

Approval data for type MTH, TH, TX, MLH, LH, LX

Type of protection "i" intrinsic safety

Approval:  II 1 GD Ex ia IIC T6 Ga
Ex ia IIIC T100°C Da

Certificate no.: ISSeP08ATEX016X/1


Permissible ambient temperature: -40 °C ... +75 °C

Electrical data for intrinsically safe application:
 $U_i = 28V$ $I_i = 50 mA$
 $C_i = 40 pF$ $L_i = 4 \mu H$

Standards applied: IEC 60079-0 : 2011, IEC 60079-11 : 2011,
IEC 60079-26 : 2006

Approval data for type TX, LX

Type of protection "d" explosion-proof enclosure

Approval:  II 2 G Ex db IIC T6 Gb
II 2 D Ex tb IIIC T80 °C Db IP66
-40 °C ≤ Tamb ≤ +75 °C

Certificate no.: ISSeP08ATEX024X/3

Standards applied: EN 60079-0: 2012+A11:2013
EN 60079-1: 2014
EN 60079-31: 2014

Operating life time

The switches are designed for an operating life time of at least 1 million cycles when used under normal design criteria.

Operating Instructions

Mechanical Temperature Switches Type MTH/TH/TX/MLH/LH/LX



Operating Instructions

- 1 **Intended Applications**
- 2 **Safety Instructions**
- 3 **Standards**
- 4 **Warranty/Guaranty**
- 5 **Transport/Storage**
- 6 **Installation/Commissioning**
- 7 **Maintenance/Cleaning**
- 8 **Technical Data**

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Specifications are subject to changes without notice!

Intended Applications


The temperature switches are specifically applied for monitoring and controlling of operations using maximum or minimum temperatures. A microswitch triggers an electrical signal when minimum or maximum temperatures are reached.


 DANGER
<p>The switch may only be used in the specified fields of application (see type label).</p> <p>The temperature has to be within the specified ranges, the pressure values and the electrical rating must not exceed the values specified.</p> <p>Observe also the applicable national safety instructions for assembly, commissioning and operation of the switch.</p> <p>The switch is not designed to be used as the only safety relevant element in pressurized systems according to DGR 97/23/EC.</p>


Safety Instructions


The safety instructions are intended to protect the user from dangerous situations and/or material damage.


In the operating instructions the seriousness of the potential risk is designated by the following signal words:

 DANGER
<p>Refers to imminent danger to men.</p> <p>Nonobservance may result in fatal injuries.</p>

 WARNING
<p>Refers to a recognizable danger.</p> <p>Nonobservance may result in fatal injuries, and destroy the equipment or plant parts.</p>

 CAUTION
<p>Refers to a danger.</p> <p>Nonobservance may result in light injuries and material damage to the equipment and/or to the plant.</p>

	IMPORTANT
Refers to important information essential to the user.	

	Disposal
<p>The equipment must be disposed of correctly in accordance with the local regulations for electric/electronic equipment.</p> <p>The equipment must not be disposed of with the household garbage!</p>	

Standards

The standards applied during development, manufacture and configuration are listed in the CE conformity and manufacturer's declaration.

Warranty/Guaranty

Warranty

Our scope of delivery and services is governed by the legal warranties and warranty periods.

Terms of guaranty

We guaranty for function and material of the single / dual temperature switch under normal operating and maintenance conditions in accordance with the statutory provisions.


Loss of guaranty

The agreed guaranty period will expire in case of:

- changes or modifications to the housing/switch/fitting
- incorrect use,
- incorrect installation or
- incorrect handling or operation contrary to the provisions of these operating instructions.

No liability is assumed for any damage resulting therefrom, or any consequential damage.

Transport/Storage

 CAUTION
<p>Severe shock and vibrations should be avoided during transport. Storage should be dry and clean.</p>

Installation/Commissioning

DANGER

Only install or uninstall the switch when deenergized (electrically and hydraulically/pneumatically).
Process connection and electrical connection must be carried out by trained or instructed personnel according to state-of-the-art standards.
The switch must only be installed in systems where the maximum temperature T_{max} is not exceeded (see type label).

