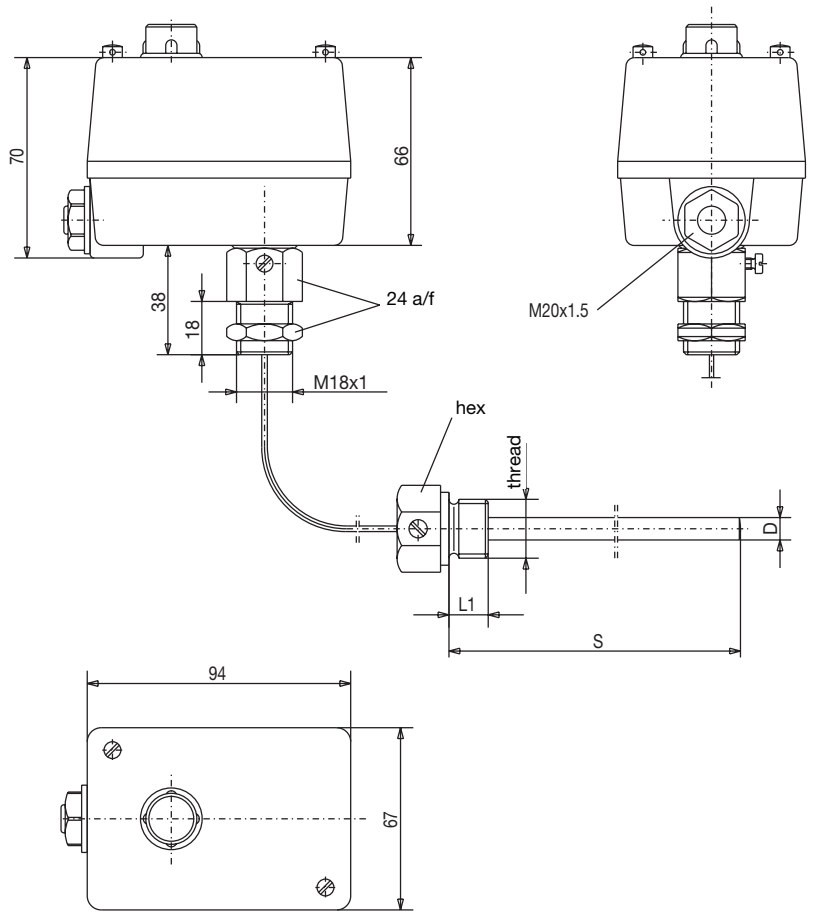


ATHf-1/b, with pocket U

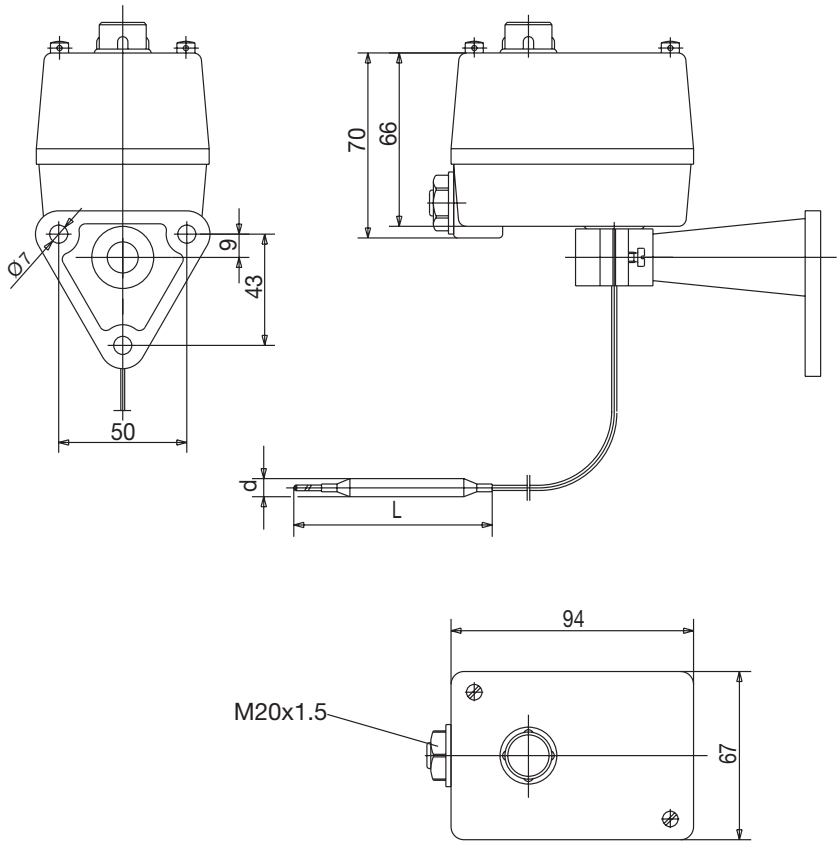


3 Mounting

ATHf-7/g
ATHf-70/g,
with pocket U



ATHf-7/k
ATHf-70/k,
with plain
cylindrical
probe A,
no pocket



3.2 Opening the case

Opening

* Unscrew the 2 cover screws
* Remove case top



Make sure the seal is correctly seated when assembling!

3.3 Securing the surface-mounting thermostat

Mounting position

to DIN 16 257, nom. position NL 0 — 90° (other NL on request)

3.3.1 Code s (rigid stem)

The case spigot is secured by a fixing screw in the enlarged pocket opening.

