GESTRA®

Temperature Transmitter

TRV 5-60

Installation & Operating Manual
819633-01

Contents

Contents

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 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 Ω 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 all persons who integrate this equipment into 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 given.
■ Please also read the instructions for use of any accessories.
■ The Installation & Operating Manual is part of the product 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

Ⓐ Keys to illustrations

 Additional information

 Read the relevant Installation & Operating Manual

 Press the rotary knob

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 will result 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 will result 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 8.

SELV

Safety Extra Low Voltage

Usage for the intended purpose

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

The temperature transmitter can be used as:

■ A safety temperature limiter/monitor in combination with a 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 the SPECTOR*control* operating terminal.

Admissible system components, dependent on the required safety integrity level

The temperature transmitter can be operated with the following system components:

	Temperature sensor	Safety control unit as a temperature limiter	Operating unit
SIL 3 to IEC 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 *control*

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, please also read the Installation & Operating Manuals for the system components used.

■ You will find the latest Installation & Operating Manuals for the system components named in Fig. 1 on our website: www.gestra.com

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 plant before performing connection work.

■ Check that the plant is not carrying live voltage before commencing work.

⚠️ **Attempts to repair the equipment will cause the plant 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 refits may only be performed by authorised staff who have undergone specific training.
Refits	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 IEC 61508 in the SPECTOR*connect* system, and can transmit alarm notifications.

When combined with the accessories, you will have a type B subsystem in accordance with IEC 61508. 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 cutout)
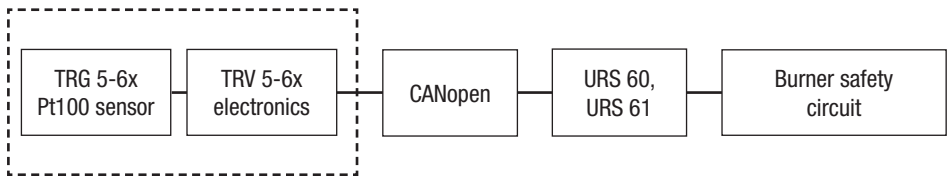
Fig. 3

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 (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 equipment	Type B
Hardware fault 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 dangerous failure on demand	PFD < 20.0 * 10^{-5}
Diagnostic coverage. Percentage of dangerous failures detected by a test.	DC > 99.0%
Mean time to dangerous failure	$MTTF_D$ > 30 a
Mean time to failure	MTTF > 10 a
Diagnostic interval	T2 = 1 hour
Performance level (to ISO 13849)	PL = d
Probability of dangerous failure on demand per hour	PFH < 20.0 * 10^{-9} 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

The TRV 5-60 temperature transmitter has a dedicated TRG 5-6x temperature sensor, the readings of which are recorded and monitored redundantly. The actual temperature is displayed on the temperature transmitter itself, as are any system malfunctions that occur.

Setting the limit value

The "AL.Hi" limit can be displayed and set, as desired, see page 28.

The temperature in the transmitter terminal box 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 alarm if the set "AL.Hi" limit is exceeded
- Malfunction indications in the event of faults in the electronic unit
- Excessive temperature in the transmitter terminal box

Behaviour in the event of alarms

The alarm state 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 switches off the connected safety circuit. The safety control unit does not lock independently during this process.

The safety circuit is interrupted without a delay if the following fault indications occur:

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

Behaviour in the event of faults

The cyclical self-tests monitor the safety functions of the equipment in the sensors. Fault indications are updated with each self-test. If there are no faults, the display automatically goes blank. Alarms and fault indications 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
- Using the URB 60

The equipment will then behave as if a normal alarm had been triggered.

(i) * The tables on pages 32 - 33 clearly show the relationship between the equipment status, the display and the alarm LEDS.