WARNING

Be aware of the fact that in case of operation with higher temperatures the casing surface may become very hot!
Ambient temperature range: $-40... +75$ °C; max. pressure at sensor: 21 bar

WARNING

In case the temperature falls below or exceeds the permissible temperature limits specified for the sensor and the permissible ambient temperature, the function of the temperature switch can no longer be guaranteed and the temperature switch may be damaged.
Check the operation of the switch regularly. If the switch does not work properly, stop operation immediately!

CAUTION

All standard temperature switches are supplied with cable glands, the explosion-proof switches with threaded plugs covering the electrical connection entry.
These must be removed to install the approved cable gland of your choice.
The capillary system must be installed with care avoiding sharp bends.
Provide protection against damage where needed.

IMPORTANT

The temperature sensing element can be used up to 21 bar. In case of pressures higher than 21 bar the temperature sensing element must be provided with a thermowell suitable for the respective application.
All temperature switches are tested for proper functioning before they leave the factory.

Contact Protection

The micro switches used are normally suitable for both direct and alternating current operation. Inductive, capacitive and lamp loads may, however, considerably reduce the life expectancy of a micro switch and, under extreme circumstances, even damage the contacts.
Depending on the application spark suppression and current limiting is recommended (see succeeding figures).

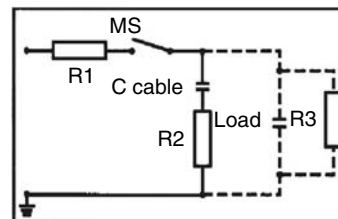


Fig. 1: Protection in case of capacitive loads
R1: Protection against starting current rushes
R2, R3: Protection against high discharge currents

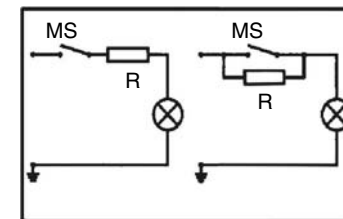


Fig. 2: Lamp load provided with resistance in parallel or series connection to switch of condensators

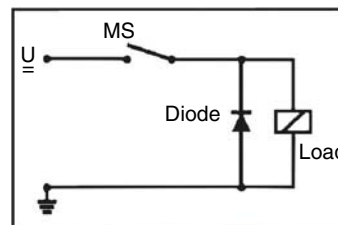


Fig. 3: Protection in case of continuous current and inductive load by recovery diode

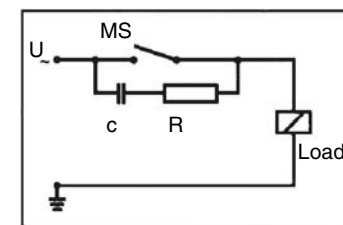


Fig. 4: Protection in case of alternating current and inductive load by RC-link

Set point adjustment


IMPORTANT

Factory-Provided: pressure (temperature) switch point setting
We confirm for pressure (temperature) switches that have been factory set the setting will be detailed on the label name plate.
Warranty is not applicable for any changes that may occur due to transportation or installation.
For critical applications we recommend the setting is checked and re-set if necessary after installation and wiring of the pressure (temperature) switch.


In temperature switches, the liquid expands in the sensing element (capillary) when the temperature changes. Due to the expansion the microswitch is actuated.

Upon delivery of the product, the set points are likely to be found in the middle of the adjustable range. On request, fix set points may be adjusted by our factory. In this event, the point will be indicated on the type plate or any separate plate, i = increasing, d = decreasing.

The set point is adjusted by turning the adjustment knob (see figure 7...12).

	IMPORTANT
In some cases the corresponding housing cover must be removed in order to reach the adjustment knob.	

- Heat the temperature switch to the desired switching temperature.
- Turn the adjustment knob to actuate the microswitch.

	IMPORTANT
Please consult the wiring diagram for the contact status at state of rest (see Fig. 5).	