3.3.2 Code f (with capillary)

Thermostat head fixing

Code	Description
g	**standard** thread with locknut M 18 x 1 at case spigot, capillary entry at case spigot
r	by two screws through base of case, capillary entry at the side of the case
b	steel mounting flange, capillary entry at case spigot
k	wall bracket

3 Mounting

3.4 Capillary / Temperature probe / Pocket

3.4.1 General



Cutting through of kinking the capillary of the surface-mounting thermostat will result in permanent failure of the instrument!

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

The temperature probe must be installed in JUMO pockets, otherwise the approval of the surface-mounting thermostat becomes invalid.



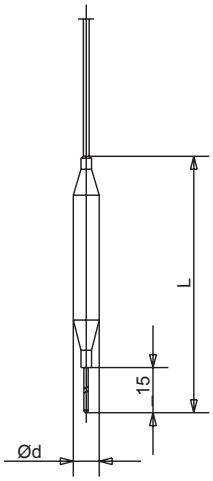
The temperature probe must be completely immersed in the medium.

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

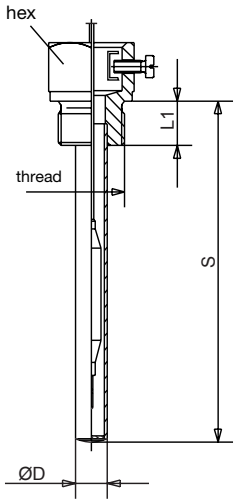
Pockets with diameter D = 10 mm may only be fitted with probes with diameter d = 8 mm.

When used in air, a process connection without pocket must be chosen.

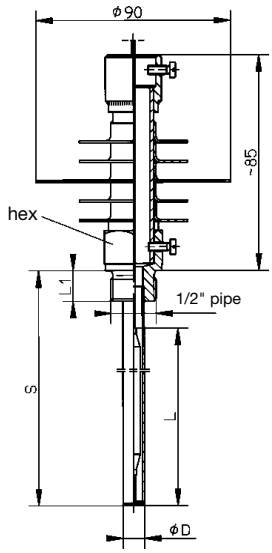
3.4.2 Approved probes and pockets



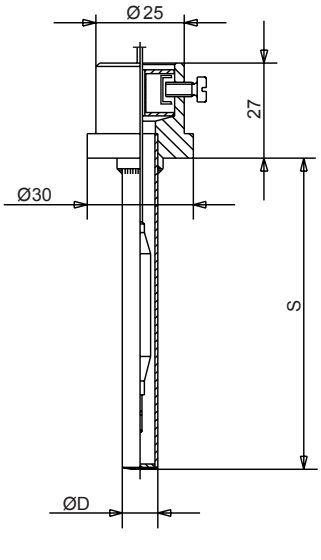
A
Plain cylindrical bulb

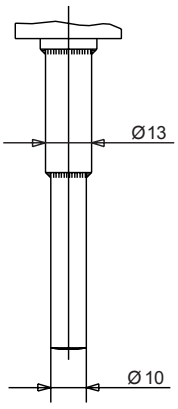


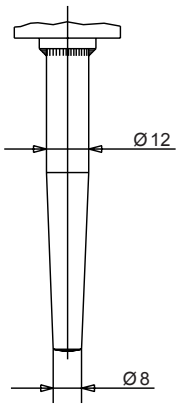
U
Screw-in pocket with screw-in spigot Form A to DIN 38522/2.
With fixing screw.



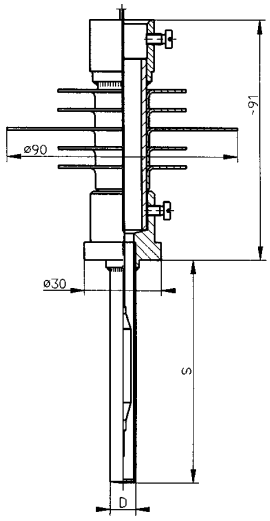
UZ
Screw-in pocket with fixing screw and extension





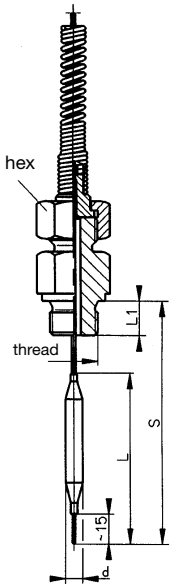


US
Weld-in pocket with fixing screw and clamp



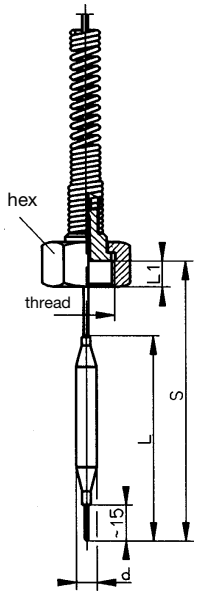
UZS
Weld-in pocket with sealing shoulder; fixing screw and extension

3 Mounting



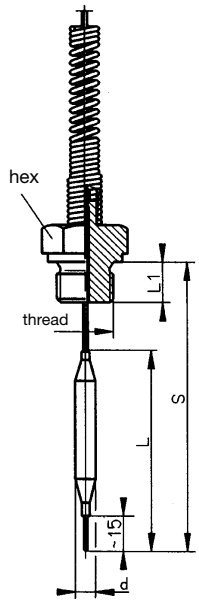
B

Probe form C with loose nipple, threaded on both ends.



