S S REGELTECHNIK TF43 Immersion Temperature Sensor Instruction Manual

S+S REGELTECHNIK

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THERMASGARD® TF 43
THERMASGARD® TF 65

Contents

TF43 Immersion Temperature Sensor

Operating Instructions, Mounting & Installation
Immersion / screw-in / duct temperature sensor with passive output
High-performance encapsulation against vibration, mechanical stress and humidity

PS-PROTECTION
PERFECT SENSOR PROTECTION

5 JAHRE GARANTIE
YEARS WARRANTY
MADE IN GERMANY

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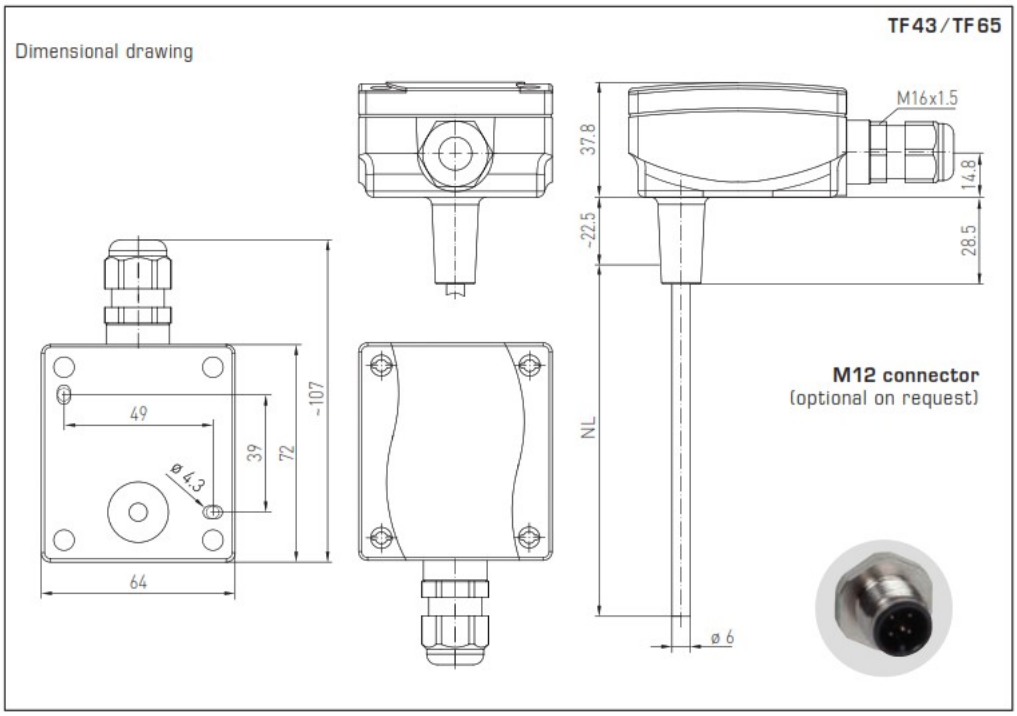
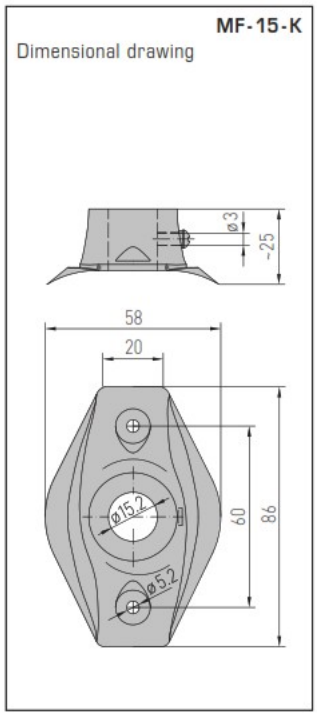
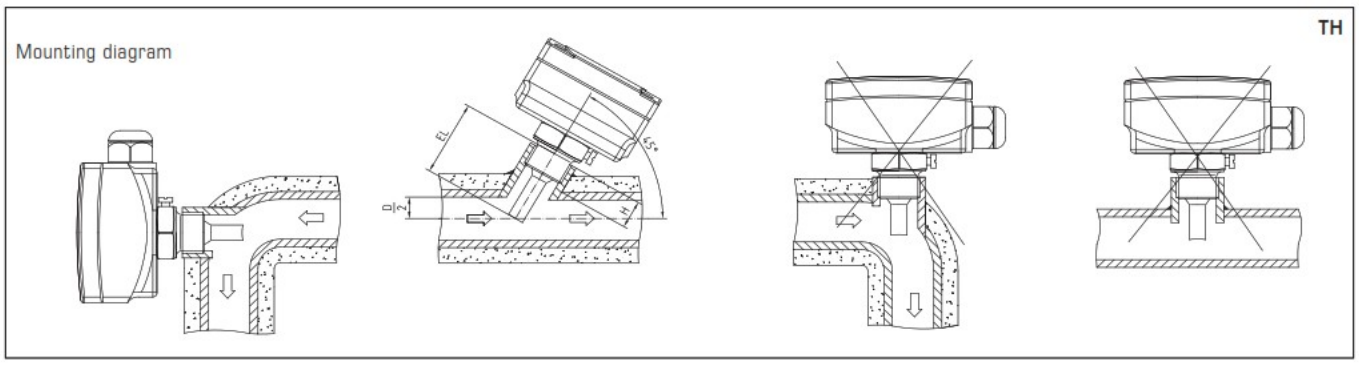
Basic device with accessories