Technical data

Supply voltage

- 24V DC ±20%

Power consumption

- Max. 7 W

Current input

- Max. 0.3 A

Internal fuse

- T2A

Safety cutout at excessive temperature

- Cutout occurs when an excessive temperature of 75 °C is measured in the electrode tip

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 AL.Hi limit in °C (cutout temperature)

- Measuring range: 0 °C to 700 °C
- Minimum limit: 20 °C
- Maximum limit: 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

- III Safety Extra Low Voltage

IP rating to EN 60529

- IP 65

Technical data

Admissible ambient conditions

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

Terminal box

- Terminal box material: Cast aluminium, powder-coated
- Terminal box attachment: Using the supplied mounting bracket

Terminals and cable entries

- 1 x 3-pole spring-loaded terminal for connecting a Pt100 temperature sensor
- Cross-section: 0.2 to 1.5 mm^2
- 1 x M16 cable gland with integrated strain relief for cable diameters 5 to 9 mm

Weight

- Approx. 1.0 kg

Factory settings

The TRV 5-60 temperature transmitter is delivered ex-works with the following settings.

Parameter	Display in menu	Unit	Parameter values
Limiter ID	ld		0004
Baud rate	bd.rt	kbit/s	0050
Alarm limit	AL.Hi	°C	0025
Password	PW	- - -	oFF

Fig. 5

Example name plate/Identification

Fig. 6

1 Safety note
2 Equipment designation
3 Equipment function
4 Nominal pressure rating
5 Connection thread
6 Material of screw-in body
7 IP rating
8 Operating data (maximum pressure and temperature)
9 Supply voltage
10 Power consumption
11 Installed length in mm
12 Measuring range in ppm
13 Measuring range in µS/cm
14 Data interface
15 Safety integrity level
16 Type-approval number
17 Conformity marking
18 Disposal information
19 Manufacturer
20 Protection class
21 Material number-serial number
22 Set limit (T_{Max})

The date of production (quarter and year) is stamped on the screw-in body.

Functional elements
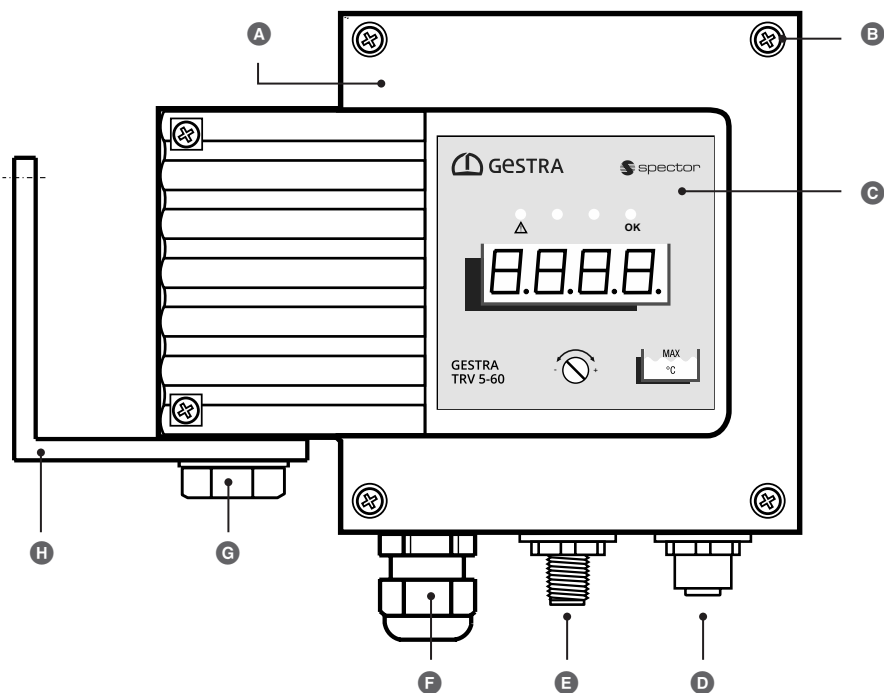
Ⓐ Terminal box

Ⓑ 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 (size 18), screw for mounting bracket