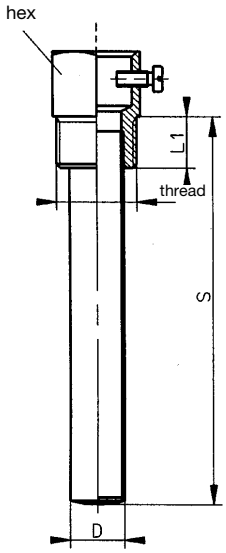
C

Plain cylindrical bulb with shoulder and union nut. Shoulder brazed or welded to capillary.



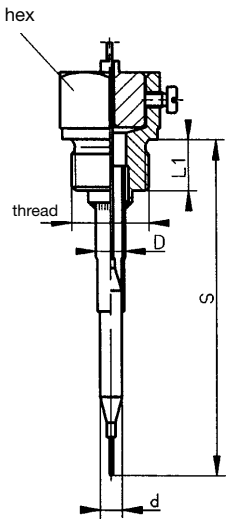
D

Plain cylindrical bulb, threaded connector brazed or welded to capillary.



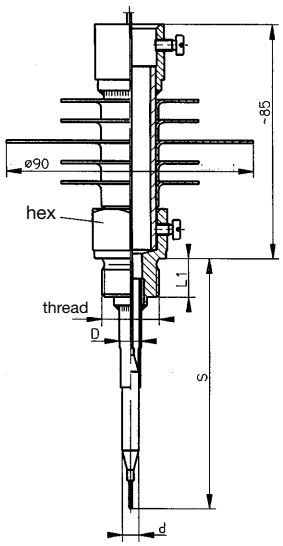
UH

Screw-in pocket with fixing screw, no sealing shoulder



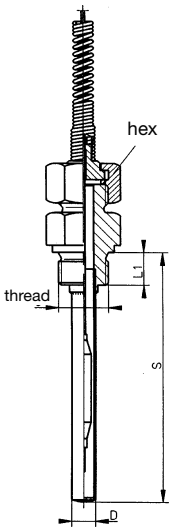
UO

Screw-in pocket with screw-in spigot Form A to DIN 3852/2, with fixing screw



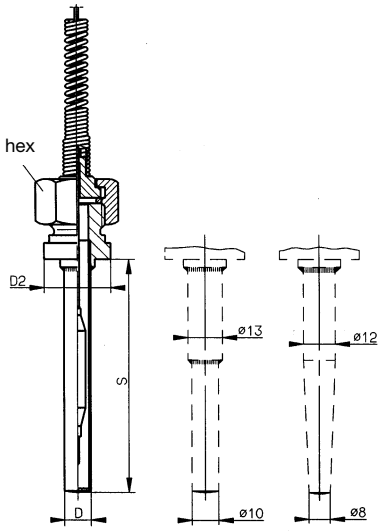
UZO

For Code s above +150°C probe temperature, pocket open at end and screw-in spigot Form A to DIN 3852/2, with fixing screw and extension



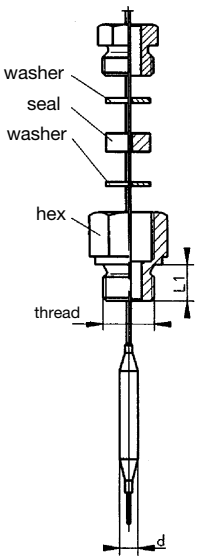
E

For Code f,
screw-in pocket with screw-in spigot Form A to DIN 3852/2, pocket secured with union nut, probe form C



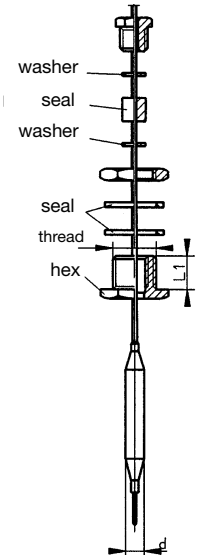
ES

For Code f,
weld-in pocket with welding shoulder, pocket secured with union nut, probe form C



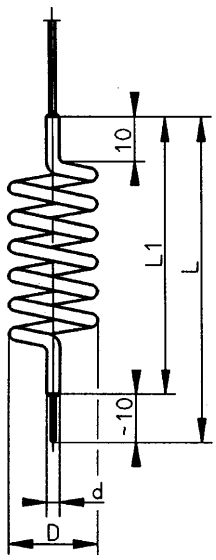
Q

For Code f,
threaded at both ends, for retrofitting on capillary. Max. probe temperature +200°C.



V

For Code f,
Sealing gland for retrofitting on capillary. Max. probe temperature +200°C.



H

Coiled bulb

3 Mounting

3.5 Permissible pressure loading on pocket

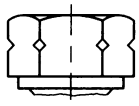
3.5.1 Pockets U, US, UZ, UZS, E, ES and EZS

The values below refer to the maximum loading on the probe mounting concerned. The maximum pressure that can be sealed depends on the installation conditions and may therefore be lower.