MF-15-K

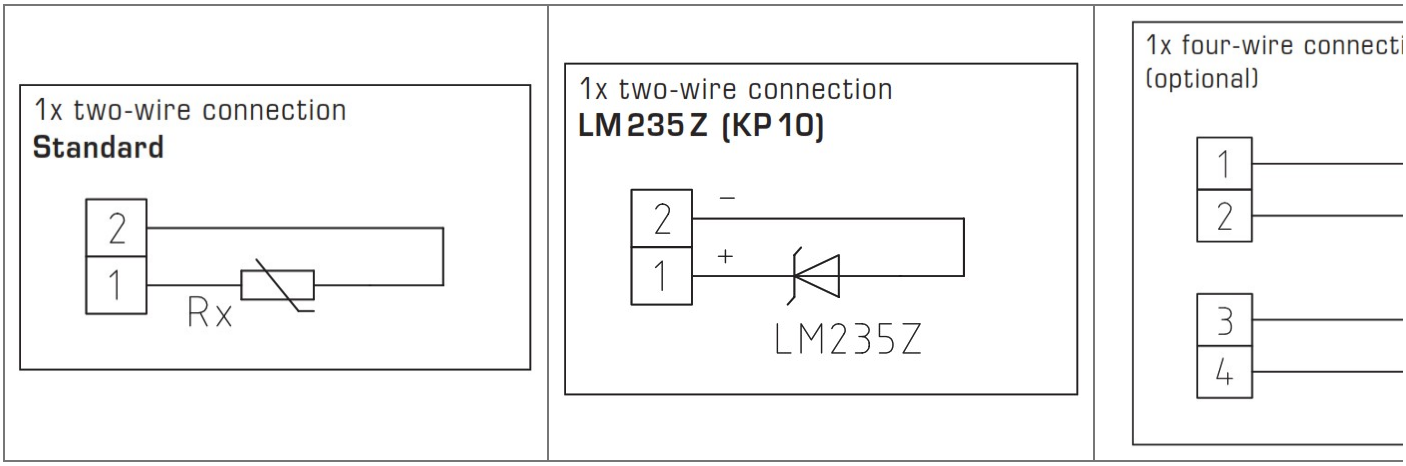
Mounting flange, plastic



THERMASGARD®TF 43 / TF 65

Patented quality product (Immersion sensor patent no. DE 10 2012 017 500.0)
THERMASGARD® TF43 is a resistance thermometer with a passive output, housing made from impact-resistant plastic with snap-on lid, and straight protective tube. THERMASGARD® TF65 is a resistance thermometer with a passive output, housing made from impact-resistant plastic with quick-locking screws, and straight protective tube. These immersion / screw-in / duct temperature sensors are electric contact thermometers for temperature measurement in liquids and gases, which are installed for example in piping systems and vessels. For aggressive

media, stainless steel immersion sleeves must be used. Applications of these temperature sensors in piping systems, in heating technology, in storage tanks, in district heating compact stations, in hot and cold-water systems, in oil and lubricant circulation systems, in mechanical, apparatus and plant engineering as well as in the entire industrial sector.



