GESTRA®

GESTRA Steam Systems

TRG 5-11
TRG 5-41

GB

Installation Instructions 818697-00

Temperature Sensor
TRG 5-11, TRG 5-41

Contents

Contents – continued –

Important Notes

Usage for the intended purpose

Use temperature sensors TRG 5-11 and TRG 5-41 only in conjunction with temperature switch TRS 5-7 for measuring temperatures.

Safety note

The equipment must only be installed and commissioned by qualified and competent staff.
Retrofitting and maintenance work must only be performed by qualified staff who – through adequate training – have achieved a recognised level of competence.

Danger

The temperature sensors TRG 5-11 and TRG 5-41 are fixed in vessels or pipes. When loosening the temperature sensor hot water, steam, gas, corrosive or toxic fluids might escape. This presents the danger of poisoning or severe scalding and acid burns to the whole body. Installation and maintenance work should only be carried out when the system is depressurized! If necessary wear protective clothing.

The temperature sensor becomes hot during operation. This presents the risk of severe burns to hands and arms.

All installation and maintenance work must only be performed when the system is cold!

PED (Pressure Equipment Directive)

The equipment complies with the requirements of the Pressure Equipment Directive PED 97/23/CE. TRG 5-11 and TRG 5-41 can be used with fluids of group 2. With CE marking.

ATEX (Atmosphère Explosible)

According to the European Directive 94/9/EC the equipment must **not** be used in explosion risk areas!

Explanatory Notes

Scope of supply

TRG 5-11
1 Temperature sensor TRG 5-11, PN 1
1 Installation manual

TRG 5-41
1 Temperature sensor TRG 5-41, PN 160
1 Installation manual

Description

TRG 5-11 and TRG 5-41 are temperature sensors with integral thermocouples to DIN EN 60584. The temperature sensors work in conjunction with the temperature switch TRS 5-7 and serve as safety temperature limiters according to DIN 3440/prEN 14597 for signalling excessively high temperatures.

Application in combination with GESTRA safety temperature limiter TRS 5-7 in steam boilers, (pressurized) hot water plants and furnaces according to DIN 30683 up to 1000 °C , e. g. for limiting furnace or flue gas temperatures.

Function

The temperature sensors feature an exchangeable temperature sensing element, consisting of two thermocouples type K (NiCr-Ni, Chromel-alumel) according to DIN IEC 584, class 2. To ensure short response times the temperature sensors are installed without an additional thermowell. The voltage generated in the thermocouple as a function of the temperature reading is compared in the safety temperature limiter with the adjusted switch-off temperature. When the adjusted temperature limit is exceeded, the follow-up function that has to be provided on site (e. g. a temperature alarm) will be triggered.

System components

TRS 5-7
Temperature switch **TRS 5-7**. Two-channel (redundancy) limiter with periodic self-checking routine to VDE 0116.

Design

TRG 5-11
Temperature sensor with protection tube to DIN IEC 751.
The temperature sensing element Ⓑ can be removed.

TRG 5-41
Temperature sensor with weld-in protection sleeve to DIN IEC 751.
The temperature sensing element Ⓑ can be removed.

Technical Data

TRG 5-11, TRG 5-41

Type approval
DIN · STW (STB) · 986 98S
EG 01 202 931-B-01 000 7

Service pressure
TRG 5-11: 1 bar g (14.5 psi g)
TRG 5-41: 150 bar g (2176 psi g)

Max. service temperature
TRG 5-11: 1000 °C (1832 °F)
TRG 5-41: 650 °C (1202 °F)

Admissible flow velocities
TRG 5-41: in water 5 m/s
in gases 60 m/s

Connections
TRG 5-11: Protection tube (stop flange or screwed socket optional)
TRG 5-41: Protection weld-in tube

Length of sensor
TRG 5-11: 710 mm nominal length
TRG 5-41: 200 mm length of protection tube

Materials
TRG 5-11: Protection tube made of X 10 CrAl 24 (1.4762)
Screwed sockets made of 9 SMnPb 28 (1.0718)
TRG 5-41: Protection weld-in tube made of X 8 CrNiNb 16-13 (1.4961)

Max. admissible ambient temperature at terminal box
120 °C (248 °F)

Protection of terminal box
IP 54

Temperature sensing element
Thermocouple type K (NiCr-Ni) to DIN IEC 584, class 2.

