



Temperature Transmitter

# TRV 5-60

EN  
English

Original Installation &  
Operating Manual

**819633-00**

# Contents

<b>Content of this Manual</b> .....	4
<b>Scope of delivery/Product package</b> .....	4
<b>How to use this Manual</b> .....	5
<b>Illustrations and symbols used</b> .....	5
<b>Hazard symbols in this Manual</b> .....	5
<b>Types of warning</b> .....	6
<b>Specialist terms/Abbreviations</b> .....	7
<b>Usage for the intended purpose</b> .....	8
Applicable directives and standards .....	8
Admissible system components, dependent on the required safety integrity level .....	9
<b>Improper use</b> .....	10
<b>Basic safety notes</b> .....	10
<b>Required personnel qualifications</b> .....	11
<b>Notes on product liability</b> .....	11
<b>Functional safety, safety integrity level (SIL)</b> .....	12
Check the safety function regularly .....	12
<b>Reliability data to EN 61508</b> .....	13
<b>Function</b> .....	14
<b>Technical data</b> .....	15
<b>Factory settings</b> .....	16
<b>Name plate/identification</b> .....	17
<b>Functional elements</b> .....	18
<b>Dimensions (incl. mounting bracket)</b> .....	19
<b>Mounting bracket with drill pattern</b> .....	19
<b>Preparing for installation</b> .....	20
<b>Installing the temperature transmitter</b> .....	20
<b>Connecting a TRG 5-6x temperature sensor</b> .....	21
Connecting cable, cable type/cross-section, and admissible cable length.....	21
Wiring diagram for TRG 5-6x temperature sensor .....	22
<b>Connecting the CAN bus system</b> .....	23
Bus line, cable length and cross-section .....	23
Example .....	23
Important notes on connecting the CAN bus system.....	24
Pin assignment of the CAN bus connector and coupling for non pre-wired control cables.....	24

# Contents

<b>Bringing into service</b> .....	<b>25</b>
Changing the factory settings if necessary .....	25
Notes on changing the communication parameter “bd.rt, ld” .....	27
Changing the baud rate .....	28
Changing the limiter ID .....	28
Setting the limit value AL.Hi (°C) (cutout temperature) .....	29
Manually triggering a display test .....	30
<b>Starting, operation and testing</b> .....	<b>31</b>
<b>System malfunctions</b> .....	<b>34</b>
Causes .....	34
Indication of system malfunctions using fault codes.....	35
Checking installation and function .....	37
<b>Taking out of service</b> .....	<b>38</b>
<b>Disposal</b> .....	<b>38</b>
<b>Returning decontaminated devices</b> .....	<b>38</b>
<b>EU Declaration of Conformity</b> .....	<b>39</b>

## Content of this Manual

### Product:

Temperature transmitter TRV 5-60

### First edition:

BAN 819633-00/08-2019cm

### Applicable documents:

- Installation & Operating Manual for Temperature Sensor TRG 5-6x
- Installation & Operating Manual for Safety Control Unit URS 6x

You can find the latest Installation & Operating Manuals on our website:

<http://www.gestra.com/documents/brochures.html>

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## Scope of delivery/Product package

- 1 x temperature transmitter TRV 5-60
- 1 x Installation & Operating Manual
- 1 x mounting bracket (preassembled)
- 4 x fastening screws M6 x 30 mm, 8 x washers M6; 4 x nuts M6

### Accessories

- 1 x M12 CAN bus connector, 5-pole, A-coded, with 120  $\Omega$  terminating resistor

## How to use this Manual

This Installation & Operating Manual describes the correct use of the TRV 5-60 temperature transmitter. It applies to persons who integrate this equipment in control systems, install, bring into service, operate, maintain and dispose of this equipment. Anyone carrying out the above-mentioned activities must have read this Installation & Operating Manual and understood its contents.

- Read this Manual in full and follow all instructions.
- Please also read the instructions for use of any accessories.
- The Installation & Operating Manual is part of the equipment package. Keep it in an easily accessible location.

### Availability of this Installation & Operating Manual

- Make sure this Installation & Operating Manual is always available to the operator.
- If you pass on or sell the equipment to a third party, please also hand over the Installation & Operating Manual.

## Illustrations and symbols used

1. Action to be taken
- 2.

- Lists
  - ◆ Bullet points in lists

### A Keys to illustrations



Additional information



Read the relevant Installation & Operating Manual

## Hazard symbols in this Manual



Danger zone/Dangerous situation



Danger of death from electric shock

## Types of warning

### **DANGER**

Warning of a dangerous situation that results in death or serious injury.

---

### **WARNING**

Warning of a dangerous situation that may possibly result in death or serious injury.

---

### **CAUTION**

Warning of a situation that may result in minor or moderate injury.

---

### **ATTENTION**

Warning of a situation that results in damage to property or the environment.

---

## Specialist terms/Abbreviations

Here, we explain some abbreviations, specialist terms, etc., which are used in this Manual.

### **IEC 61508**

International standard IEC 61508 describes both the type of risk assessment and actions taken to provide appropriate safety functions.

### **SIL (safety integrity level)**

Safety integrity levels SIL 1 to 4 are used to quantify risk reduction. SIL 4 is the highest level of risk reduction. International standard IEC 61508 forms the basis for establishing, testing and operating technical safety systems.

### **CAN (Controller Area Network) bus**

Data transmission standard and interface for connecting electronic equipment, sensors and control systems. Data can be sent and received.

### **TRG .. / TRV .. / URS .. / URB .. / etc.**

Equipment and type designations of GESTRA AG, see page 9.

### **SELV**

Safety Extra Low Voltage

## Usage for the intended purpose

The TRV 5-60 temperature transmitter may be used in combination with temperature sensors TRG 5-63, TRG 5-64, TRG 5-65, TRG 5-66, TRG 5-67 and TRG 5-68 solely for limiting excessive temperatures.