Ⓗ Mounting bracket

Fig. 7

Dimensions (with mounting bracket)
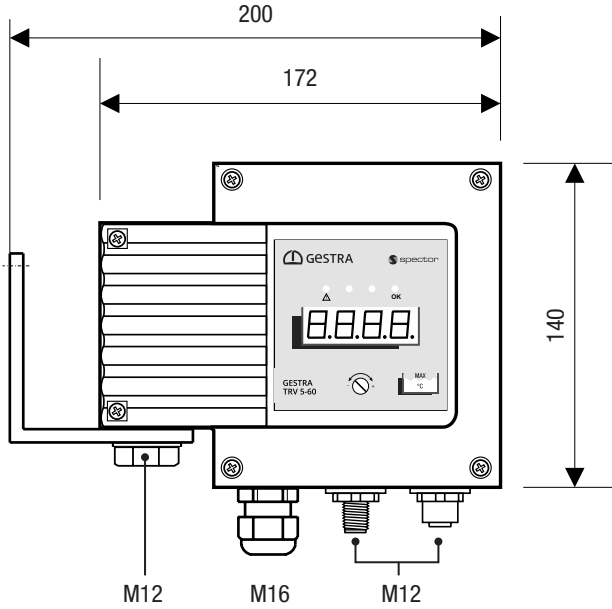
Fig. 8   All dimensions in mm

Mounting bracket with drill template
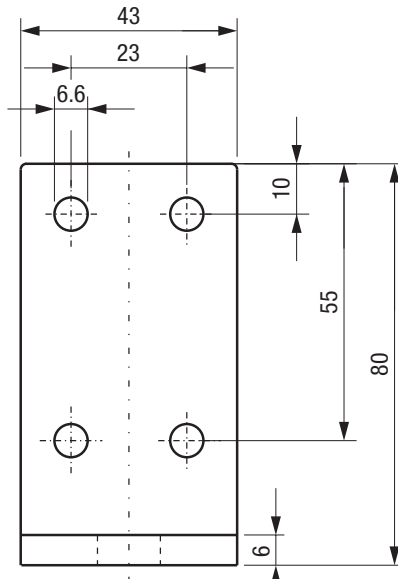
Fig. 9   All dimensions in mm

Preparing for installation

The TRV 5-60 temperature transmitter is designed for mounting on a wall or panel.

It must be mounted on a sufficiently flat and stable surface (wall or steel girder, etc.).

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

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

- Pay attention to the admissible ambient conditions in the technical data, see page 15.
- 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 plant 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 harmful environmental influences such as lightning, insects and animals, and salty air.

You will need the following tools:
- Allen key, 5 mm
- Box wrench, 10 mm

Installing the temperature transmitter

1. Switch off voltage to the plant.
2. Then check that the plant 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 required mounting holes.
5. Next, 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 mm², 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.

Safe and secure cable routing 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 terminal box.

2. Strip off cable sheathing 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 ⓕ and pull the temperature sensor cable and 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 21.