Weight
TRG 5-11: approx. 1.02 kg at nominal length 710 mm
TRG 5-41: approx. 1.1 kg

Technical Data – continued –

Corrosion resistance

Provided that the equipment is used for the intended purpose, its safety is not impaired by corrosion.

Sizing

The housing must not be subjected to sharp increases in pressure. The dimensional allowances for corrosion reflect the latest state of technology.

Name plate / marking

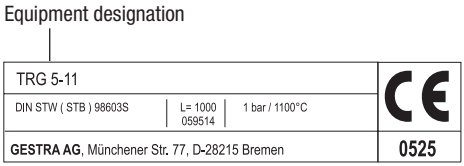


Fig. 1

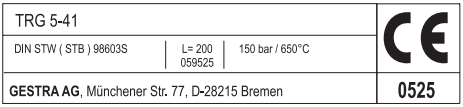


Fig. 2

Technical Data – continued –

Dimensions

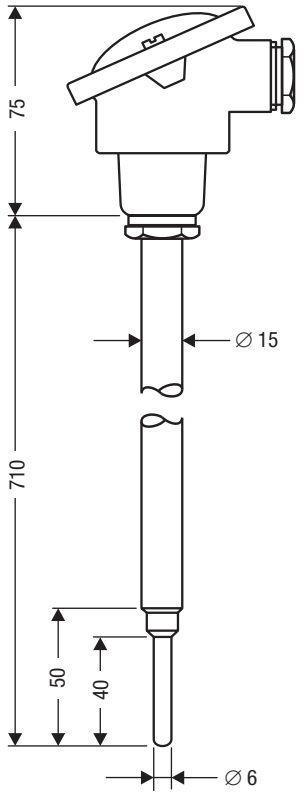
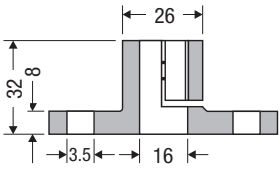