### The temperature transmitter can be used as:

- A safety temperature limiter/monitor, in combination with TRG 5-6x temperature sensor and URS 60 / URS 61 safety control units.  
Safety temperature limiters or monitors switch off the heating when the maximum admissible temperature is reached. Method of operation TYPE 2.BKP (+JV, with external lock) to EN 60730-1.
- Visualisation and operation take place via the URB 60 or SPECTOR*control* operating terminal.

## Applicable directives and standards

The TRV 5-60 temperature transmitter has been tested and approved for use in the scope governed by the following directives and standards:

### Directives:

- |                        |   |
|------------------------|---|
| ■ Directive 2014/68/EU | EU Pressure Equipment Directive –<br>Item of equipment with safety function |
| ■ Directive 2014/35/EU | Low Voltage Directive   |
| ■ Directive 2014/30/EU | EMC Directive   |
| ■ Directive 2011/65/EU | RoHS II Directive   |

### Standards:

- |               |   |
|---------------|---|
| ■ EN 12953-09 | Shell boilers, requirements for limiting devices                                    |
| ■ EN 12952-11 | Water-tube boilers, requirements for limiting devices                               |
| ■ EN 14597    | Temperature control devices and temperature limiters for heat<br>generating systems |
| ■ EN 60730-1  | Automatic electrical controls – Part 1:<br>General requirements                     |
| ■ EN 61508    | Functional safety of electronic systems   |



## Usage for the intended purpose

### Admissible system components, dependent on the required safety integrity level

In accordance with the EU Pressure Equipment Directive and standards EN12952, EN12953, EN14597 and EN 61508, the temperature transmitter can be operated with the following system components, as suitable for the required safety integrity level.

	Temperature sensor	Safety control unit as temperature limiter	Operating unit
<b>SIL 3</b> to EN 61508	TRG 5-63 TRG 5-64 TRG 5-65 TRG 5-66 TRG 5-67 TRG 5-68	URS 60 URS 61	URB 60 SPECTOR <i>control</i>

**Fig. 1**

#### Key to Fig. 1:

TRG = temperature sensor

URS = SPECTOR*connect* safety control unit

URB = visual display and operating unit



To ensure the proper use of equipment during all types of use, you must also read the Installation & Operating Manuals for the system components used.

- You will find the current operating instructions for the system components named in Fig. 1 on our website:  
<http://www.gestra.com/documents/brochures.html>

## Improper use



**There is a danger of death due to explosion if the equipment is used in potentially explosive atmospheres.**

Do not use the equipment in potentially explosive atmospheres.



**The TRV 5-60 temperature transmitter is not designed for marine use.**



**Do not bring any equipment into service that does not have its own specific name plate.**

The name plate indicates the technical features of the equipment.

## Basic safety notes



**There is a risk of electric shock during work on electrical systems.**

- Always switch off the voltage to the system before performing connection work.
- Check that the system is not carrying live voltage before commencing work.



**Attempts to repair the equipment will cause the system to become unsafe.**

- The TRV 5-60 temperature transmitter may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

## Required personnel qualifications

Activity	Personnel	
Integration in control system	Specialist staff	Plant designer
Installation/electrical connection/bringing into service	Specialist staff	The unit is an item of equipment with a safety function (EC Pressure Equipment Directive) and may only be brought into service by suitable, trained staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and setup work may only be performed by authorised staff who have undergone specific training.
Setup work	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

**Fig. 2**

## Notes on product liability

We the manufacturer cannot accept any liability for damages resulting from improper use of the equipment.

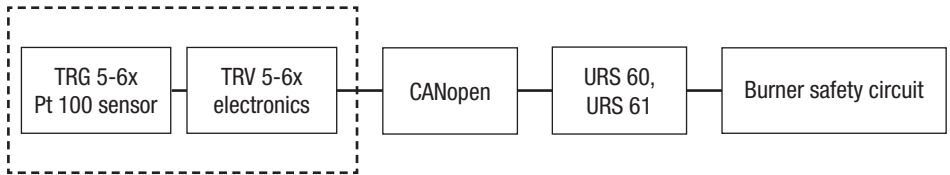
## Functional safety, safety integrity level (SIL)

In combination with the URS 60 / URS 61 safety control unit, the TRV 5-60 temperature transmitter is suitable for safety functions up to SIL 3.

It is an element of a safety circuit up to SIL 3 as per EN 61508 in the SPECTOR*connect* system, and can transmit alarm notifications.

Combinations with accessories constitute a type B subsystem. The technical and safety characteristics in Fig. 4 are based on the TRV 5-60 temperature transmitter with TRG 5-6x temperature sensor.

### Breakdown of safety function failure rates (Tmax switch-off)



**Fig. 3**

The CANopen interface is a “Black Channel” type, and can be ignored during calculation due to the low failure rate of < 1FIT.

### Check the safety function regularly

Check the function of the temperature transmitter at least once a year by bringing the system to the set limit value (T1 = 1 year), see page 29 and 37.

## Reliability data to EN 61508

Description	Characteristic values
Safety integrity level	SIL 3
Architecture	1oo1
Type of device	Type B
Hardware error tolerance	HFT = 0
Overall failure rate for dangerous undetected failures	$\lambda_{DU} < 20 * 10^{-9}$ 1/h
Overall failure rate for dangerous detected failures	$\lambda_{DD} < 5000 * 10^{-9}$ 1/h
Safe failure fraction	SFF > 99.0 %
Test interval	T1 = 1 year
Probability of failure on demand	PFD < 20.0 * 10 <sup>-5</sup>
Diagnostic coverage. Percentage of dangerous failures detected by a test.	DC > 99.0 %
Mean time to failure	MTTF <sub>D</sub> > 30 a
Diagnostic interval	T2 = 1 hour
Performance level (to ISO 13849)	PL = d
Probability of failure per hour	PFH < 20.0 * 10 <sup>-9</sup> 1/h
Ambient temperature as a basis for calculation	Tu = 60 °C
Mean time to repair	MTTR = 0 (no repair)
Fraction of undetected dangerous failures that have a common cause	beta = 2 %
Fraction of detected dangerous failures that have a common cause	beta d = 1 %

**Fig. 4**

## Function

A TRG 5-6x temperature sensor is assigned to the TRV 5-60 temperature transmitter, and its readings are recorded redundantly and monitored. The actual temperature is displayed on the temperature transmitter itself, as are any system malfunctions that occur.