3.5.1.1 Steel pockets

Material

Tube:	St 35.8 I
Screw-in nipple up to 300°C:	9 SMnPb.28 K
Screw-in nipple up to 450°C:	16 Mo 3 (turned groove)
Weld-in nipple:	16 Mo 3 (no groove)



Loading

Temperature	Tube diameter D			
	8 x 0.75 mm or taper	10 x 0.75 mm	13.7 x 0.75 mm*	15 x 0.75 mm
	Max. permissible pressure			
100°C	89 bar	72 bar	58 bar	48 bar
150°C	83 bar	67 bar	54 bar	45 bar
200°C	78 bar	63 bar	51 bar	42 bar
300°C	59 bar	47 bar	38 bar	32 bar
350°C	50 bar	40 bar	33 bar	27 bar
400°C	46 bar	37 bar	30 bar	25 bar
450°C	24 bar	19 bar	15 bar	13 bar

***** probe forms US, UZS only, in conjunction with probe diameter $12\ ^{+0.03}_{-0.01}$ mm

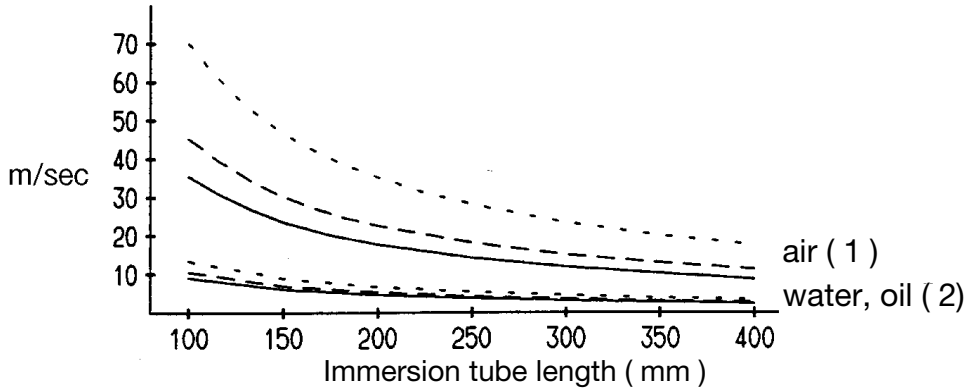
Permissible flow velocity

Temperature: +200°C

Thermal medium: air (1)
water, oil (2)

Tube dia. D: ——— 8 mm
– – – – – – 10 mm
. . . . . 15 mm

Permissible flow velocity (m/sec) at max. permissible pressure loading and different immersion tube lengths S.



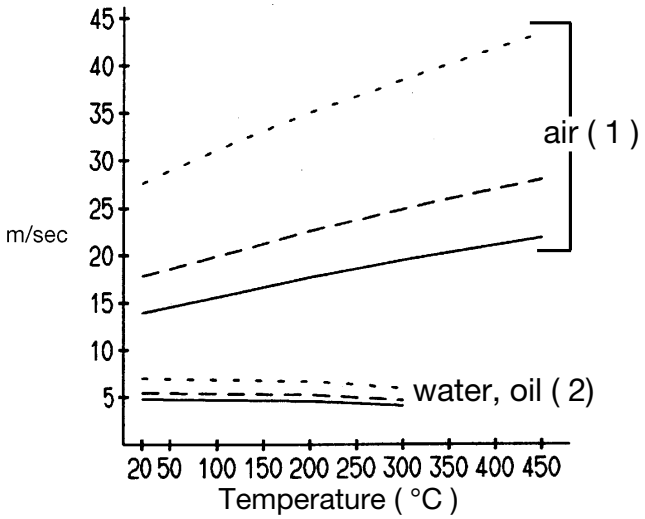
The values below refer to the maximum loading on the probe mounting concerned. The maximum pressure that can be sealed depends on the installation condition and may therefore be lower.

Temperature: +200°C

Thermal medium: air (1)
water, oil (2)

Tube diameter D: ——— 8 mm
– – – – – – 10 mm
. . . . . 15 mm

Permissible flow velocity (m/sec) at max. permissible pressure loading and different immersion tube temperatures t.



3.5.1.2 Stainless steel pockets

Material

Tube and nipple: X 6 CrNiMoTl 17 122			
Temperature	Tube diameter D		
	8 x 0.75 mm or taper	10 x 0.75 mm	15 x 0.75 mm
	Max. permissible pressure		
100°C	92 bar	74 bar	50 bar
150°C	88 bar	71 bar	48 bar
200°C	83 bar	67 bar	45 bar
300°C	72 bar	58 bar	39 bar
400°C	67 bar	54 bar	36 bar

Permissible flow velocity

on request

3.5.1.3 Brass pockets

Material

Tube and nipple: brass (CuZn)			
Temperature	Tube diameter D		
	8 x 0.75 mm	10 x 0.75 mm	15 x 0.75 mm
	Max. permissible pressure		
100°C	50 bar	40 bar	27 bar
150°C	48 bar	39 bar	26 bar

Pocket UH

110°C	16 bar

Permissible flow velocity

on request

3.5.1.4 Probe mountings B, C, D

(probe in direct contact with medium)

Nipple material		
CuZn 39	9 SMnPb.28K	X 6 CrNiMoTi 17 122
Max. temperature		
200°C	300°C	400°C

Probe material	Ø mm dia.	Thermostat function	
		TR, TW, TB	STB, STW (STB)
SF-CuF 29	4	6 bar	2 bar
	5	5 bar	
	6	4 bar	
	7	3 bar	
	8	3 bar	
	9	3 bar	
	10	3 bar	
1.4571 (V4A); St 35	4 — 10	10 bar	2 bar

The process connections **A, H, UO, UZO, Q and V** may **only** be used in pressure-free media.



To ensure their overall accuracy, the thermostats may **only** be used together with the pockets supplied by the factory.

Fitting several probes into a common pocket is **only** permitted with 2 or 3 cylindrical probes 6 mm dia. and pockets 15 x 0.75 mm.