Fig. 3
TRG 5-11



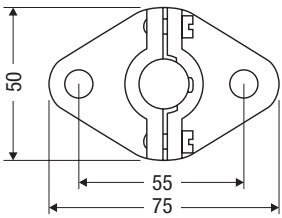


Fig. 4

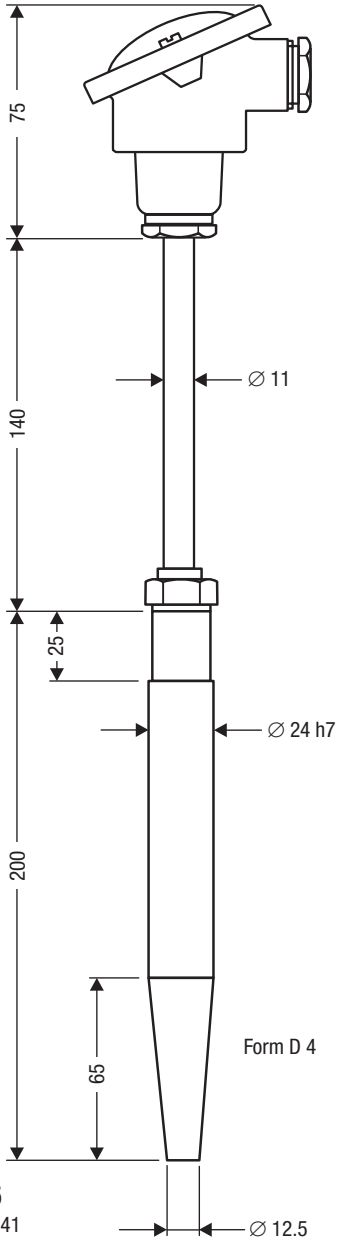


Fig. 5
TRG 5-41

Component Parts

TRG 5-11, TRG 5-41

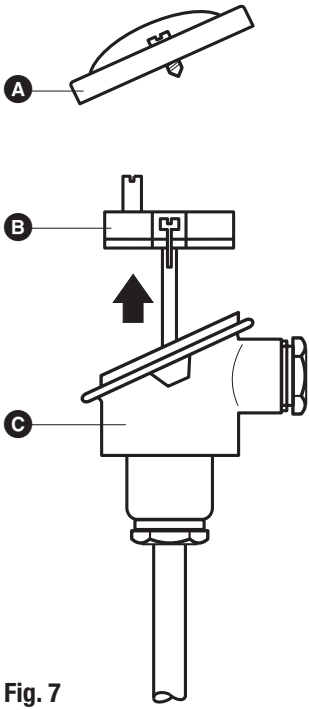
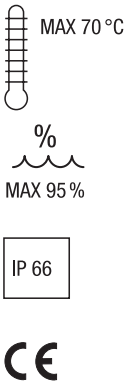


Fig. 7



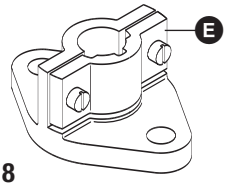


Fig. 8

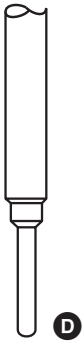


Fig. 6
TRG 5-11

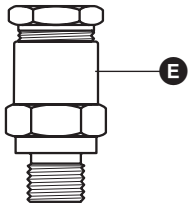


Fig. 9

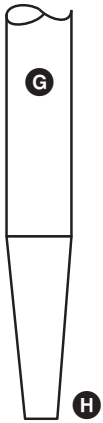


Fig. 10
TRG 5-41

Component Parts – continued –

Key

- **A** Cover
- **B** Sensing element
- **C** Temperature sensor
- **D** Measuring tip TRG 5-11
- **E** Mounting flange
- **F** Screwed socket ¾"
- **G** Protection tube
- **H** Measuring tip TRG 5-41
- **I** Insulation (provided by customer)
- **J** Elbow
- **K** Twin PG thread (page 14)

Installation

TRG 5-11

1. Provide a bore for the sensor d = 16 mm on site.
2. Insert the temperature sensor Ⓒ such that its measuring tip Ⓓ reaches 120 mm into liquids or 225 mm into gases, **Fig. 6**.
3. To fix the sensor use either a mounting flange or a gas-tight screwed socket, **Fig. 8, Fig. 9**.

TRG 5-41

1. Provide a bore for the protective tube d = 24 mm on site.
2. Unscrew the cover of the temperature sensor Ⓒ from the protection tube Ⓖ, **Fig. 5, Fig. 10**.
3. Insert the protective tube Ⓖ such that the measuring tip Ⓗ reaches 100 mm into liquids or 160 mm into gases. If a short installation length is required provide an angled piece for the sensor and ensure that the tip points against the flow direction, **Fig. 13, Fig. 14**.
4. Weld the protection tube in place. Use only gas-welding process 111 and 141 to ISO 4063.
5. Place copper ring D 18 x 22 onto the protection tube Ⓖ and screw the cover of the temperature sensor Ⓒ onto the protection tube. Slightly fasten the cover of the temperature sensor with an open-end spanner.

Attention

- Only qualified welders certified according to EN 287-1 may weld protective sleeves into pressurized lines.