### Limit value settings

The limit value "AL.Hi" can be displayed and set if desired, see page 29.

The temperature in the transmitter housing is continually monitored by a temperature sensor on the PCB. An automatic self-test cyclically monitors the safety and function of the temperature sensor and the measured value acquisition.

The data are transferred to the URS 6x safety control unit as a data telegram via the CANopen protocol using a CAN bus to ISO 11898.

### These data telegrams contain the following information:

- Actual temperature
- Sensor alarms if the set limit "AL.Hi" is exceeded
- Malfunction indications in the event of faults in the electronic unit
- Excessive temperature in transmitter housing

### Behaviour on the occurrence of alarms

The alarm status is displayed on the TRV 5-60 and transferred to the URS 6x safety control unit via CAN bus. After the delay time, the safety control unit shuts off the connected safety circuit. The safety control unit does not lock independently during this process.

### The safety circuit is interrupted without delay if the following error messages are received:

- Fault in sensors (negative self-test, excessively high temperature in transmitter housing)
- Communication failure

### Behaviour in the event of malfunctions

The cyclical self-tests monitor the safety functions of the equipment in the sensors. Error messages are updated with each self-test. If there are no malfunctions, the message is automatically deleted. Alarms and error messages are transferred to the control unit via the CANopen protocol.

### Simulating the alarm state \*

The triggering of an alarm can be simulated by:

- Pressing the rotary knob on the TRV 5-60  
or
- Pressing the relevant button on the URS 60 or URS 61 safety control unit  
or
- By operating the URB 60

The device combination should then behave as if a normal alarm had been triggered.



\* A detailed allocation between the respective device status, the display and the alarm LEDs can be found in the tables on pages 32 - 33.

## Technical data

### Supply voltage

---

- 24V DC +/-20 %

### Power consumption

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- max. 7 VA

### Current input

---

- max. 0.3 A

### Internal fuse

---

- T2A

### Safety cutout at excessive ambient temperature

---

- The cutout at excessive ambient temperatures takes place at  $T_{amb.} > 75\text{ °C}$

### Input/output

---

- Interface for CAN bus to ISO 11898, CANopen, insulated
- M12 CAN bus connector, 5-pole; A-coded
- M12 CAN bus coupling, 5-pole; A-coded

### Measuring range and adjustable limit value AL.Hi in °C (cutout temperature)

---

- Measuring range: 0 °C to 700 °C
- Minimum limit value: 20 °C
- Maximum limit value: 650 °C
- Reset hysteresis: -2 K

### Indicators and controls

---

- 1 x 4-digit green 7-segment display for showing actual values and status information
- 1 x red LED for displaying the alarm or malfunction status
- 1 x green LED for displaying normal operation
- 1 x rotary knob IP65 with button for menu navigation and test function

### Protection class

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- III Safety Extra Low Voltage

### IP rating to EN 60529

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- IP 65

## Technical data

### Admissible ambient conditions

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- Ambient temperature: 0 °C – 70 °C
- Storage temperature: -40 °C – 80 °C
- Transport temperature: -40 °C – 80 °C
- Air humidity: 10 % – 95 %, non-condensing

### Housing

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- Housing material: Cast aluminium, powder-coated
- Housing attachment: Using supplied mounting bracket

### Terminals and cable entries

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- 1 x 3-pole spring-loaded terminal for connecting a Pt 100 temperature sensor
- Cross-section: 0.2 to 1.5 mm<sup>2</sup>
- 1 x M16 cable gland with integrated strain relief for cable diameters 5 to 9 mm

### Weight

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- Approx. 1.0 kg

## Factory settings

### The TRV 5-60 is delivered ex-works with the following settings:

- Baud rate: 50 kBit/s
- Limiter ID: 0004
- Limit value AL.Hi: 25 °C



## Name plate/identification





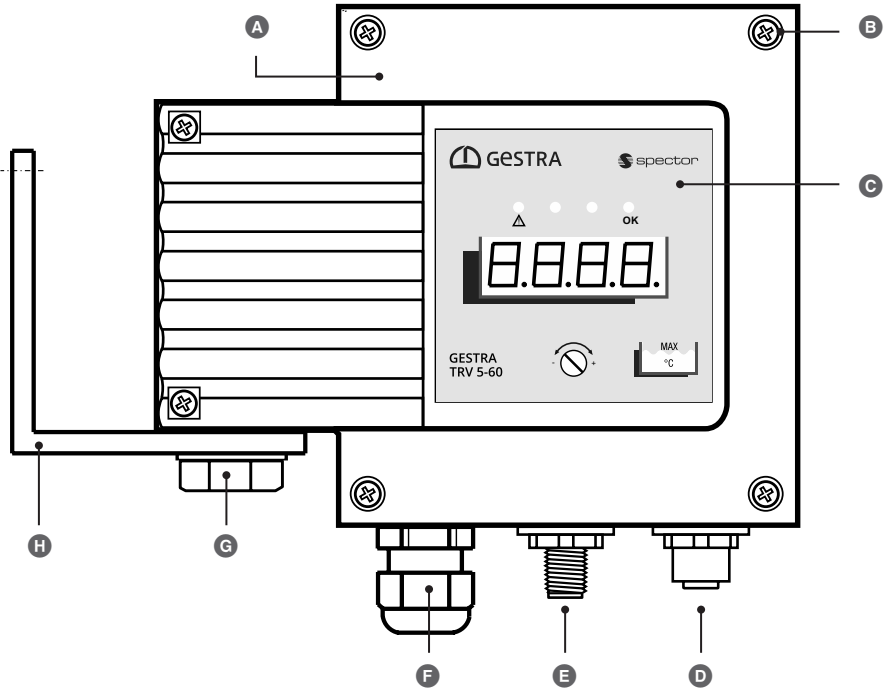
Safety note →	Betriebsanleitung beachten See installation instructions Voir instructions de montage  Hier öffnen Open here Ouvrir ici	 	
Equipment designation →	<b>TRV 5 - 60</b>		
Equipment function →	Temperaturtransmitter Temperature transmitter Transmetteur de température		
Set limit value →	<b>T<sub>MAX</sub> ..... °C</b>		
Temperature sensor, admissible ambient temperature →	IN: Pt 100	T 70°C (158 °F)	IP 65 ← IP rating
Power consumption →	7 VA	24 V $\pm$ 20%	← Supply voltage
Data interface →	IN/OUT: CAN-Bus		
	IEC 61508 SIL 3 ← Safety integrity level		
Current approval →	TÜV . STW(STB) . XX – XXX DIN STW (STB) xxxxx	<b>CE</b> 0525	← CE marking ← Appointed authority
Manufacturer →	<b>GESTRA AG</b> Münchener Str. 77 28215 Bremen GERMANY	 	← Protection class ← Disposal information
Serial number →			