TECHNICAL DATA

Measuring range:	–30…+150 °C (Tmax NTC = +150 °C, Tmax LM235Z = +125 °C)
Sensors / output:	see table, passive (Perfect Sensor Protection) (optional also with two sensors)
Connection type:	2-wire connection (4-wire connection on PT100 / PT1000A, optional on other sen sors)
Testing current:	< 0.6 mA (Pt1000) < 1.0 mA (Pt100) < 0.3 mA (Ni1000, Ni1000 TK5000) < 2.0 mW (NTC xx) 400 µA…5 mA (LM235Z)
Insulating resistance:	≥ 100 MΩ, at +20 °C (500 V DC)
Ambient temperature:	–20…+100 °C
Housing:	plastic, UV-resistant, material polyamide, 30 % glass-globe reinforced, colour traf fic white (similar to RAL 9016) TF 43 with snap-on lid TF 65 with quick-locking screws (slotted / Phillips head combination)
Housing dimensions:	72 x 64 x 37.8 mm (Tyr 1 / Tyr 01)
Cable connection:	cable gland, plastic (M 16 x 1.5; with strain relief, exchangeable, max. inner diam eter 10.4 mm) or M12 connector according to DIN EN 61076-2-101 (optional on request)
Electrical connection:	0.14 – 1.5 mm², via terminal screws
Protective tube:	stainless steel, V4A (1.4571), Ø = 6 mm, inserted length (EL) = 50 – 400 mm (se e table)
Permissible humidity:	< 95 % r. H., non-precipitating air
Protection class:	III (according to EN 60 730)
Protection type:	**TF 43 IP 54** (according to EN 60 529)* Housing tested, TÜV SÜD, Report No. 71 3160960A (Tyr 01) **TF 65 IP 67** (according to EN 60 529)* Housing tested, TÜV SÜD, Report No. 71 3139052 (Tyr 1) * Housing in the built-in state
ACCESSORIES	
MF – 15 – K	Mounting flange, plastic, 56.8 x 84.3 mm, Ø = 15.2 mm tube gland, Tmax= +100 °C
TH 08 – ms / xx	Immersion sleeve, brass, nickel-plated, Ø = 8 mm, Tmax= +150 °C, pmax= 10 b ar
TH 08 – VA / xx	Immersion sleeve, stainless steel, V4A (1.4571), Ø = 8 mm, Tmax= +600 °C, pm ax= 40 bar
TH 08 – VA / xx / 90	Immersion sleeve, stainless steel, V4A (1.4571), with neck tube (90 mm), Ø = 8 mm, Tmax= +600 °C, pmax= 40 bar

Type / WG03	Sensor / Output
TF 43 / TF 65	**other sensors on request**
TF xx PT100 xx MM	Pt100 (according to DIN EN 60 751, class B)
TF xx PT1000 xx MM	Pt1000 (according to DIN EN 60 751, class B)
TF xx PT1000A xx MM	Pt1000 (according to VDI / VDE 3512, class A-TGA)
TF xx NI1000 xx MM	Ni1000 (according to DIN EN 43 760, class B, TCR = 6180 ppm / K)
TF xx NITK xx MM	Ni1000 TK5000 (TCR = 5000 ppm / K), LG – Ni1000
TF xx LM234Z xx MM	LM235Z (TCR = 10 mV / K; 2.73 V at O °C), KP10
TF xx NTC1,8K xx MM	NTC 1.8 K
TF xx NTC10K xx MM	NTC 10 K
TF xx NTC20K xx MM	NTC 20 K
Inserted Length:	**xx MM = 50 mm, 100 mm, 150 mm, 200 mm, 250 mm, 300 mm, 350 mm, 400 mm**