Note

- When installing the equipment in pipes weld an elbow Ⓙ onto the pipe, ensuring that the measuring tip points against the flow direction of the fluid, **Fig. 13, Fig. 14**.
- Install the temperature sensor such that its measuring tip Ⓓ/Ⓗ is permanently immersed in the fluid, **Fig. 11, Fig.12**.
- Do not completely insulate the temperature sensor. See Examples of Installation, **Fig. 11, Fig. 12**.

Tools

- Open-end spanner 24 mm A. F.

Heat treatment of welds

A subsequent heat treatment of the welds may be required if it is specified by the plant operator.

Examples of installation

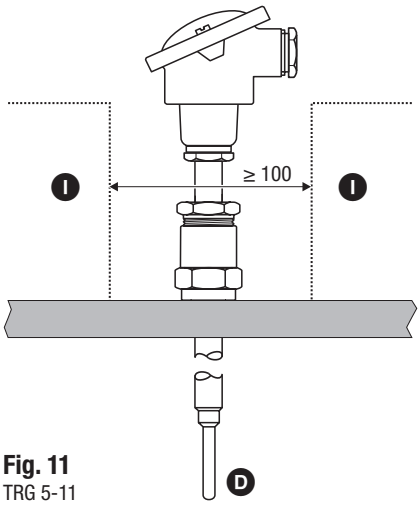


Fig. 11
TRG 5-11

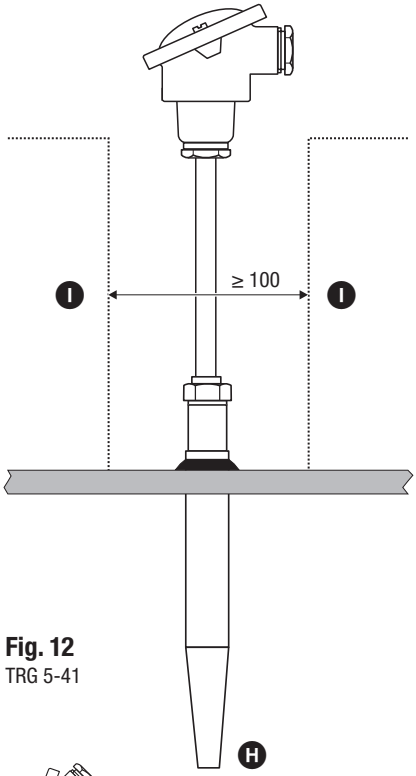


Fig. 12
TRG 5-41

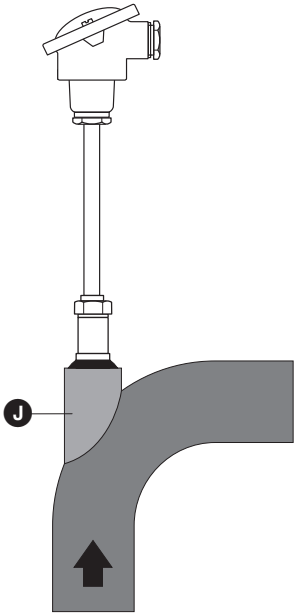


Fig. 13
TRG 5-41

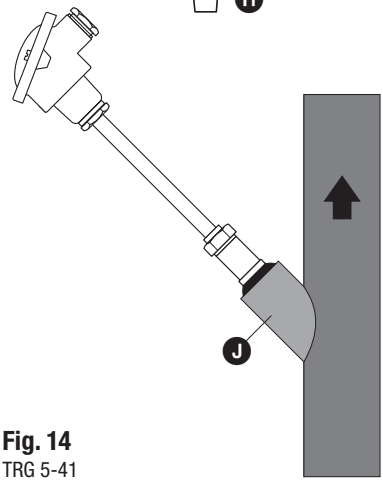


Fig. 14
TRG 5-41

Installation – continued –

Key

Ⓓ Measuring tip TRG 5-11

Ⓗ Measuring tip TRG 5-41

Ⓘ Insulation (provided by customer)

Ⓙ Elbow

Ⓚ Twin PG thread (page 14)

Wiring

TRG 5-11, TRG 5-41

Use 2 x 0.35 mm² compensating line as supply line. Note that two supply lines per temperature sensor are required for the safety temperature monitoring function.