Fig. 5



The date of production is printed on the inside of the housing.

## Functional elements



- Ⓐ Housing
- Ⓑ Cover screws M4 x 16 mm
- Ⓒ Operating panel with 4-digit LCD, alarm LEDs and rotary knob, see page 31
- Ⓓ M12 CAN bus socket, 5-pole, A-coded
- Ⓔ M12 CAN bus connector, 5-pole, A-coded
- Ⓕ M16 cable gland (connecting cable of TRG 5-6x temperature sensor)
- Ⓖ M12 x 40 mm (A.F.18), fastening screw of mounting bracket
- Ⓗ Mounting bracket

**Fig. 6**

## Dimensions (incl. mounting bracket)

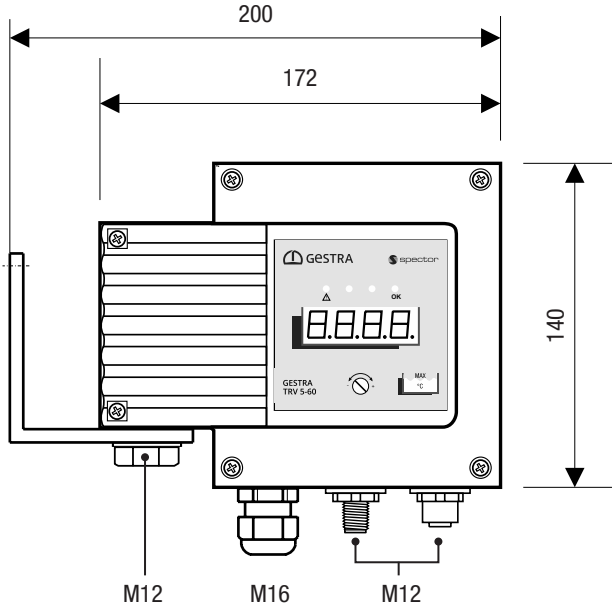


Fig. 7

All data in mm

## Mounting bracket with drill pattern

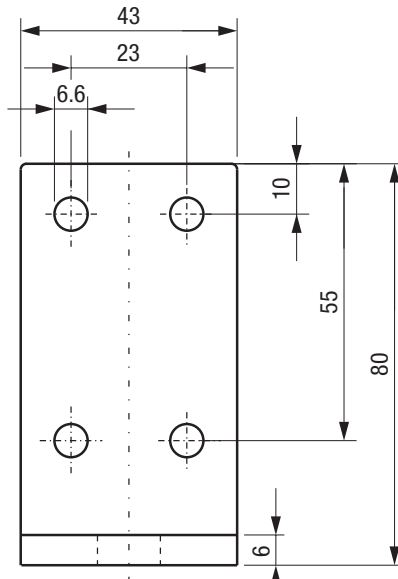


Fig. 8

All data in mm

## Preparing for installation

The TRV 5-60 temperature transmitter is designed for mounting on a wall or panel. It must be mounted on sufficiently flat, stable surfaces (wall, steel girder, etc.).

- A mounting bracket is preassembled at the factory. 4 hexagon socket head bolts M6 x 30 mm, 4 nuts M6 and 8 washers M6 are enclosed, see page 4.



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**If the equipment is to be installed outdoors, outside the protection of a building, environmental influences may adversely affect function.**

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- Pay attention to the admissible ambient conditions in the technical data, see page 16.
  - Do not operate the equipment if the temperature is below freezing.
    - ◆ At temperatures below freezing, use a suitable heat source (e.g. control cabinet heater, etc.).
  - Connect all system parts to a central earthing point to prevent equalisation currents.
  - Use a cover to protect the equipment from direct sunlight, condensation and heavy rain.
  - Use UV-resistant cable ducts for routing the connecting cable.
  - Take further measures to protect the equipment from lightning, insects and animals, and salty air.
- 

### You will need the following tools:

- Allen key, 5 mm
- Ring spanner, 10 mm

## Installing the temperature transmitter

1. Switch off the voltage to the system.
2. Next, check that the system is not carrying live voltage.
3. Determine the desired installation position and mark the four drill holes.  
You can manually rotate the mounting bracket to the desired position if necessary.
4. Drill the holes.
5. Finally, install the temperature transmitter.

## Connecting a TRG 5-6x temperature sensor

### Connecting cable, cable type/cross-section, and admissible cable length

- Use a three-core, shielded cable, e.g. Ölflex® 110CH from Lapp, 3 x 1.0 mm<sup>2</sup>, to connect the TRG 5-6x temperature sensor.
- The length of the cable between the temperature sensor and temperature transmitter must not exceed 25 m.



#### **Only lay the shield on the TRG 5-6x temperature sensor.**

Please read the information about this in the Installation & Operating Manual of the TRG 5-6x temperature sensor.