General notes

Measuring principle of HVAC temperature sensors in general:
The measuring principle of temperature sensors is based on an internal sensor that outputs a temperature-dependent resistance signal.
The type of the internal sensor determines the output signal. The following active / passive temperature sensors are distinguished:
a) Pt 100 measuring resistor (according to DIN EN 60 751)
b) Pt 1000 measuring resistor (according to DIN EN 60751)
c) Ni 1000 measuring resistor (according to DIN EN 43 760, TCR = 6180 ppm / K)
d) Ni 1000_TK 5000 measuring resistor (TCR = 5000 ppm / K)
e) LM235Z, semiconductor IC (10 mV / K, 2.73 V / °C). Ensure correct polarity + /– when connecting!
f) NTC (according to DIN 44070)
g) PTC
h) KTY silicon temperature sensors

The most important resistance characteristics are shown on the last page of these operating instructions. According to their characteristics, individual temperature sensors exhibit different slopes in the range between 0 °C and +100 °C (TK value). Maximum-possible measuring ranges also vary from sensor to sensor (for some examples to this see under technical data).

Design of HVAC temperature sensors in general:
Sensors are distinguished by shape type as follows: surface-contacting sensors, cable temperature sensors, and housing-type and built-in temperature sensors.

- On surface-contacting sensors, the temperature sensor has at least one contact area that must be brought in contact, e.g. with the surface of radiators or pipes. If the contact area is not positioned correctly relative to the surface to be measured, significant temperature measurement errors may occur. Good contact area and temperature conduction must be ensured, dirt and unevenness must be avoided, and heat-conductive paste is to be used where necessary.
- On cable temperature sensors, the temperature sensor is installed inside a sensor sleeve, from which a

connecting cable is leading out. In addition to the standard insulating materials PVC, silicone, and fiberglass with stainless steel texture, other versions are also available that may allow a wider range of application.

- On housing-type sensors, the temperature sensor is embedded in a respective housing. Different designs of housing are available, e.g. with an external sensor sleeve (see outside temperature sensor ATF2). Housing-type sensors are normally distinguished into in-wall (FSTF) and on-wall (RTF, ATF) types and indoor and wet room versions. Connection terminals are placed on a plate inside the connecting housing.
- Duct and built-in temperature sensors are distinguished into temperature sensors with interchangeable measuring insert and without interchangeable measuring insert. Connection parts are placed inside a connecting head. Standard process connection for immersion sensors is a pipe thread (sizes in inches) and a mounting flange for duct sensors. However, it may be designed differently. When a built-in sensor has a neck tube, the application range is usually somewhat wider since ascending heat cannot flow directly and immediately into the connecting head. This is to be noted especially when transmitters are installed. The temperature sensor in built-in sensors is always placed inside the front part of the protective tube. On temperature sensors with short reaction times, protective tubes are stepped.

Note!
Select immersion depth for built-in sensors so that the error caused by heat dissipation stays within the admissible error margins. A standard value is: 10 x diameter of protection tube + sensor length. In connection with housing-type sensors, particularly with outdoor sensors, please consider the influence of thermal radiation. For that purpose, a sunshade and radiation protector SS-02 can be attached. If the sensor is used in refrigeration circuits, it must be insulated together with the housing to reduce the temperature potential between the device and the medium to a minimum and thus prevent condensation damage.

Maximum thermal load on components:
On principle, all temperature sensors shall be protected against unacceptable overheating!
Standard values for individual components and materials selected are shown for operation under neutral atmos phere and otherwise normal conditions (see table to the right).
For combinations of different insulating materials, the lowest temperature limit shall always apply.

Component ..... max. thermal load
Connecting cable
PVC, normal .....+70 ° C
PVC, heat-stabilized ..... +105 °C
Silicone ..... +180 °C
PTFE .....+200 °C
Fibreglass insulation with stainless steel texture .....+400 °C

Housing / Sensor
see table “Technical Data”

Resistance characteristics of passive temperature sensors (see last page)

In order to avoid damages / errors, preferably shielded cables are to be used.
Laying measuring cables parallel with current-carrying cables must in any case be avoided. EMC directives shall be observed!
These instruments must be installed by authorised specialists only!