Note

- Two supply lines per temperature sensor are required for the safety function “Temperature monitoring”.
- The supply lines must go through the twin PG thread into the terminal box, **Fig. 16**.

Tools

- Screwdriver for slotted screws, size 2.5, completely insulated to DIN VDE 0680-1

Wiring – continued –

Wiring diagram

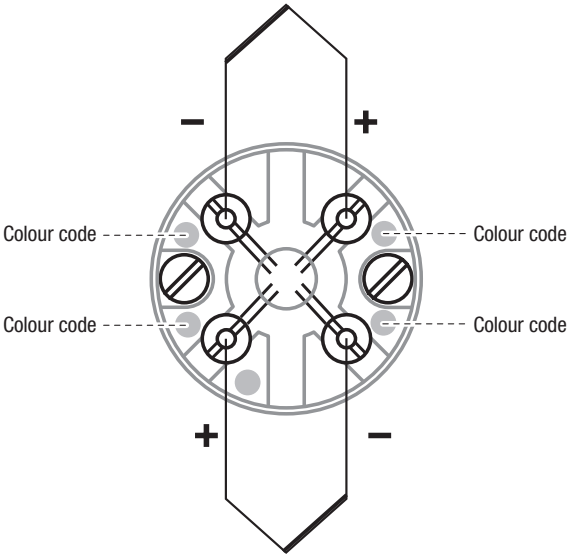


Fig. 15

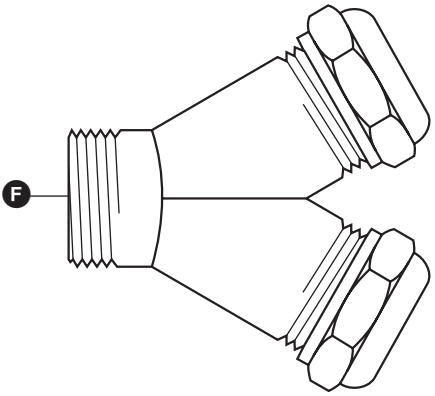


Fig. 16

Commissioning

Check wiring

Make sure that the TRG 5-11 or TRG 5-41 and the associated control unit TRS 5-7 are wired in accordance with the wiring diagram, **Fig. 15**.

Apply mains voltage

Switch on mains voltage for temperature switch TRS 5-7.

Measure fluid temperature

Use the following table indicating the voltages of the thermocouples to ascertain the current temperature of the fluid.

1. Connect the test wires directly to the terminal box.
2. Measure the voltage with a voltmeter.
3. Find the corresponding value in the table below, read off the temperature and, if necessary, determine the exact value by interpolation.

°C	0	– 10	– 20	– 30	– 40	– 50	– 60	– 70	– 80	– 90
– 100	– 3.553	– 3.852	– 4.138	– 4.410	– 4.669	– 4.912	– 5.141	– 5.534	– 5.550	– 5.730
0	0	– 0.392	– 0.777	– 1.156	– 1.527	– 1.889	– 2.243	– 2.586	– 2.920	– 3.242
°C	0	10	20	30	40	50	60	70	80	90
0	0	0.397	0.798	1.203	1.611	2.022	2.436	2.850	3.266	3.681
100	4.095	4.508	4.919	5.327	5.733	6.137	6.539	6.939	7.338	7.737
200	8.137	8.537	8.938	9.341	9.745	10.151	10.560	10.969	11.381	11.793
300	12.207	12.623	13.039	13.456	13.874	14.292	14.712	15.132	15.552	15.974
400	16.395	16.818	17.241	17.664	18.088	18.513	18.938	19.363	19.788	20.214
500	20.640	21.066	21.493	21.919	22.346	22.772	23.198	23.624	24.050	24.476
600	24.902	25.327	25.751	26.176	26.599	27.022	27.445	27.867	28.288	28.709
700	29.128	29.547	29.965	30.383	30.799	31.214	31.629	32.042	32.455	32.866
800	33.277	33.686	34.095	34.502	34.909	35.314	35.718	36.121	36.524	36.925
900	37.325	37.724	38.122	38.519	38.915	39.310	39.703	40.096	40.488	40.879
1000	41.269	41.657	42.045	42.432	42.817	43.202	43.585	43.968	44.349	44.729
1100	45.108	45.486	45.863	46.238	46.612	46.985	47.356	47.726	48.095	48.462
1200	48.828	49.192	49.555	49.916	50.276	50.633	50.990	51.344	51.697	52.049
1300	52.398	52.747	53.093	53.439	53.782	54.125	54.466	54.807		