Routing cables safely helps to prevent malfunctions. Please note the following recommendations:

- Keep cables away from heat sources
- Use protective tubes if necessary
- Do not route signal lines parallel to power lines

### **You will need the following tools**

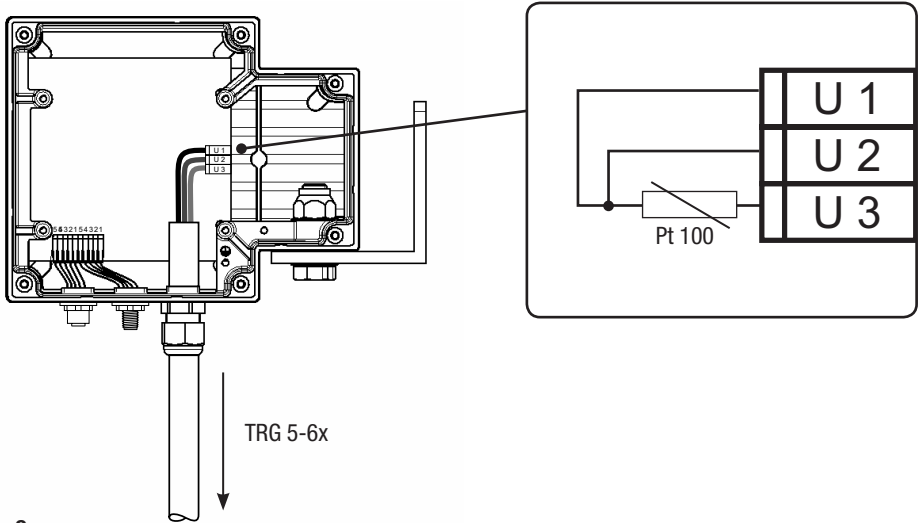
- Phillips screwdriver PH2
- Stripping tool

### **Connecting the temperature sensor**

1. Using a Phillips screwdriver, open the back of the housing.
2. Take the cable sheathing off to approx. 60 mm and remove the shield from the cable. The shield may only be laid on the temperature sensor.
3. Undo the cable gland **F** and pull the temperature sensor cable through the gland, taking care not to forget the seal.
4. Strip the cores to approx. 7 mm.
5. Connect the cores as shown in the wiring diagram, see page 22.
6. Tighten the cable gland **F** securely to ensure it is adequately sealed.
7. Finally, screw the rear housing panel firmly back on, making sure the seal is correctly seated.

## Connecting a TRG 5-6x temperature sensor

### Wiring diagram for TRG 5-6x temperature sensor



# Connecting the CAN bus system

## Bus line, cable length and cross-section

- A shielded, multi-core, twisted-pair control cable, e.g. UNITRONIC® BUS CAN 2 x 2 x .. mm<sup>2</sup> or RE-2YCYV-fl 2 x 2 x .. mm<sup>2</sup> must be used as the bus line.
- Pre-wired control cables (with plug and coupling) are available as accessories in various lengths.
- The baud rate (transfer rate) is determined by the cable length between the bus terminal devices, and the wire cross-section is determined by the overall power input of the measuring sensors.
- 0.2 A at 24 V is required per sensor. With 5 sensors, there is therefore a voltage drop of approx. 8 V per 100 m when using cables of 0.5 mm<sup>2</sup>. In this case, the system is operating at its limits.
- If using 5 sensors or more and a cable length of 100 m, the wire cross-section needs to be doubled to 1.0 mm<sup>2</sup>.
- At larger distances of > 100 m, the 24 V DC supply can also be connected on site.