Limiting deviation according to classes:
Tolerances at 0 °C:
Platinum sensors (Pt100, Pt1000):
DIN EN 60751, class B ..... ± 0.3 K

1 / 3 DIN EN 60751, class B ……..± 0.1 K
Nickel sensors:
NI1000 DIN EN 43760, class B …….. ± 0.4 K
NI1000 1 / 2 DIN EN 43760, class B …….. ± 0.2 K
NI1000 TK5000 …….. ± 0.4 K

ATTENTION, NOTE ! Testing current influences the thermometer‘s measuring accuracy due to intrinsic heating and therefore, should never be greater than as specified below:
Sensor current, maximum …….. Imax
Pt1000 (thin-layer) …… < 0.6 mA
Pt100 (thin-layer) …… < 1.0 mA
Ni1000 (DIN), Ni1000 TK5000 ……. < 0.3 mA
NTC xx …… < 2 mW
LM235Z …… 400 µA … 5 mA
KTY 81 – 210 ……< 2 mA

Installation and Commissioning

Devices are to be connected under dead-voltage condition. Devices must only be connected to safety extra-low voltage. Consequential damages caused by a fault in this device are excluded from warranty or liability. These devices must be installed and commissioned by authorised specialists. The technical data and connecting conditions shown on the device labels and in the mounting and operating instructions delivered together with the device are exclusively valid. Deviations from the catalogue representation are not explicitly mentioned and are possible in terms of technical progress and continuous improvement of our pro ducts. In case of any modifications made by the user, all warranty claims are forfeited. Operating this device close to other devices that do not comply with EMC directives may influence functionality. This device must not be used for monitoring applications, which serve the purpose of protecting persons against hazards or injury, or as an EMERGENCY STOP switch for systems or machinery, or for any other similar safety-relevant purposes.
Dimensions of housing or housing accessories may show slight tolerances on the specifications provided in these instructions. Modifications of these records are not permitted.
In case of a complaint, only complete devices returned in original packing will be accepted.

Our “General Terms and Conditions for Business“ together with the “General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry“ (ZVEI conditions) including supplementary clause “Extended Retention of Title“ apply as the exclusive terms and conditions“.

Notes regarding mechanical mounting and attachment: Mounting shall take place while observing all relevant regulations and standards applicable for the place of measurement (e.g. such as welding instructions, etc.).
Particularly the following shall be regarded:

- VDE / VDI directive technical temperature measurements, measurement set – up for temperature measurements.
- The EMC directives must be adhered to.
- It is imperative to avoid parallel laying of current-carrying lines.
- We recommend to use shielded cables with the shielding being attached at one side to the DDC / PLC.
- If the sensor is used in refrigeration circuits, it must be insulated together with the housing to reduce the temperature potential between the device and the medium to a minimum and thus prevent condensation damage.

Before mounting, make sure that the existing thermometer‘s technical parameters comply with the actual conditions at the place of utilization, in particular in respect of:

- Measuring range
- Permissible maximum pressure, flow velocity
- Installation length, tube dimensions
- Oscillations, vibrations, shocks are to be avoided (< 0.5 g)

Attention! In any case, please observe the mechanical and thermal load limits of the protective tubes according to DIN 43763 or according to specific S+S standards!

Notes regarding process connection of built-in sensors:
If possible, select material of protective tube to match the material of piping or tank wall, in which the thermometer will be installed!
Maximum temperatures Tmax and maximum pressures pmax are as follows: for TH – MS brass sleeves Tmax = +150 °C, pmax = 10 bar and for TH – VA stainless steel sleeves (standard) Tmax = +400 °C, pmax = 40 bar.