When fitting 2 probes into a common pocket, the factory-supplied spring clip must be fitted inside the pocket.

With pockets U, US, UZ, UZS, E, ES and EZS in materials St 35.8I and 16Mo 3, the permissible operating life at operating temperatures above 420°C is limited to 200,000 hours. Please refer to the requirements of TRD 508 for application in this range.

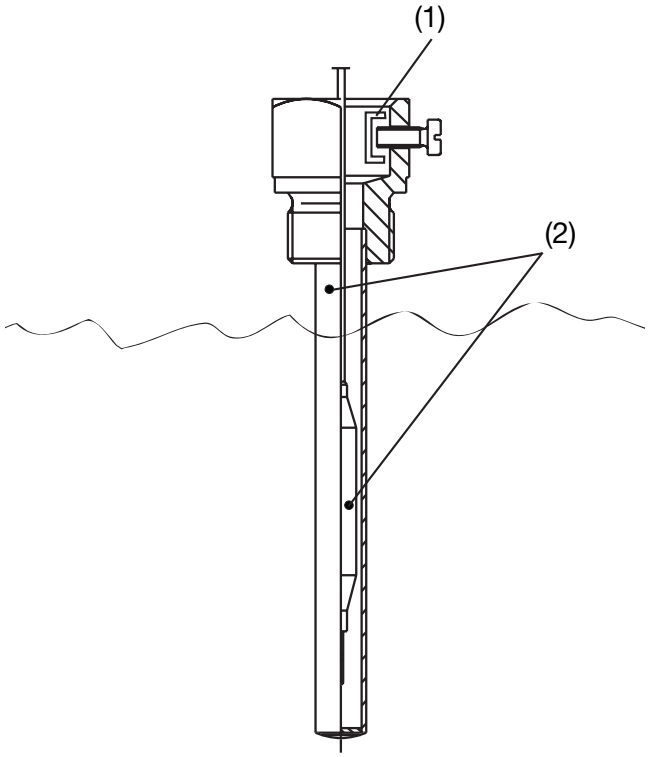
3 Mounting

3.6 Mounting the probe



The temperature probe (2) must be completely immersed in the medium, otherwise there will be appreciable deviations from the switching point.

In the case of thermostats with capillary (Code f), the temperature probe is secured in the pocket by a clamp (1) with probe mountings U and US.



4.1 Regulations and notes



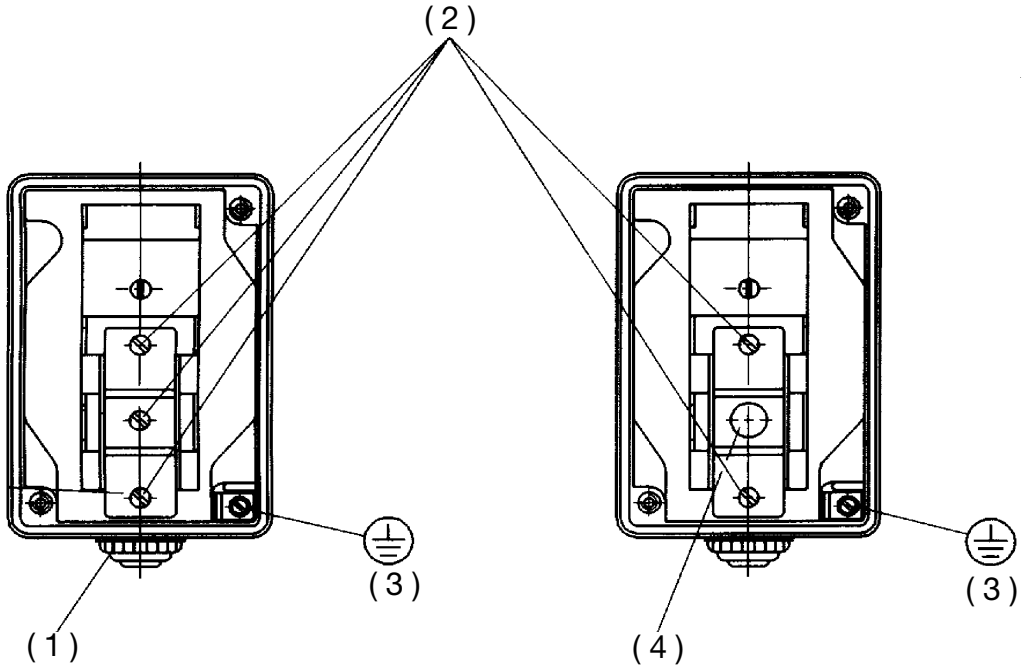
- ❏ The electrical connection must only be carried out by qualified personnel.
- ❏ The choice of cable, the installation and the electrical connection must conform to the requirements of VDE 0100 “Regulations on the installation of power circuits with nominal voltages below 1000 V”, or the appropriate local regulations.
- ❏ Ensure that the instrument is completely isolated from the mains supply before carrying out work where live components may be touched.
- ❏ Earth the instrument at terminal PE to the protective earth. This cable must have at least the same cross-section as the supply cable. Earthing cables must be wired in star configuration, to a common earthing point which is connected to the protective earth of the supply. Do not loop the earthing cables, i.e. do not run them from one instrument to another.
- ❏ Apart from faulty installation, incorrect settings on the thermostat may also affect the proper functioning of the following process or lead to damage. Adjustments should therefore only be made by qualified personnel. Please observe the corresponding safety regulations in this matter.