## Example

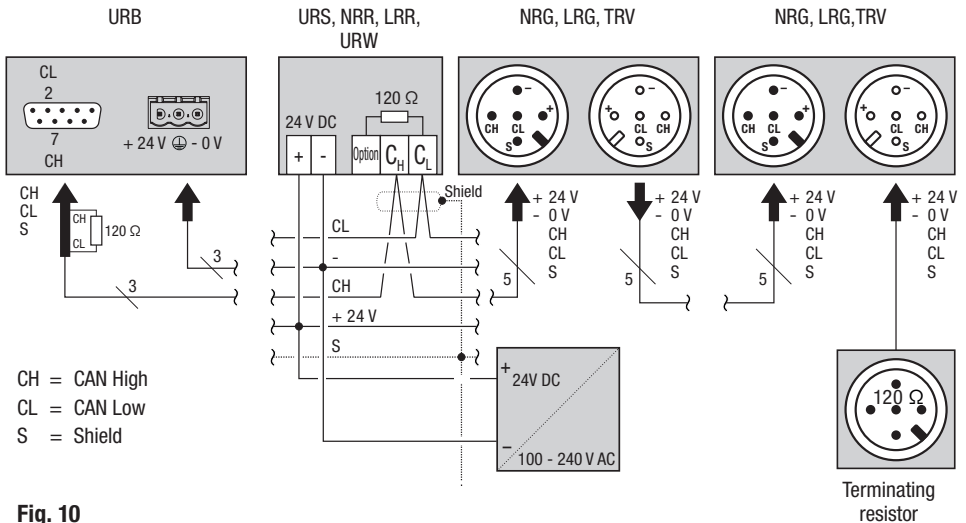


Fig. 10

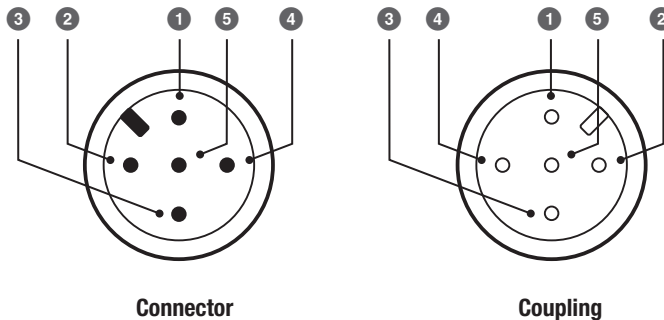
## Connecting the CAN bus system

### Important notes on connecting the CAN bus system

- A dedicated 24 V DC SELV power supply unit that is isolated from connected loads must be used to supply the SPECTORconnect system.
- Make sure wiring is in line, not in a star!
- Avoid potential differences in system parts by connection to a central earthing point.
  - ◆ Connect the bus line shields to one another all the way along, and connect them to the central earthing point (CEP).
- Connect the sensor line shields to the temperature sensor **once only** (EMC cable gland).
- If two or more system components are connected in a CAN bus network, a 120 Ω terminating resistor must be connected to the **first** and **last** units between terminals C<sub>L</sub> / C<sub>H</sub>.
- Use the CAN bus connector with terminating resistor if you are using the temperature transmitter as the first or last unit.
- Only **one** URS 60 and **one** URS 61 safety control unit may be used in the CAN bus network.
- The CAN bus network must not be interrupted during operation!  
**If it is, an alarm is triggered.**

### Pin assignment of the CAN bus connector and coupling for non pre-wired control cables

If non pre-wired control cables are used, you must wire the CAN bus connector and couplings as shown in the wiring diagram **Fig. 11**.



**Fig. 11**

① S	Shield
② + 24 V	Power supply
③ – 0 V	Power supply
④ CH	CAN High data line
⑤ CL	CAN Low data line



## Bringing into service

**Before bringing into service, check that all equipment is correctly connected:**

- Is the polarity of the CAN bus control line correct throughout?
- Is a 120  $\Omega$  terminating resistor connected to the terminal devices of the CAN bus line?

**Next, switch on the supply voltage.**


## Changing the factory settings if necessary

**You will need the following tools**

- Slotted screwdriver, size 2.5

## Bringing into service

### Select and set a parameter:

1.  Using the screwdriver, turn the rotary knob clockwise or anti-clockwise until the desired parameter appears on the display, the set value appears after approx. 3 seconds.

The display alternately shows the selected parameter with its current value, e.g. bd.rt → “value” → bd.rt.


### Turning the rotary knob to the right shows the following parameters in sequence:


“actual value” → ld → bd.rt → °C.in → °C.Pt → AL.Hi → diSP → “actual value”

**Key to parameters, see page 27.**



If you do not enter anything for 30 seconds, the display automatically shows the actual value.

2.  Once you have selected a parameter, press the rotary knob and hold until the current value of this parameter flashes on the display.


3.  Set the desired value.  
- / + Reducing/increasing the value

### Each parameter has an individual, admissible value range.

By pressing the knob briefly, you can jump to the next digit. This is a more convenient way of making large changes to values.



If you do not set a parameter within 10 seconds, the process is aborted (“quit”) and the old parameter value is retained.

4.  Save your set value by pressing the rotary knob for approx. 1 second.  
The response “donE” appears and the display returns to the parameters.

## Bringing into service

### Key to parameters:

- “Actual value” = actual value display, the actual temperature currently measured by the Pt 100
- Id = limiter ID
- bd.rt = baud rate
- °C.in = ambient temperature of housing
- °C.Pt = the actual value currently measured by the Pt 100
- AL.Hi = limit value (TMax.)
- diSP = display test trigger

### Notes on changing the communication parameter “bd.rt, Id”



In general, all GESTRA AG CAN bus devices are delivered ex-works with pre-set communication parameters that make it possible to bring a standard system into service without any changes.

#### Observe the following rules if you have to make changes to the communication parameters:

- Set the same baud rate for all bus participants.
- Perform the following functions on the URB 60 visual display and operating unit or on the SPECTOR *control*, in order to apply the changed communication parameters:
  - ◆ **Device list - Reimport**



Observe the information in the operating manual of the URB 60 visual display and operating unit or SPECTOR*control*.

## Bringing into service

### Changing the baud rate



You must set the same baud rate for all bus participants.

**Note the setting instructions on page 26 and proceed as follows:**

1. Select the parameter “**bd.rt**”.
2. Press and hold the rotary knob until the current baud rate flashes on the display.
3. Set the desired baud rate (50 kBit/s / 250 kBit/s).
4. Save your set value by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the baud rate, restart the entire system.

### Changing the limiter ID



For setting the limiter ID, please also pay attention to the information in the Installation & Operating Manual of the URS 60 / URS 61 safety control unit.

**Note the setting instructions on page 26 and proceed as follows:**

1. Select the parameter “**ld**”.
2. Press and hold the rotary knob until the current limiter ID flashes on the display.
3. Set the desired ID (0001 to 0008).
4. Save your set value by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the limiter ID, restart the entire system.

## Bringing into service

### Setting the limit value AL.Hi (°C) (cutout temperature)

**Note the setting instructions on page 26 and proceed as follows:**

1. Select the parameter "**AL.Hi**".
2. Press and hold the rotary knob until the display test starts by showing "...".  
The following numbers are shown one after the other:  
"..., 1, 2, 3, 4, 5, 6, 7, 8, 9, ..."
3. Check that all numbers are displayed correctly.
  - If there are discrepancies in the numbers, wait approx. 10 seconds and do not make any entries during this time. This aborts the process and retains the old limit value.



Only set the new limit value if the display test was successful.

4. When the display test is complete, the last digit of the limit value flashes.
5. Set the desired cutout temperature (0020 to 0650).
6. Save your set value by pressing the rotary knob for approx. 1 second.
7. Enter the set limit value AL.Hi = TMax (°C) on the name plate.

### Checking the set limit value or switching point



Check the switching point by exceeding the set limit value "**AL.Hi**". In this case, the equipment must behave as if there were an alarm.

Always check the switching point when bringing into service, after changing a limit value, and each time the TRG 5-6x temperature sensor or TRV 5-60 temperature transmitter is changed.