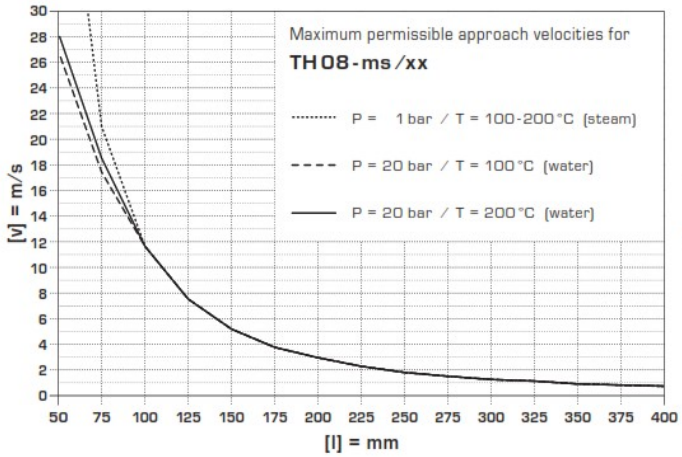
Screw-in threads:
Ensure appropriate support of the gasket or sealing material when mounting! Permissible tightening torque standard values for screw – in threads, are as follows:
M 18 x 1.5; M 20 x 1.5; pipe thread G ½ " : 50 Nm
M 27 x 2.0; pipe thread G ¾ " : 100 Nm

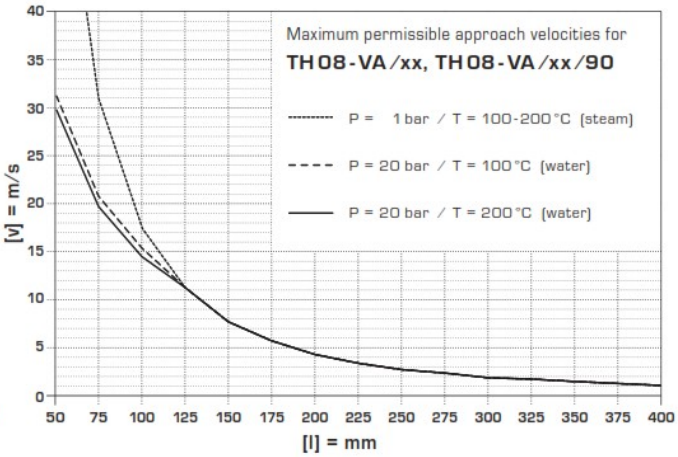
Flange mounting:
In case of flange mounting, screws in the flange part must be equally tightened. The lateral pressure screw must clamp securely, otherwise the feeler shaft might slip through.

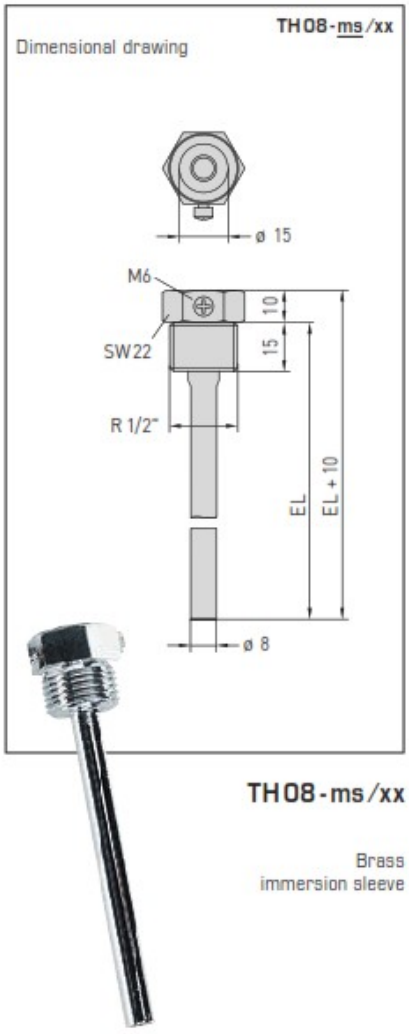
Welding sleeves:
Specific welding instructions shall be observed.
On principle, unevenness or the like that might influence the system‘s "CIP ability“ must not develop at welds.
For high-pressure lines, pressure test certifications and inspections are required.