Precise adjustment of set point to actuate on increasing temperature

Connect a control unit (lamp, buzzer, etc.) to 1 (C) and 4 (NO). When the unit is connected correctly and the sensor temperature is higher than the temperature adjusted on the scale, the buzzer or lamp is **not** activated.

Adjust the desired switch point with the help of the scale and via the adjustment knob.

Watch the switch point while the temperature is rising (about 2°C/minute). The control unit is activated when the switch point is reached.

If necessary, readjust the set temperature by some degrees (by means of the scale the temperature can be adjusted with an accuracy of 3...5 % of the scale value).

Precise adjustment of set point to actuate on decreasing temperature


Connect a control unit (lamp, buzzer, etc.) to 1 (C) and 2 (NC). When the unit is connected correctly and the sensor temperature is higher than the temperature adjusted on the scale, the buzzer or lamp is activated.

Adjust the desired switch point with the help of the scale and via the adjustment knob.

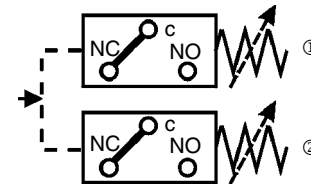
Increase the temperature (about 2°C/minute) until the control unit is deactivated.

Watch the point at which the control unit is activated again while the temperature is falling. This is the set switch point.

If necessary, readjust the set temperature by some degrees (by means of the scale the temperature can be adjusted with an accuracy of 3...5 % of the scale value).

	IMPORTANT
Adjustment of several set points is performed for each set point as specified above.	
Due to the sluggishness of the capillary system switching delays may occur in case of rapid temperature changes (>2 °C/Minute).	

Wiring Code for all Types (Contact status at atm. pressure)



Power circuit ①	Power circuit ②
C = purple	C = brown
NC = blue	NC = orange
NO = red	NO = black

Circuit ① = lower contact (low)
Circuit ② = upper contact (high)

Fig. 5 Wiring Code

Use in Hazardous Locations


The weather-proof standard temperature switches must not be used for hazardous locations. Depending on the application we offer two versions for hazardous locations:

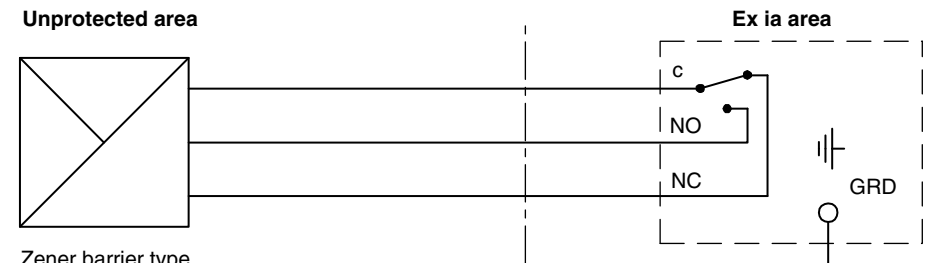
- An intrinsically safe version Ex ia IIC T6 with certificate no. ISSeP08ATEX016X for all standard temperature switches
- and the special temperature switch versions T1X, T2X and L1X for Ex db IIC T6 Gb;
- Ex tb IIC T80°C Db IP66 explosion-proof applications with certificate no. ISSeP08ATEX024X.

Both versions are suitable for gas and dust applications and approved for Ex II G or D in accordance with the ATEX 2014/34/EU regulations.

The intrinsically safe versions must be operated with an approved switch amplifier (see Fig. 6).

The switches with explosion-proof enclosure can be wired via conduit connection or cable gland with Ex approval. The switches may only be used in accordance with the instructions and provisions of the declaration of conformity.

	WARNING
With option Ex i: The models having light-alloy (aluminium) enclosures or enclosure parts must be protected against all impact or friction which can ignite the explosive atmosphere.	



Zener barrier type
Switch amplifier NAMUR

Fig. 6: Operation of temperature switches in intrinsically safe areas

Maintenance/Cleaning

Maintenance

The pressure switch is maintenance free. Checking the set points lies within the discretion of the user. The usual preventive maintenance work in accordance with the PED and ATEX guidelines must always be carried out.