6. Tighten the cable gland ⓕ securely to ensure it is adequately sealed.

7. Finally, screw the rear panel of the terminal box 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

| U 1 |
| U 2 |
| U 3 |

Pt100

TRG 5-6x
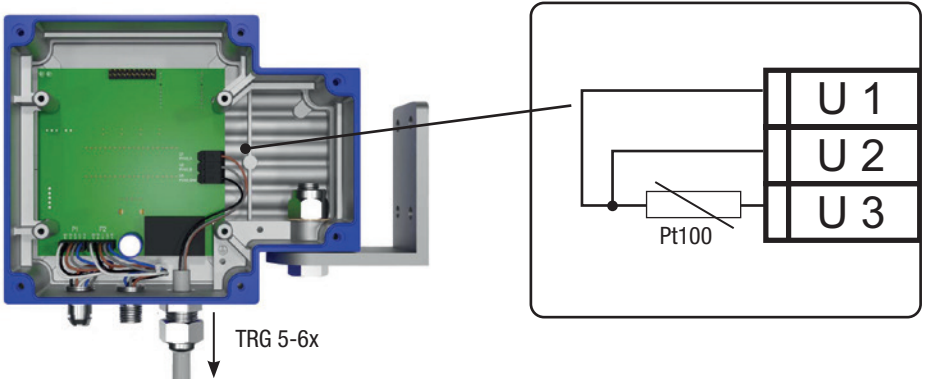
Fig. 10

Connecting the CAN bus system

Bus line, cable length and cross-section

- Use a shielded, multi-core, twisted-pair control cable, e.g. UNITRONIC® BUS CAN 2 x 2 x .. mm^2 or RE-2YCYV-fl 2 x 2 x .. mm^2 as the bus line.
- Pre-wired control cables (with connector and coupling) are available as accessories in various lengths.
- The baud rate is determined by the line length (transfer rate) between the bus terminal devices, and the conductor size is determined by the overall current input of the measuring sensors.
- 0.2 A at 24 V is required per sensor. With five sensors, there is therefore a voltage drop of approx. 8 V per 100 m when using cables of 0.5 mm². In this case, the system is operating at its limits.
- If using five or more sensors and a cable length of 100 m, the conductor size needs to be doubled to 1.0 mm².
- At larger distances of > 100 m, the 24 V DC supply can also be connected on site.

Example
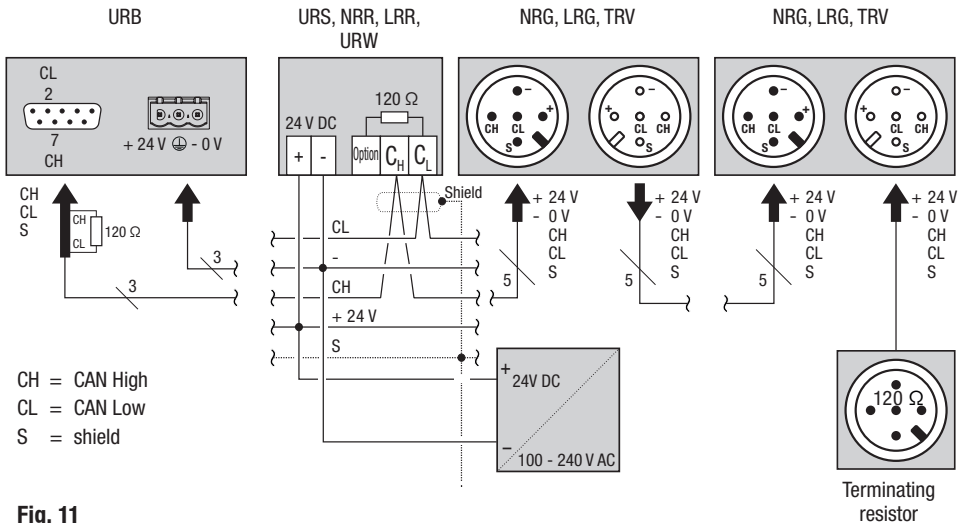
Fig. 11

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 SPECTOR*connect* system.
- Make sure wiring is in line, not in a star!
- Use a central earth to prevent differences in potential between plant parts.
  - ◆ 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** devices between terminals C_L/C_H.
- Use the CAN bus connector with terminating resistor if you are using the temperature transmitter as the first or last device.
- 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 **Fig. 12** diagram.