4 Installation

4.2 Electrical connection

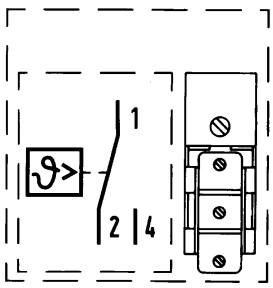
Steps

- ✱ Open case. ⇨ Chapter 3.2 “Opening the case”, page 9.
- ✱ Pass the connecting cable (cable diameter 5 to 10 mm) through the cable gland (1). Fitting type “X” (no special tools), screw connection up to 2.5mm^2 conductor cross-section.
- ✱ Make connection to the terminals (2) according to the connection diagram.
- ✱ Connect protective earth conductor to the terminal PE (3).
- ✱ The reset button (4) must be free to move.

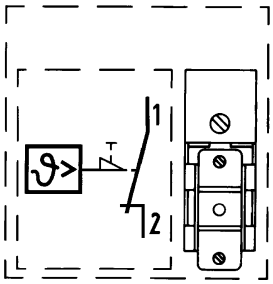


The connections are suitable for fixed cabling. Cable entry without fixed strain relief. Fitting type “X” (no special tools).

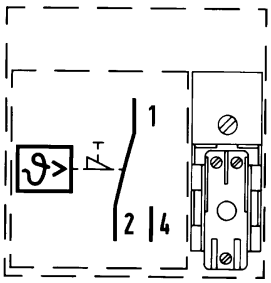
Connection diagrams



TR, TW, STW (STB) with changeover contact



TB, STB with n.c. (break) contact and lock-out



TB, STB with n.c. (break) contact, lock out and additional signal contact

4.2.1 Closing the case

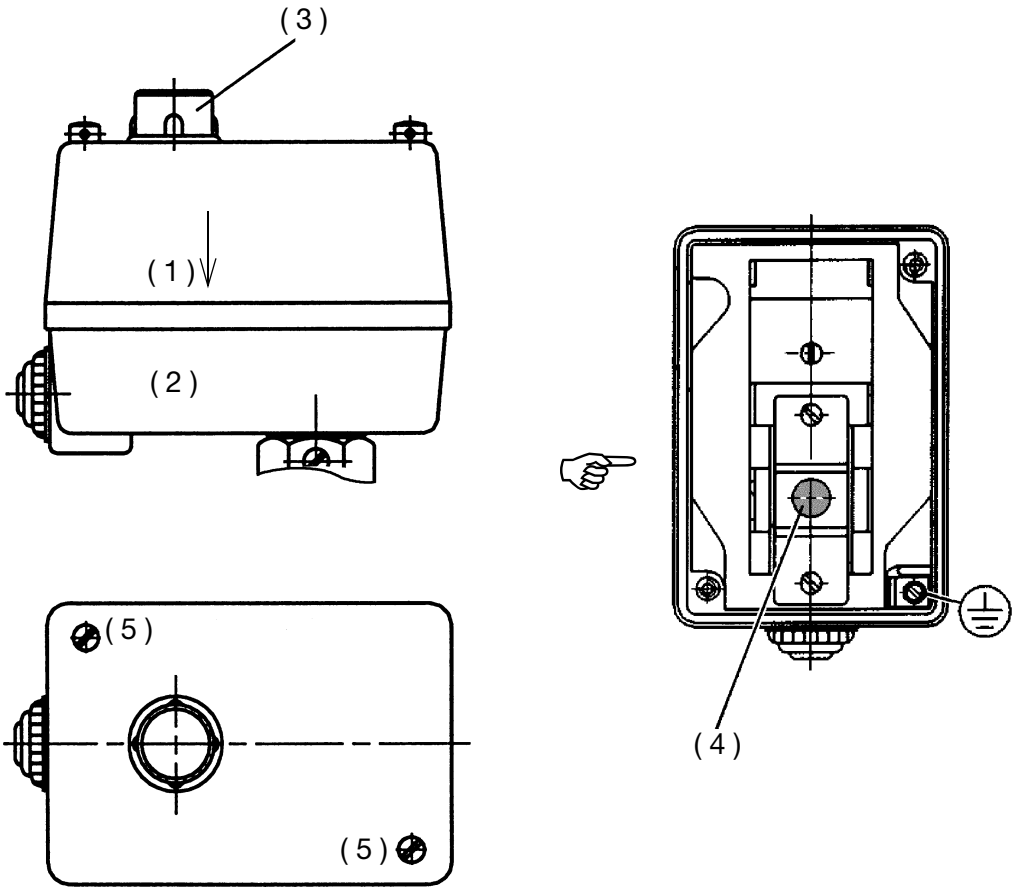
Thermostats as TW, TB, STW (STB), STB

Make sure that the plastic seal in the case bottom is seated correctly.



The reset button (3) must be located precisely on top of the internal reset button for the microswitch (4), since this is the only way the reset button can be operated from the outside.

✱ Place the case top (1) onto the case bottom (2).



✱ Tighten the lead-sealable cheese-head screws (5).

4 Installation

Thermostat as TR

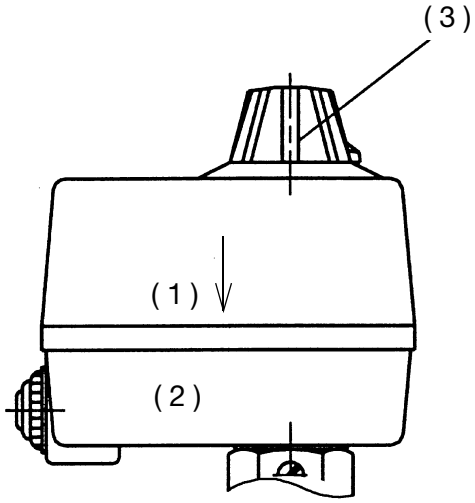
✱ Set the internal setpoint spindle and the external setpoint knob to the same point on the scale.