Technical Data

See data sheet

Dimensions in mm (inch)

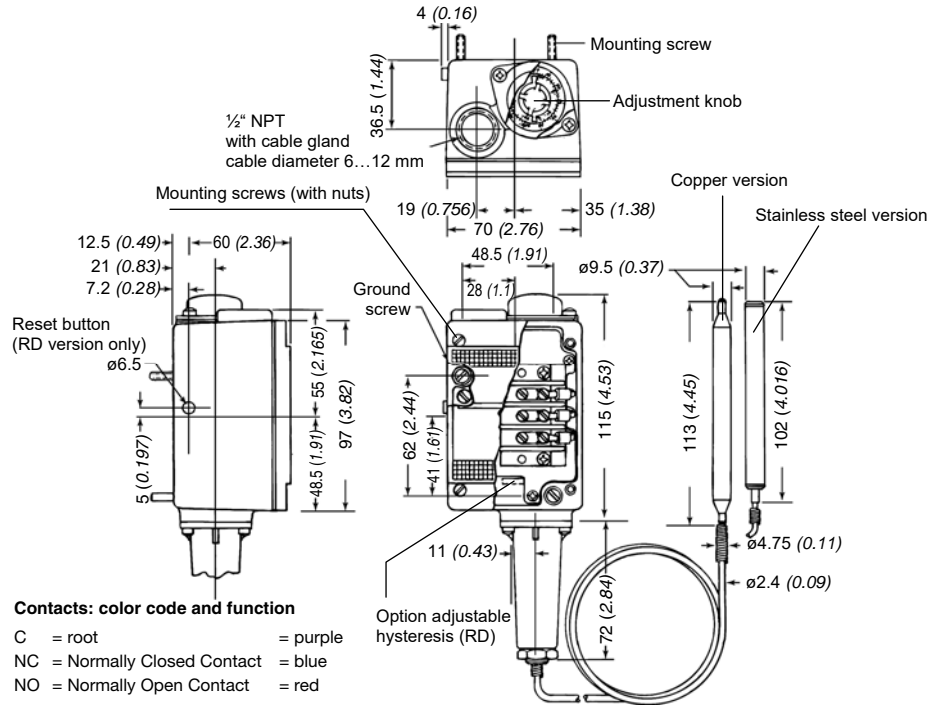
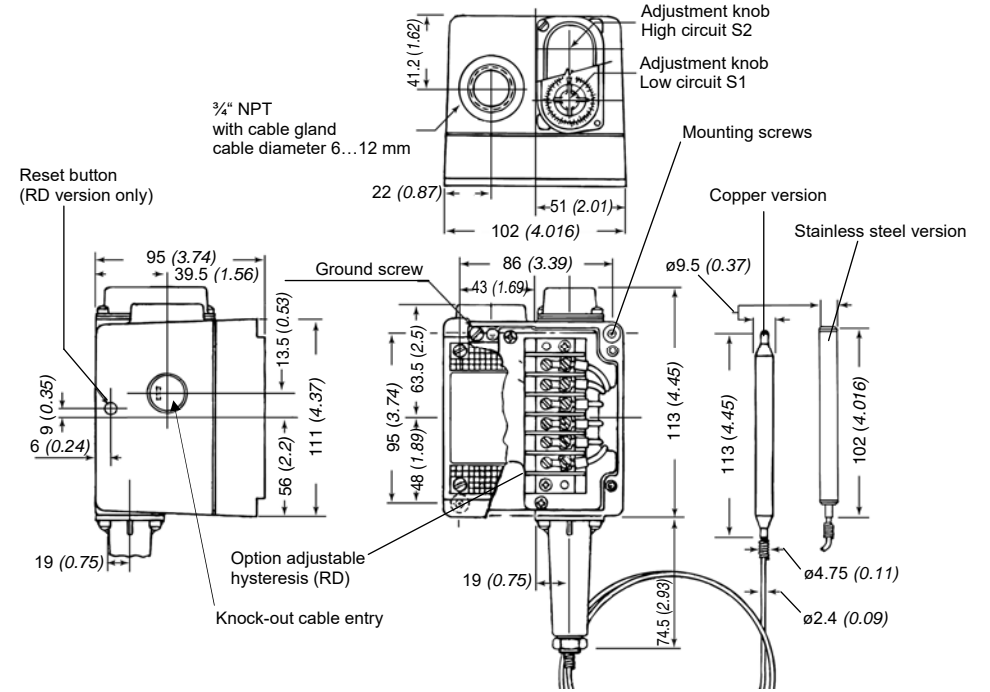