	Connector			Coupling
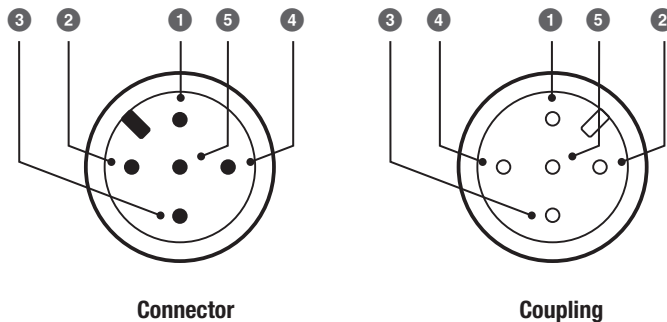
Fig. 12

❶	S	Shield
❷	+ 24 V	Power supply
❸	0 V	Power supply
❹	CH	CAN High data line
❺	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 Ω 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

Changing parameters with password protection enabled

When password protection is enabled, you must enter the password before changing parameters, see page 25. Password protection applies only to the menu items with parameters that the user can actually change.

Menu items that can only display values (i.e. not parameters) are not covered by password protection. You can retrieve information about this at any time.

Password protection after restarting the equipment

Parameters are also password-protected when the equipment has been restarted, if password protection was previously enabled, see page 30.

Default ex-works password

The default password is "**1902**" and cannot be changed. Password protection is available from software version S-14 onwards.

Bringing into service

Selecting and setting 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 is displayed after approx. 3 seconds.

The display alternates between the set parameter and its actual value, e.g. Filt. ➜ "value" ➜ Filt.

When you turn the rotary knob clockwise, the following parameters are shown in turn:

1234 ➜ Id ➜ bd.rt ➜ °C.in ➜ °C.Pt ➜ AL.Hi ➜ diSP ➜ InFo ➜ PW ➜ 1234

Key to parameters, see page 26.

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

2. Once you have selected a parameter, press and hold the rotary knob until:

- "**PASS**" appears on the display, prompting you to enter a password; move on to step **3**.

  or (password protection disabled)

- the current parameter value flashes on the display; move on to step **8**.

With password entry:

3. Release the rotary knob.

4. Next, press and hold the rotary knob until "**0000**" appears on the display and the right-hand digit flashes.

5. Enter the password "**1902**". You can skip to the next flashing digit by briefly pressing the rotary knob.

– / + reduce/increase the value.

6. After the final digit, press and hold the rotary knob until "**donE**" is displayed.

The display then alternates between the selected parameter and its current value.

7. Keep pressing the rotary knob until the current parameter value flashes on the display. Move on to step **8**.

Bringing into service

Without password entry:

8. Set the desired value.

$-/+$ reduce/increase the value

Each parameter has an individual, admissible value range.

By pressing the knob briefly, you can skip 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.

9. Save your settings by pressing the rotary knob for approx. 1 second.

The message "**donE**" is shown and the parameter appears on the display once more.

Pay attention to the time limit for password entry

Disabled password protection is re-enabled after 30 minutes without any activity (rotary knob) and the password must then be entered again.

Key to parameters:

- 1234 = actual value display, the actual temperature currently measured by the Pt100
- Id = limiter ID
- bd.rt = baud rate
- °C.in = ambient temperature of terminal box
- °C.Pt = the actual value currently measured by the Pt100
- AL.Hi = limit value (TMax.)
- diSP = initiate a display test
- InFo = show software version and equipment type
- PW = enable/disable password protection

Bringing into service

Notes on changing communication parameters "bd.rt, Id"

All CAN bus equipment from GESTRA AG has default ex-works parameter settings, which enable a standard system to be brought into operation without making any changes.

Please follow the steps below if you need to make changes to communication parameters:

- Set the same baud rate for all bus nodes.
- To apply changed communication parameters, perform the steps below on the URB 60 visual display and operating unit or the SPECTOR*control*:
    - ◆ **Reimport the list of equipment**

To do this, please read the instructions in the Installation & Operating Manual of the URB 60 visual display and operating unit or the SPECTOR*control*.

Changing the baud rate

Set the same baud rate for all bus nodes.