Basic resistance values according to EN 60584 for thermocouples type K (Ni-Cr/Ni-Al)

Operation

TRG 5-11, TRG 5-41

Operation in combination with control unit TRS 5-7 in steam plants and (pressurized) hot water installations to TRD 401, TRG 602, TRD 604, EN 12952, EN 12953 or according to national regulations as well as in flue gas lines and industrial furnaces.

Note

- Should malfunctions occur during the commissioning procedure refer to section “Troubleshooting” on page 16 in order to find, analyse and eliminate the fault.

Troubleshooting

Fault-finding list for malfunctions

Normal operation – temperature alarm

Fault: The temperature switch gives an alarm during normal operation.
Remedy: Check whether the cable leading to the thermocouple is damaged.
Remedy: Check the thermocouple for correct voltage readings. (Basic reference voltages according to EN 60584 for thermocouples type K (Ni-Cr/Ni-Al)). If the voltage readings are incorrect or there is no voltage replace the sensing element.

Fault: The temperature switch gives an alarm during normal operation.
Remedy: Refer to the fault-finding list of the temperature switch TRS 5-7.

If faults occur that are not listed above or cannot be corrected, please contact our service centre or authorized agency in your country.

Maintenance

Spare parts

Item	Designation	Stock code	Stock code
		TRG 5-11	TRG 5-41
B	Sensing element	052272	052268
F	Screwed socket ¾", material: 1.0718	051599	
E	Mounting flange	051600	
G	Protection tube D4, 24 x 200 mm, 1.4961		143612
K	Twin PG thread	387100	387100

Replace sensing element

The sensing element B can be replaced during operation if necessary.

1. Remove cover A, **Fig. 7**
2. Disconnect wires from terminals.
3. Use a screwdriver to unscrew and remove the sensing element B.
4. Insert new sensing element and fasten with a screwdriver.
5. Connect terminals according to wiring diagram, **Fig. 15**
6. Mount cover A.

Decommissioning

Danger

Risk of severe burns and scalds to the whole body.

Before removing the temperature sensor make sure that the vessel or pipeline is depressurised (0 bar) and cooled down to room temperature (20 °C).

Disposal

Remove the temperature sensor and separate the waste materials in accordance with the material specification.
Electronic components (boards) must be disposed of separately.
For the disposal of the temperature sensor observe the pertinent legal regulations concerning waste disposal.

Annex – continued –

Declaration of Conformity CE

We hereby declare that the equipment **TRG 5-11** and **TRG 5-41** conform to the following European guidelines:

- LV guideline 73/23/EC version 93/68/EC
- EMC guideline 89/336/EC version 93/68/EC
- Pressure Equipment Directive (PED) 97/23/EC of 29 May 1997 (provided that the equipment is not excluded from the scope of this directive according to section 3.3)
- LV standard EN 50178
- EMC standard EN 50081-2. EN 50082-2

Applied conformity assessment procedure: Annex III, module B and D, verified by the notified body 0525.

This declaration is no longer valid if modifications are made to the equipment without consultation with us.

Bremen, 3rd January 2005
GESTRA AG

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For your notes

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