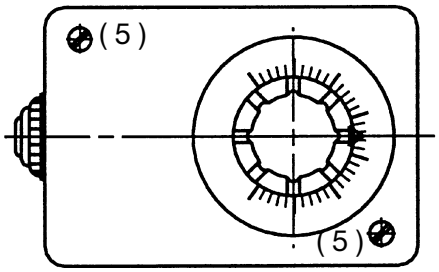
✱ Make sure that the plastic seal in the case bottom (2) is seated correctly.

✱ Place the case top (1) onto the bottom (2).

☞ The external setpoint knob (3) must engage with the coupling disk of the setpoint spindle, since this is the only way the setpoint can be accurately set from the outside.

✱ Assemble the two case parts.



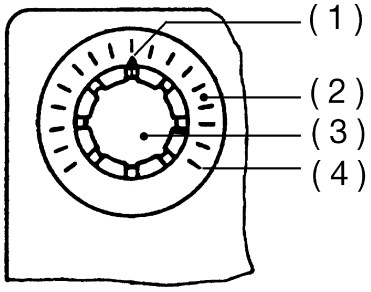


✱ Tighten the lead-sealable cheese-head screws (5).

5.1 Setpoint /limit setting

5.1.1 Controller TR

✱ Rotate the setpoint knob over the external scale



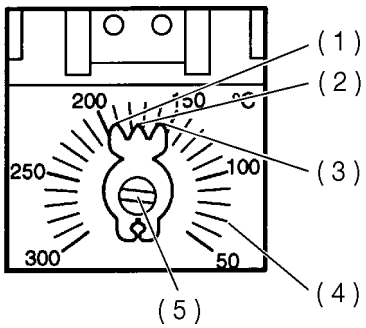
(1) Setpoint pointer
(2) External scale
(3) Setpoint knob
(4) Scale graduation

5.1.2 Monitor and limiter TW, STW (STB), TB, STB

✱ Open case.
⇨ Chapter 3.2 “Opening the case”, page 9.

✱ Set limit value on the setpoint spindle (5) using a screwdriver.

✱ Close case

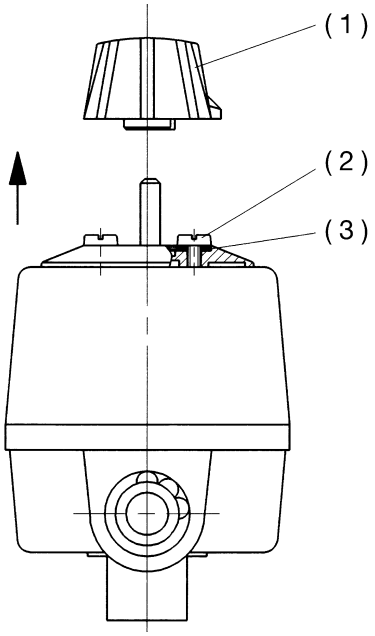


(1) Top stop
(2) Setpoint pointer
(3) Bottom stop
(4) Scale graduation
(5) Setpoint spindle

5.2 Limiting the setpoint range

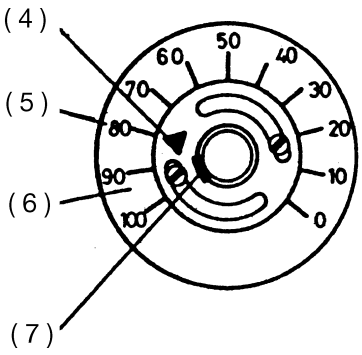
In the case of the controller TR (Code 1), the maximum setpoint that can be selected can be restricted by using an adjustable stop (3).

✱ Pull off the setting knob (1) and loosen the cheese-head screw (2).



Example

Range 0 to +100°C,
maximum setpoint that can be selected +80°C



(4) Setpoint marking

(5) Maximum setpoint that can be selected

(6) External scale

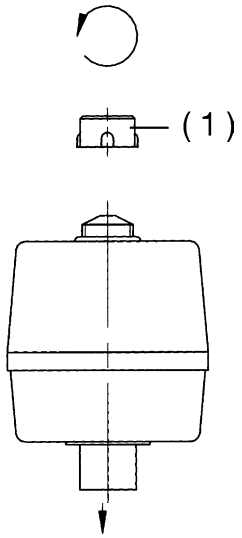
(7) Stop

✱ Tighten cheese-head screw (2), put setting knob (1) back on its spindle.

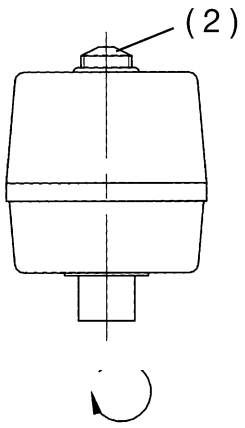
5.3 Resetting the TB and STB

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

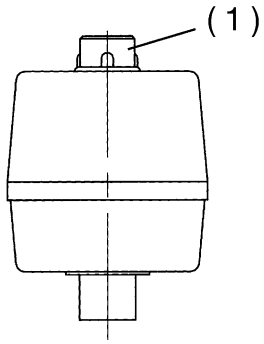
✱ Remove the screw cap (1).