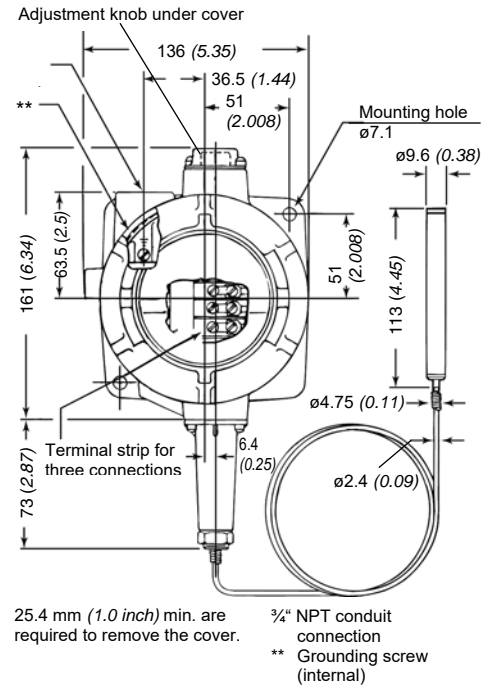
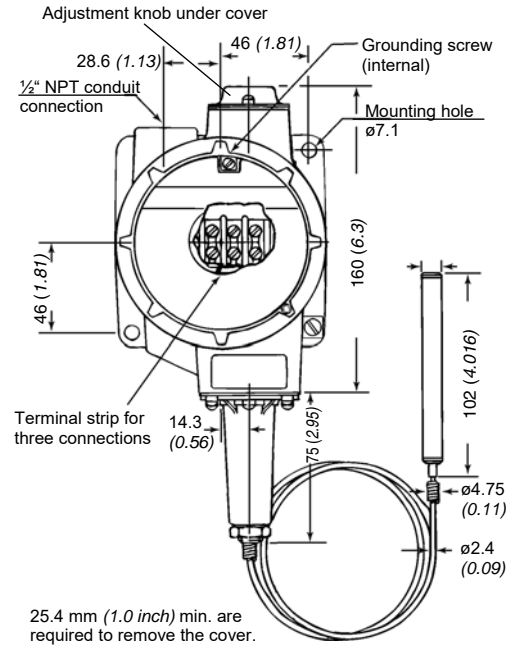
Fig. 7: Temperature switch type MT1H-...



Contacts: color code and function

	Lower contacts	Upper contacts
C = root	= purple	C = brown
NC = Normally Closed Contact	= blue	NC = orange
NO = Normally Open Contact	= red	NO = yellow

Fig. 8: Temperature switch type T2H-...