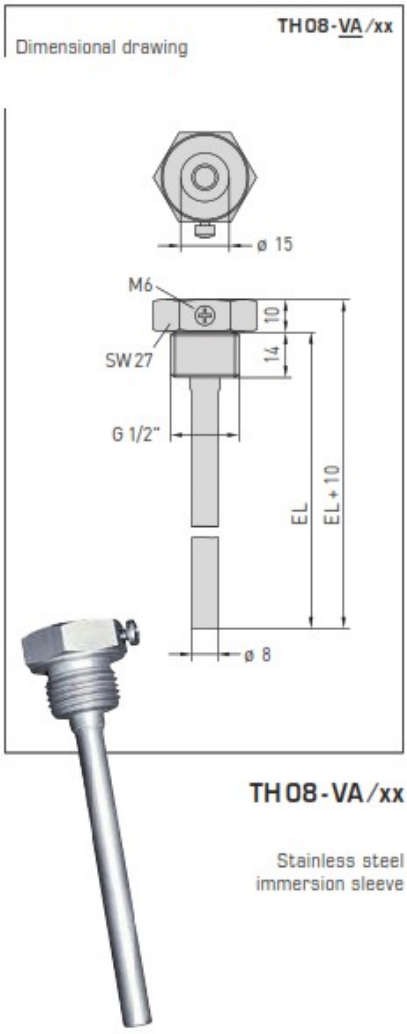
Notes on commissioning:
This device was calibrated, adjusted and tested under standardized conditions.
When operating under deviating conditions, we recommend performing an initial manual adjustment on-site during commissioning and subsequently at regular intervals.
Commissioning is mandatory and may only be performed by qualified personnel!

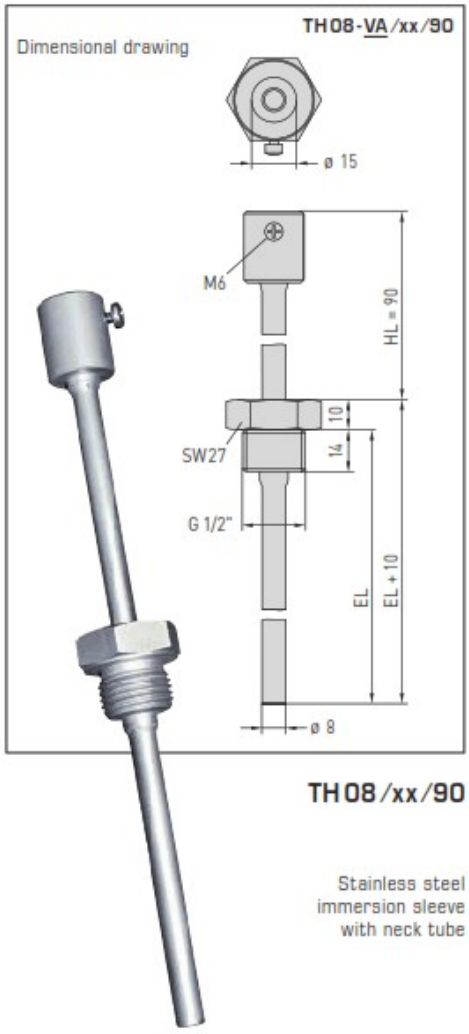
Permissible approach velocities (flow rates) for crosswise approached protective tubes in water.
The approaching flow causes protective tube to vibrate. If specified approach velocity is exceeded even by a marginal amount, a negative impact on the protective tube’s service life may result (material fatigue). Discharge of gases and pressure surges must be avoided as they have a negative influence on the service life and may damage the protective tubes irreparably.
Please observe maximum permissible approach velocities
for stainless steel protective tubes 8 x 0.75 mm (1.4571) (see graph TH 08 – VA / xx, TH 08 – VA / xx / 90) as well as for brass protective tubes 8 x 0.75 mm (see graph TH 08 – ms / xx) :











Subject to errors and technical changes. All statements and data herein represent our best knowledge at date of publication. They are only meant to inform about our products and their application potential, but do not imply any warranty as to certain product characteristics. Since the devices are used under a wide range of different conditions and loads beyond our control, their particular suitability must be verified by each customer and/or end user themselves. Existing property rights must be observed. We warrant the faultless quality of our products as stated in our General Terms and Conditions.