Pay attention to the setting instructions on page 25 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 setting by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the baud rate, restart the entire system.

Bringing into service

Changing the limiter ID

To set the limiter ID, please also read the instructions in the Installation & Operating Manual of the URS 60/URS 61 safety control unit.

The limiter ID defines the channel on the relevant safety control unit

ID = 1	>	URS 60, channel 1
ID = 2	>	URS 60, channel 2
ID = 3	>	URS 60, channel 3
ID = 4	>	URS 60, channel 4

ID = 5	>	URS 61, channel 1
ID = 6	>	URS 61, channel 2
ID = 7	>	URS 61, channel 3
ID = 8	>	URS 61, channel 4

Pay attention to the setting instructions on page 25 and proceed as follows:

1. Select the parameter "**Id**".
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 setting by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the limiter ID, restart the entire system.

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

Pay attention to the setting instructions on page 25 and proceed as follows:

1. Select the parameter "**AL.Hi**".
2. Press and hold the rotary knob until the display test starts and shows "**....**".
   The following numbers are displayed 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 setting by pressing the rotary knob for approx. 1 second.
7. Enter the AL.Hi limit = TMax (°C) on the rating plate.

Bringing into service

Checking the set limit or switchpoint

(i) You need to check the switchpoint by allowing the set "**AL.Hi**" limit to be exceeded. In this case, the equipment must behave as if there were an alarm.

Always check the switchpoint 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 replaced.

Manually initiating a display test

Pay attention to the setting instructions on page 25 and proceed as follows:

1. Select the parameter "**diSP**".
2. Press and hold the rotary knob until the display test starts and shows "**....**".
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 until it has finished, and cannot be interrupted.
5. The display test ends with "**donE**".

Replacing faulty equipment

⚠ **Faulty equipment jeopardises plant safety.**

■ If numbers or decimal points are displayed incorrectly or not at all, you must replace the temperature transmitter with an identical one from GESTRA AG.

Viewing the software version and equipment type "InFo"

Pay attention to the setting instructions on page 25 ff. and proceed as follows:

1. Select the parameter "**InFo**".
2. The display shows the software version "**S-xx**" alternating with "**InFo**".

Then view the equipment type (see 3. and 4.) or quit the menu (see 5.):

3. Press and hold the rotary knob until the software version is continuously displayed.
4. Turn the rotary knob clockwise or anti-clockwise to view the equipment type.
5. You can quit the menu by pressing and holding (message "**donE**") or by waiting (message "**quit**").

Bringing into service

Enabling/disabling password protection

The default ex-works password cannot be changed

- The default password is "**1902**".
- Password protection is available from software version S-16 onwards.

Pay attention to the setting instructions on page 25 and proceed as follows:

1. Select the parameter "**PW**".

   "**PW**" alternates with the current status, e.g. "**oFF** or **on**", on the display.

2. Press and hold the rotary knob until "**PASS**" is displayed.
3. Release the rotary knob.
4. Next, press the rotary knob until "**0000**" appears and the right-hand digit flashes.
5. Enter the password "**1902**". You can skip to the next flashing digit by briefly pressing the rotary knob.
6. After the final digit, press and hold the rotary knob until "**donE**" is displayed.

   The following may appear on the display:

   - **donE** The correct password was entered
   - **FAiL** The wrong password was entered
   - **quit** Timeout. Password entry has been aborted.

7. Release the rotary knob.

   "**PW**" alternates with the current status, e.g. "**oFF** or **on**", on the display.

8. Press the rotary knob again until "**oFF** or **on**" flashes on the display.
9. Turn the rotary knob and set the desired status.

   - **on** = password protection is enabled
   - **oFF** = password protection is disabled

10. Press and hold the rotary knob until "**donE**" is displayed.
11. Release the rotary knob.

    "**PW**" alternates with the set status, e.g. "**oFF** or **on**", on the display.