Contacts: color code and function

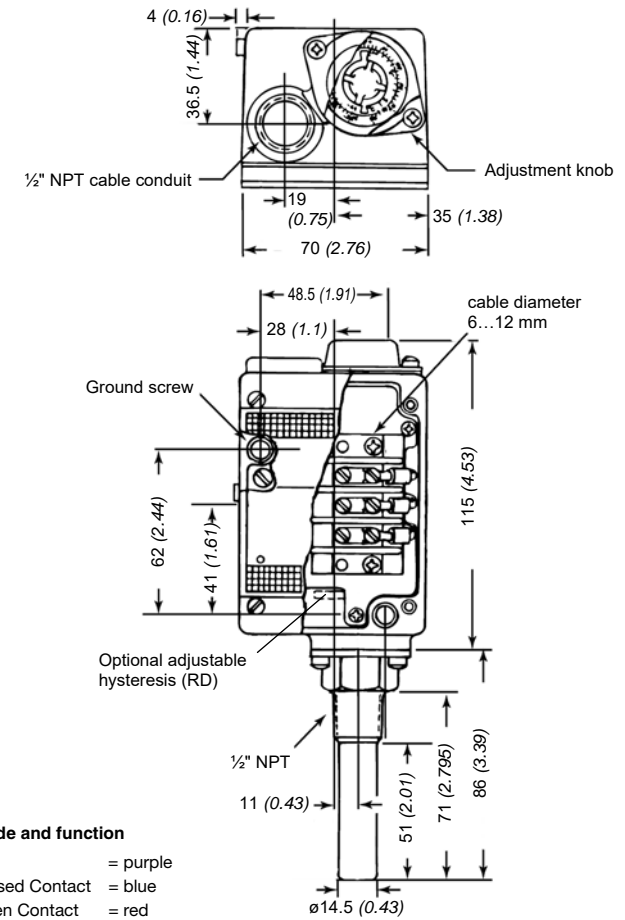
	Lower contacts	Upper contacts
C = root	= purple	C = brown
NC = Normally Closed Contact	= blue	NC = orange
NO = Normally Open Contact	= red	NO = yellow

Contacts: color code and function

	Lower contacts	Upper contacts
C = root	= purple	C = brown
NC = Normally Closed Contact	= blue	NC = orange
NO = Normally Open Contact	= red	NO = yellow

Fig. 9: Temperature switch type T1X-.../ T1X-Ex...

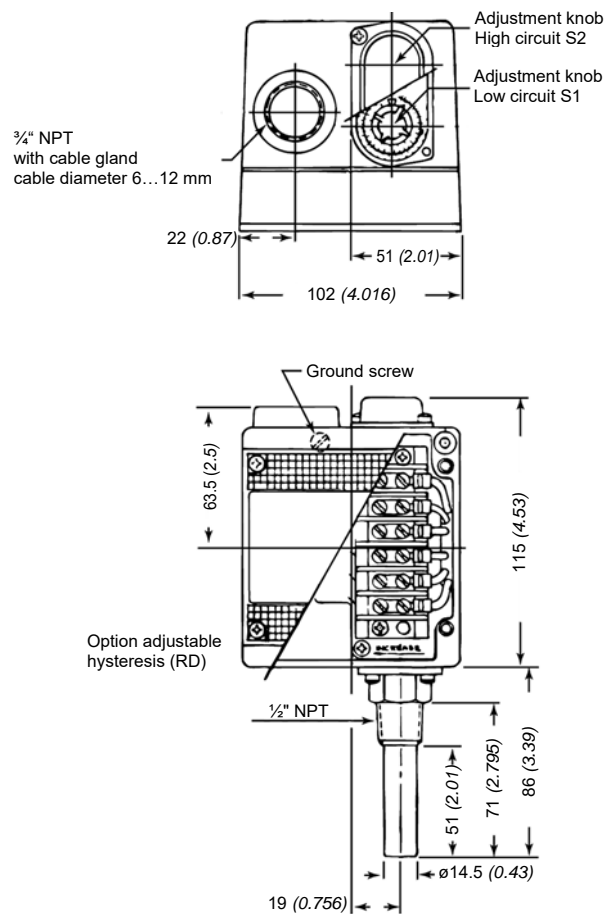
Fig. 10: Temperature switch type T2X-...



Contacts: color code and function

C = root	= purple
NC = Normally Closed Contact	= blue
NO = Normally Open Contact	= red

Fig. 11: Temperature switch type ML1H-...



Contacts: color code and function

	Lower contacts	Upper contacts
C = root	= purple	C = brown
NC = Normally Closed Contact	= blue	NC = orange
NO = Normally Open Contact	= red	NO = yellow

Fig. 12: Temperature switch type L2H-...