✱ Press the reset button (2)
until the microswitch is reset.



✱ Screw cap (1) back into position.



5 Settings

5.4 Self-monitoring

5.4.1 Response to a fracture of the measuring system



On the STB and STW (STB), a fracture of the measuring system (leakage) will cause the circuit to open **permanently**.

On the STB, the microswitch will additionally be locked.

5.4.2 Response to falling below the temperature limit



If the probe cools down to below the minimum temperature of -10°C, the circuit will open (STW (STB) and STB).

As the probe temperature rises above the minimum probe temperature, the STB has to be reset manually.
⇨ Chapter 5.3 “Resetting the TB and STB”, page 25.

The STW resets itself automatically.

5.5 Use of the STW (STB) as STB



The lock-out function to DIN 3440 must be ensured by a subsequent circuit. This circuit must conform to DIN VDE 0116, Section 8.7.

6.1 Technical data

Permissible ambient temperature

	Capillary	Thermostat head		with end of scale
		TR, TW	TB, STW (STB), STB	
max.	+80°C	+80°C	+80°C	
min.	-40°C	-40°C	0°C	< 200°C
	-20°C	-20°C	0°C	≥ 200°C ≤ 350°C
	-40°C	-40°C	0°C	> 350°C ≤ 500°C

Permissible storage temperature

+50°C max., -50°C min.

Case

cover: plastic with screws suitable for lead sealing

base: aluminium die-casting, painted (with code “r”: plastic)

Connection cable

diameter 5 to 10 mm, max. conductor cross-section 2.5 mm^2

Switching differential in % of range span

Code	with liquid-filled measuring system		
	Nom. value	Possible actual value	
TR, TW	3	3 max. 4	standard
	6	6 max. 8	on request
	1.5	1 max. 2	at extra cost
	with gas-filled measuring system		
	5	4 max. 8	standard
	9	8 max. 12	on request
	2	1.5 max. 2.5	at extra cost

Code	with liquid-filled measuring system		
	Nom. value	Possible actual value	
STW (STB)	5	4 max. 6	standard
	9	8 max. 11	on request
	2	1 max. 3	at extra cost
	with gas-filled measuring system		
	7	5 max. 12	standard
	9	8 max. 16	on request
	2	1.5 max. 3	at extra cost

6 Instrument description

Max. current rating

TR, TW with differentials 3, 5, 6, 9% / STW (STB) 5, 7, 9% and TB, STB	
230 V +10% AC, 10 (2) A, p.f. = 1 (0.6)	230 V +10% DC, 0.25 A

with differentials TR, TW 1.5% / STW (STB) 2%	
230 V +10% AC, 6 (1.2) A, p.f. = 1 (0.6)	230 V +10% DC, 0.15 A

microswitch gold-plated, Code /au	
24 V AC/DC, 0.1 A	contact resistance 2.5 — 10 mΩ

Protection

EN 60 529 - IP54, use in normal conditions

Operating medium

water, oil, air, superheated steam

Time constant $t_{0.632}$

in water	in oil	in air / superheated steam
≤ 45 sec	≤ 60 sec	≤ 120 sec

Action

according to EN 60 730-1

TR, TW, TB: Type 2BL = automatic action
with micro disconnection in operation,
no auxiliary supply required.

STB, STW (STB): Type 2BK = automatic action
with micro disconnection in operation,
with break protection.

Weight

0.5 kg approx.

Material of capillary and probe

End of scale	Capillary	Probe
up to +200°C	copper, Mat. Ref. 2.0090 1.5 mm dia.	copper, Mat. Ref. 2.0090 brazed
up to +350°C	copper, Mat. Ref. 2.0090 1.5 mm dia.	st. steel, Mat. Ref. 1.4571 brazed
up to +500°C	st. steel, Mat. Ref. 1.4571 1.5 mm dia.	st. steel, Mat. Ref. 1.4571 welded
at extra cost		
up to +350°C	st. steel, Mat. Ref. 1.4571 1.5 mm dia.	st. steel, Mat. Ref. 1.4571 welded

Minimum bending radius of capillary

5 mm

Switching point accuracy

in % of scale span,
referred to setpoint / limit value at T_{amb} +22°C

TR	in upper third of scale	± 1.5%
	at start of scale	± 6%
TB, STB, STW (STB)	in upper third of scale	$^{+0}_{-5}$ %
	at start of scale	$^{+0}_{-10}$ %

Mean ambient temperature error

in % of scale span, referred to limit value.

A deviation from the ambient temperature at the thermostat head and / or capillary from the calibration ambient temperature +22°C produces a shift of the switching point.
Higher ambient temperature = lower switching point
Lower ambient temperature = higher switching point

Surface-mounting thermostats with end of scale			
< +200°C		≥ +200°C ≤ +350°C	
TR/TW/TB	STB/STW (STB)	TR/TW/TB	STB/STW (STB)
on thermostat head			
0.08%/°C	0.17%/°C	0.06%/°C	0.13%/°C
on capillary per meter			
0.047%/°C	0.054%/°C	0.09 %/°C	0.11%/°C

Surface-mounting thermostats with end of scale	
≥ +350°C ≤ +500°C	
TR/TW/TB	STB/STW (STB)
on thermostat head	
0.14%/°C	0.12%/°C
on capillary per meter	
0.04 %/°C	0.03 %/°C