12. You can quit the menu by waiting (message "**quit**") or by turning the rotary knob to the actual value.

Starting, operation and testing
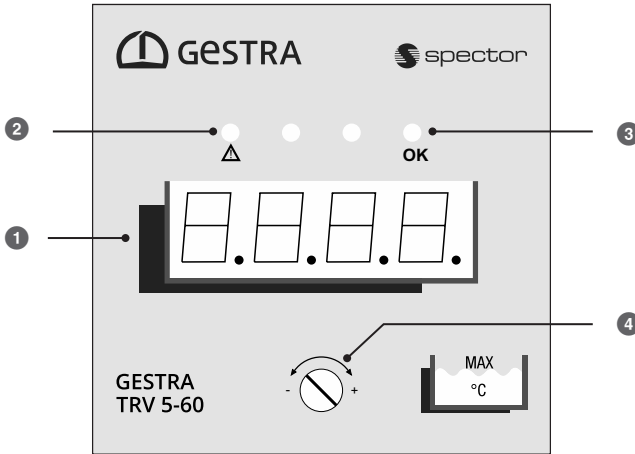
Fig. 13   **The operating panel:**

❶ Actual value display/error code/limit value, green, 4 digits

❷ LED 1, alarm/fault, red

❸ LED 2, function OK, green/flashing during self-test

❹ Rotary knob for operation and settings

Notes on the priority of the various indications

Fault indications and alarms are displayed based on their priority. Indications with higher priority are shown continuously before those with low priority. If several indications need attention, the display does not alternate between them.

Priority 1 = fault indications as per error code table, see page 35 ff.

Priority 2 = alarm, temperature limit exceeded.

Priority of error code display

Higher priority error codes overwrite lower ones on the display!

Starting, operation and testing

Relationship between equipment status, display and alarm LEDs:

Starting		
Switch on supply voltage.	All LEDs light up - Test **Indication:** 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 AL.Hi limit (°C).	**Indication:** e.g. 0361 **LED 2:** Operating LED lights up green	Actual value is displayed
Actual value T (°C) higher than AL.Hi limit (°C).	**Indication:** Hi.t and current actual value, alternating **LED 1:** Alarm LED lights up red	Display of Hi.t (high temperature) and the current actual temperature. After the time delay has elapsed, the URS 60/URS 61 safety control unit opens the output contacts.

Behaviour in the event of a malfunction (error code display)		
On the occurrence of a fault	**Indication:** e.g. E.003	An error code is continuously displayed, error codes, see page 35.
	LED 1: Alarm LED lights up red	A fault indication is active
	LED 2: Operating LED is OFF	A fault is present
■ The fault or error state is transferred to the URS 60/URS 61 safety control unit via CAN data telegram. ■ The fault triggers an immediate safety shutdown there. ■ The affected signal output is activated. ■ The URS 60/URS 61 safety control unit does not automatically lock the safety contacts.		

Alarms and faults cannot be acknowledged.
When the alarm or fault is cancelled the display also goes blank, and the URS 60/URS 61 safety control unit closes the safety contacts and deactivates the relevant signal outputs once more.

See the following page for more information and tables.

Starting, operation and testing

(i) When password protection is enabled, you must enter the password before running the test function.

Testing		
Checking the safety function by simulating the alarm state		
In operating mode: Press the rotary knob on the TRV 5-60 and hold until the end of the test or press button 1, 2, 3 or 4 of the URS 60/URS 61 safety control unit and hold until the end of the test or open the relevant menu on the URB 60 and initiate the test function.	**Indication:** e.g. Hi.t and set limit value, alternating	A temperature rise is simulated.
	LED 1: Alarm LED lights up red	Temperature alarm
	LED 2: Operating LED is OFF	Alarm is triggered
	■ The URS 60/URS 61 safety control unit or equipment behaves as if there were a real alarm. ■ The switch-off delay is running, the signal output closes with/without a delay. ■ Once the delay time has elapsed, the output contacts of the URS 60/URS 61 are opened and the corresponding signal outputs are activated. ■ The test has now finished	

⚠ **Faulty equipment jeopardises plant 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 Ω 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 cannot be assigned more than once.