Electrical Ratings

Micro switch	Special Characteristics	Volt AC 50/60 Hz	Ind. Load A	Res. Load A	Volt DC	Ind. Load A	Res. Load A	Notes
H	Microswitch with silver contacts	125 250 480	10 10 3	10 10 3	6 to 24	0,50	0,5	Small hysteresis; high AC / low DC loads
M	Microswitch with silver contacts	125 250 480	10 10 3	10 10 3	12 24 250	5,00 1,00 0,25	15,0 2,0 0,4	Medium hysteresis; high AC and DC loads
GH*	Microswitch with gold plated contacts for low voltage and low current	125	1	1	24	1,00	1,00	Small hysteresis
GM*		30	0.1	0.1	30	0,10	0,10	Medium hysteresis
S	Microswitch with silver contacts	125 250 480	15 15 15	15 15 15	12 24 250	10,00 5,00 0,03	15,0 6,0 0,2	Adjustable hysteresis
J	Microswitch - sealed - with silver contacts	125 250 480	10 10 3	10 10 3	6 to 24	0,50	0,5	Small hysteresis
G...RD	Microswitch with silver contacts	125 250 480	10 10 10	10 10 10	12 24 250	15,00 10,00 0,20	15,0 15,0 0,3	Manual reset

We recommend gold plated contacts for all intrinsically safe and other applications with low voltage/power.

	IMPORTANT
Data only valid for application in non-explosive atmosphere.	
We recommend to use a prefuse of the maximum current rating from the table above according to the load switched.	

Operation pressure:

Housing: -40 °C... +75 °C, except temperature code 454, 601, 603
 Sensor: See table „Measuring Ranges“, „Max. temperature at sensor“

Temperature switch with remote sensor


Measuring Ranges

Order code	Max. temperature at sensor [°C]	Adjustment range [°C]
154	-73... +93	-45... +66
251	-73... +149	+10... +121
351	-73... +205	+66... +177
601	-18... +343	+149... +227
603	-18... +343	+160... +316

Reset values

Order code	Adjustment range [°C]	Approximate hysteresis of different types of microswitches				
		GH, H		J	M	S adjustable from to
154	-45... +66	0.55 1.1	0.55 1.7	1.1 2.2	2.2 8.2	2.8
251	+10... +121	0.55 1.1	0.55 1.7	1.1 2.2	2.2 8.2	2.8
351	+66... +177	0.55 1.1	0.55 1.7	1.1 2.2	2.2 8.2	2.8
601	+149... +227	1,10... 2,2	1,60... 2,8	2,2... 3,3	3,8... 13,8	2,8
603	+160... +316	1,10... 2,2	1,60... 2,8	2,2... 3,3	3,8... 13,8	2,8

* can be reset

 IMPORTANT
The values given are for use in liquids. For gaseous media hysteresis will be approx. double the values.

Local mount temperature switches


Measuring Ranges

Order code	Max. temperature at sensor [°C]	Adjustment range [°C]
201	-73... +121	-45... +24
202	-73... +121	-9... +60
203	-73... +121	+24... +93
351	-73... +205	+38... +107
204	-73... +121	-45... +93
354	-73... +205	+38... +177
454	-18... +260	+66... +232

Reset values

Order code	Adjustment range [°C]	Approximate hysteresis of different types of microswitches				
		GH, H		J	M, GM	S adjustable from
201...354	-45... +177	0.55 1.6	0.55 2.2	1.7 3.3	3.8 11.0	2.8
454	+66... +232	1.60 3.3	2.20 3.8	3.3 5.0	5.5 16.5	2.8

* can be reset

 IMPORTANT
The values given are for use in liquids. For gaseous media hysteresis will be approx. double the values.

Operatio pressure:

Without thermowell: Max. 21 bar (max. 300 psi)
 With thermowell: See table „Pressure-/Temperature rating“

Pressure / Temperature rating (values in bar)

Thermowell material	Temperature01 in °C				
	+22	+94	+210	+320	+430
Brass	350	295	70	0	0
Steel	365	350	335	320	245
Stainless steel	490	435	390	380	365