## Bringing into service

### Manually triggering a display test

**Note the setting instructions on page 26 and proceed as follows:**

1. Select the parameter “**diSP**”.
2. Press and hold the rotary knob until the display test starts by showing “....”.
3. The following numbers and decimal points run across the display from right to left:  
“...., **1, 2, 3, 4, 5, 6, 7, 8, 9, ....**”
4. Check that all numbers and decimal points are displayed correctly.  
The display test runs automatically to the end and cannot be aborted.
5. The display test ends with the message “**donE**”.

### Replacing faulty equipment



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#### **Faulty equipment jeopardises system safety.**

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- If numbers or decimal points are displayed incorrectly or not at all, you must replace the level electrode with an identical unit from GESTRA AG.
-

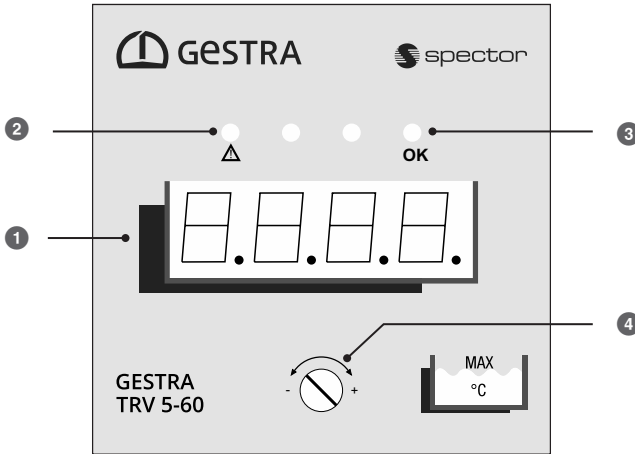


Fig. 12

### The operating panel:

- ① Display of actual value/fault code/limit value, green, 4 digits
- ② LED 1, alarm / fault, red
- ③ LED 2, function OK - green / flashes during self-test
- ④ Rotary knob for operation and settings

### Note on the display priority of the individual messages



The fault signals and alarms are displayed according to their priority. Signals with higher priority are always displayed before those with low priority. If there are multiple signals, the display will not switch between the individual signals.

Priority 1 = fault signals according to fault code table, see page 35 ff.

Priority 2 = alarm, temperature limit value exceeded.

### Priority in fault code display

Higher value fault codes overwrite lower value codes in the display!

## Starting, operation and testing

### Relationship between equipment status, display and alarm LEDs:

Start		
Switch on supply voltage.	All LEDs light up - test <b>Display:</b> S-xx = software version t-06 = equipment type TRV 5-60	The system is started and tested. The LEDs and display are tested.

Operation		
Actual value T (°C) lower than limit value AL.Hi (°C).	<b>Display:</b> e.g. 0361 <b>LED 2:</b> Operating LED lights up green	Display of actual value
Actual value T (°C) higher than limit value AL.Hi (°C).	<b>Display:</b> Hi.t and current actual value, alternating <b>LED 1:</b> Alarm LED lights up red	Display Hi.t (high temperature) and the current actual temperature value. After the delay time, the URS 60 / URS 61 safety control unit opens the output contacts.

Behaviour in the event of a malfunction (fault code display)		
On the occurrence of a fault	<b>Display:</b> e.g. E.003	A fault code is permanently displayed, fault codes, see page 35.
	<b>LED 1:</b> Alarm LED lights up red	A malfunction is active
	<b>LED 2:</b> Operating LED is OFF	A fault is present
<ul style="list-style-type: none"> <li>■ The malfunction or faulty state is transferred to the safety control unit URS 60 / URS 61 via CAN data telegram.</li> <li>■ Here, the malfunction triggers an immediate safety shutoff.</li> <li>■ The affected signal output is activated.</li> <li>■ The URS 60 / URS 61 safety control unit does not automatically lock the safety contacts.</li> </ul>		



#### Alarms and faults cannot be acknowledged.

When the alarm or malfunction is cancelled, the message in the display also disappears and the safety control unit URS 60 / URS 61 closes the safety contacts and deactivates the affected signal outputs again.

See the following page for more information and tables.



## Starting, operation and testing

Test		
Testing the safety function by simulating the alarm state		
<p><b>In operating mode:</b> Press the rotary knob on the TRV 5-60 and hold until the end of the test</p> <p>or</p> <p>Press button 1, 2, 3 or 4 of the URS 60 / URS 61 safety control unit and hold until the end of the test</p> <p>or</p> <p>Open the relevant menu on the URB 60 and initiate the test function</p>	<p><b>Display:</b> e.g. Hi.t and set limit value, alternating</p>	A temperature rise is simulated.
	<p><b>LED 1:</b> Alarm LED lights up red</p>	Temperature alarm
	<p><b>LED 2:</b> Operating LED is OFF</p>	Alarm
	<ul style="list-style-type: none"> <li>■ The safety control unit URS 60 / URS 61 or the device combination behaves as if there were a real alarm.</li> <li>■ The switch-off delay is running, the signal output closes with/without a delay.</li> <li>■ Once the delay time has elapsed, the output contacts of the URS 60 / URS 61 are opened and the corresponding signal outputs are activated.</li> <li>■ The test has now finished</li> </ul>	



### Faulty equipment jeopardises system safety.

- If the TRV 5-60 temperature transmitter does not behave as described above, it may be faulty.
- Perform failure analysis.
- The TRV 5-60 temperature transmitter may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

# System malfunctions

## Causes

System malfunctions occur if CAN bus components have been incorrectly installed or configured, if the equipment has overheated, if there is interference in the supply network or if electronic components are faulty.

### Check the installation and configuration before systematic troubleshooting

#### Installation:

- Check that the installation location complies with the admissible ambient conditions (temperature, vibration, interference sources, etc.).

#### Wiring:

- Does the wiring conform to the wiring diagrams?
- Is the bus line polarity correct throughout?
- Is a 120  $\Omega$  terminating resistor connected to the terminal devices of the CAN bus line?

#### Sensor configuration:

- Are the sensors set to the correct limiter ID 1,2,3,4,5,6,7,8?
- Limiter IDs must not be assigned in duplicate.