Baud rate:
- Is the cable length correct for the set baud rate?
- Is the baud rate identical for all devices?

⚠ ATTENTION

Interrupting the CAN bus causes a plant shutdown and triggers an alarm.
- Bring the plant into a safe operating state before commencing work on the installation.
- Switch off the voltage to the plant and secure so that it cannot be switched back on.
- Check that the plant is not carrying live voltage before commencing work.

System malfunctions

Indication of system malfunctions using error codes
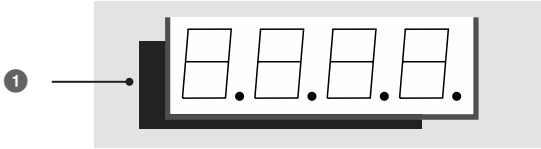
Fig. 14   ❶ Actual value display/error code/limit value, green, 4 digits

Error code display			
Error code	**Internal designation**	**Possible errors**	**Remedy**
E.001	ADS1110 read error	Faulty hardware	Replace the temperature transmitter
E.002	MinTempErrCh1	Temperature < 0°C	Check the wiring, check the temperature sensor
E.003	MinTempErrCh2		
E.004	MaxTempErrCh1	Temperature > 750°C	Check the wiring, check the temperature sensor
E.005	MaxTempErrCh2		
E.006	KompErrCh1	Connecting cable resistance > 4 Ω	Check the 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 the installation location or replace the temperature transmitter
E.009	ADVErrCh2		
E.010	ADCErrCh1	Error during dynamic test	Replace the temperature transmitter
E.011	ADCErrCh2		
E.012	IKonErrCh1	Excessive deviations in measuring current	Check the wiring and temperature sensor, replace the temperature transmitter
E.013	IKonErrCh2		

System malfunctions

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

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

ⓘ Virtually all of the aforementioned error 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.

- You need to check the switchpoint by allowing the set "**AL.Hi**" limit to be exceeded. In this case, the equipment must behave as if there were an alarm.
- Always check the switchpoint 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 replaced.

System malfunctions in the TRV 5-60 temperature transmitter also trigger a system malfunction on 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 error 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/Disassembly

1. Switch off the supply voltage and switch off the voltage to the equipment.
2. Open the cover of the terminal box 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 equipment

If products have come into contact with media that are hazardous to health, they must be drained and decontaminated before being returned to GESTRA AG.

Such media include solid, liquid or gaseous substances, mixtures of these, or radiation.

GESTRA AG can accept returned products only if accompanied by a completed and signed return note and also a completed and signed declaration of decontamination.

（ⓘ）The return confirmation and declaration of decontamination must be attached to the returned goods and be accessible from the outside. Otherwise, the goods cannot be dealt with and will be returned, carriage unpaid.

Please proceed as follows:

1. Let GESTRA AG know about the return beforehand by e-mail or phone.
2. Wait until you have received the return confirmation from GESTRA.
3. Fill out the return confirmation (and declaration of decontamination) and send it with the products to GESTRA AG.

Declaration of Conformity; Standards and Directives

You can find details on the conformity of the equipment and the applicable standards and directives in the Declaration of Conformity and associated certificates.

You can download the Declaration of Conformity from www.gestra.com and request relevant certificates by writing to the following address:

GESTRA AG

Münchener Straße 77
28215 Bremen
Germany
Tel.   +49 421 3503 0
Fax   +49 421 3503 393
e-mail   info@de.gestra.com
Website www.gestra.com

Modifications to the equipment not approved by us will invalidate the Declarations of Conformity and certificates.

GESTRA

You can find our authorised agents around the world at:
www.gestra.com