Resistance characteristics of passive temperature sensors

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ºC	PT 100 Ω	PT 1000 Ω	Ni1000 Ω	Ni 1000 TK 5000 Ω	Fe T (T1) Ω	KTY 81-210 Ω	LM235Z (KP10) mV	ºC
– 50	80.3	803	743	790.8	–	1030	–	– 50
– 40	84.3	843	791	826.8	–	1135	2330	– 40
– 30	88.2	882	842	871.7	1935	1247	2430	– 30
– 20	92.2	922	893	913.4	20 31	1367	2530	– 20
– 10	96.1	961	946	956.2	2128	1495	2630	– 10
0	100.0	1000	1000	1000.0	2227	1630	2730	0
+ 10	103.9	1039	1056	1044.8	2328	1772	2830	+ 10
+ 20	107.8	1078	1112	1090.7	2429	1922	2930	+ 20
+ 30	1 11.7	1 1 17	11 71	1 137.6	2534	2080	3030	+ 30
+ 40	1 15.5	1155	1230	1 185.7	2639	2245	3130	+ 40

+ 50	1 19.4	1194	1291	1235.0	2746	2417	3230	+ 50
+ 60	123.2	1232	1353	1285.4	2856	2597	3330	+ 60
+ 70	127.1	1271	1417	1337.1	2967	2785	3430	+ 70
+ 80	130.9	1309	1483	1390.1	3079	2980	3530	+ 80
+ 90	134.7	1347	1549	1444.4	3195	3182	3630	+ 90
+ 100	138.5	1385	1618	1 500.0	3312	3392	3730	+ 100
+ 110	142.3	1423	1688	1557.0	3431	3607	3830	+ 110
+ 120	146.1	1461	1760	1625.4	3552	3817	3930	+ 120
+ 130	149.8	1498	1833	–	3676	4008	–	+ 130
+ 140	153.6	1536	1909	–	3802	4166	–	+ 140
+ 150	157.3	1573	1987	–	3929	4280	–	+ 150

ºC	NTC 1.8 kOhm Ω	NTC 2.2 k0hm Ω	NTC 3 k0hm Ω	NTC 5 kOhm Ω	NTC 10 k0hm Ω	NTC 10 kPRE Ω	NTC 20k0hm Ω	NTC SO kOhm Ω	ºC
– 50	–	–	–	–	–	–	–	–	– 50
– 40	39073	–	–	–	–	–	806800	2017000	– 40
– 30	22301	27886	53093	88488	175785	135200	413400	1033500	– 30
– 20	13196	16502	29125	48541	96597	78910	220600	551500	– 20
– 10	8069	10070	16599	27664	55142	47540	122260	305650	– 10
0	5085	6452	9795	16325	32590	29490	70140	175350	0
+ 10	3294	4138	5971	9951	19880	18790	41540	103850	+ 10
+ 20	2189	2719	3747	6246	12491	12270	25340	63350	+ 20
+ 30	1489	1812	2417	4028	8058	8196	15886	39715	+ 30

+ 40	1034	1248	1597	2662	5329	5594	10212	25530	+ 40
+ 50	733	876	1081	1801	3605	3893	6718	16795	+ 50
+ 60	529	626	746	1244	2489	2760	4518	11295	+ 60
+ 70	389	454	526	876	1753	1900	3098	7745	+ 70
+ 80	290	335	346	627	1256	1457	2166	5415	+ 80
+ 90	220	251	275	458	915	1084	1541	3852	+ 90
+ 100	169	190	204	339	678	817	1114	2785	+ 100
+ 110	131	146	138	255	509	624	818	2045	+ 110
+ 120	103	–	105	195	389	482	609	1 523	+ 120
+ 130	–	–	81	151	300	377	460	1 149	+ 130
+ 140	–	–	64	118	234	298	351	878	+ 140
+ 150	–	–	50	93	185	238	272	679	+ 150

Documents / Resources

	S S REGELTECHNIK TF43 Immersion Temperature Sensor [pdf] Instruction Manual TF43, TF65, TF43 Immersion Temperature Sensor, Immersion Temperature Sensor, Temperature Sensor, Sensor

References

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