#### Baud rate:

- Is the cable length correct for the set baud rate?
- Is the baud rate identical for all units?

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## ATTENTION

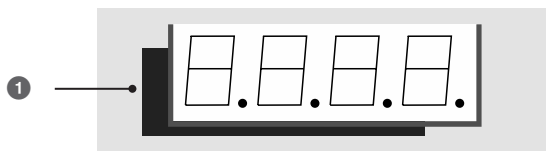


### Interrupting the CAN bus causes a system shutdown and triggers an alarm.

- Bring the system into a safe operating mode before commencing work on the system installation.
  - Switch off the voltage to the system and secure so that it cannot be switched back on.
  - Check that the system is not carrying live voltage before commencing work.
-

# System malfunctions

## Indication of system malfunctions using fault codes



**Fig. 13**                      ① Display of actual value/fault code/limit value, green, 4 digits

Fault code display			
Fault code	Internal designation	Possible faults	Remedy
E.001	ADS1110 read error	Faulty hardware	Replace temperature transmitter
E.002	MinTempErrCh1	Temperature < 0°C	Check wiring, check temperature sensor
E.003	MinTempErrCh2		
E.004	MaxTempErrCh1	Temperature > 750°C	Check wiring, check temperature sensor
E.005	MaxTempErrCh2		
E.006	KompErrCh1	Connecting cable resistance > 4 Ω	Check wiring and terminals, use a shorter cable, use a larger cross-section
E.007	KompErrCh2		
E.008	ADVErrCh1	Differences in analogue measurements, problems with EMC or hardware	Check installation location or replace temperature transmitter
E.009	ADVErrCh2		
E.010	ADCErrCh1	Error during dynamic test	Replace temperature transmitter
E.011	ADCErrCh2		
E.012	IKonErrCh1	Excessive deviations in measuring current	Check wiring and temperature sensor replace temperature transmitter
E.013	IKonErrCh2		

## System malfunctions

Fault code display			
Fault code	Internal designation	Possible faults	Remedy
E.014	CalibCRCErr	Incorrect calibration values	Replace temperature transmitter
E.015	UnCalErr	The temperature transmitter is uncalibrated	Replace temperature transmitter
E.016	Ch1Ch2DiffErr	Excessive differences in evaluation channels	Replace temperature transmitter
E.019	V6Err	EMC or voltage error 6.0 V	Check installation location, replace temperature transmitter
E.020	V5Err	EMC or voltage error 5.0 V	Check installation location, replace temperature transmitter
E.021	V3Err	EMC or voltage error 3.3 V	Check installation location, replace temperature transmitter
E.022	V1Err	EMC or voltage error 1.2 V	Check installation location, replace temperature transmitter
E.023	V12Err	EMC or voltage error 12 V	Check installation location, replace temperature transmitter
E.024	CanErr	Wrong baud rate, wiring error	Check wiring, check baud rate, check terminating resistors
E.025	ESMG1Err	EMC or internal process error	Check installation location, replace temperature transmitter
E.026	BISTErr	EMC or internal error	Check installation location, replace temperature transmitter
E.027	OvertempErr	Ambient temperature > 75 °C	Check the installation location Lower the ambient temperature of the terminal box

All E.017 and E.018 fault codes not listed here are available as reserves



Virtually all of the aforementioned fault codes can be caused by EMC interference. This is less likely to be the case in the event of permanent faults, but should be considered for sporadic fault messages.

## System malfunctions

### Checking installation and function

When you have remedied system malfunctions, perform a function test as follows.

- Check the switching point by exceeding the set limit value “**AL.Hi**”. In this case, the equipment must behave as if there were an alarm.
- Always check the switching point when bringing into service, after changing a limit value, and each time the TRG 5-6x temperature sensor or TRV 5-60 temperature transmitter is changed.



System malfunctions in the TRV 5-60 temperature transmitter also trigger a system malfunction in the URS 60 / URS 61 safety control unit. The output contacts open without a delay and the relevant signal output is activated.

**If you require assistance, please tell us the indicated fault code.**



In the event of malfunctions or faults that cannot be remedied with the aid of this Installation & Operating Manual, please contact our service centre or authorised agent in your country.

## Taking out of service

1. Switch off the supply voltage and switch off the voltage to the equipment.
2. Open the housing cover and disconnect the TRG 5-6x temperature sensor.
3. Unplug the connections of the CAN bus control lines and plug them into one another.



An alarm is triggered when the CAN bus cable is interrupted.

4. Next, remove the TRV 5-60 temperature transmitter and mounting bracket.

## Disposal

Dispose of the temperature transmitter in accordance with statutory waste disposal regulations.

## Returning decontaminated devices

**Products that come into contact with hazardous media must be drained and decontaminated before being returned or sent back to GESTRA AG.**

The term media can refer to solid, liquid or gaseous substances or mixtures, as well as radiation.

GESTRA AG only accepts returned products with a filled-out and signed return note, along with a filled-out and signed decontamination declaration.



The return confirmation and decontamination declaration must be attached to the outside of the return package, as processing will otherwise be impossible and the products will be returned to the sender at their expense.

**Please proceed as follows:**

1. Inform GESTRA AG of the return package via phone or e-mail.
2. Wait until you have received the return confirmation from GESTRA.
3. Fill out the return confirmation (including decontamination declaration) and send it with the products to GESTRA AG.

## EU Declaration of Conformity

We hereby declare that the TRV 5-60 temperature transmitter conforms to the following European Directives:

- Directive 2014/68/EU                      EU Pressure Equipment Directive
- Directive 2014/35/EU                    Low Voltage Directive
- Directive 2014/30/EU                    EMC Directive
- Directive 2011/65/EU                    RoHS II Directive

Please see our Declaration of Conformity for details on the conformity of our equipment with European Directives.

The current Declaration of Conformity can be found online at [www.gestra.com](http://www.gestra.com) or can be requested from us.



You can find our authorised agents around the world at:

**[www.gestra.com](http://www.gestra.com)**

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