GESTRA®

Control Unit

TRS 5-40

spector bus

CANopen

EN
English

Original Installation Instructions

818800-02

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Important Notes

Usage for the intended purpose

Use temperature switch TRS 5-40 only in conjunction with temperature transmitter TRV 5-40 for monitoring 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 terminal strips of the control unit TRS 5-40 are live during operation.
This presents the risk of severe cases of electric shock!
Always **cut off power supply** before mounting, removing or connecting the terminal strips!

ATEX (Atmosphère Explosible)

According to the European Directive 2014/34/EU the equipment must **not** be used in explosion-risk areas.

Note on the Declaration of Conformity / Declaration by the Manufacturer CE

For details on the conformity assessment according to the European Directives see our Declaration of Conformity or our Declaration of Manufacturer.

The current Declaration of Conformity / Declaration of Manufacturer are available in the Internet under www.gestra.de/documents or can be requested from us.

Explanatory Notes

Scope of supply

TRS 5-40
1 Control unit TRS 5-40
1 Terminating resistor 120 ohm
1 Installation manual

Explanatory Notes - continued -

Description

The control unit TRS 5-40 together with the temperature sensors TRS 5-6x and the temperature transmitter TRV 5-40 constitutes a temperature monitoring system.

Two temperature sensors TRG 5-6x detect the temperature values which are then converted by the temperature transmitter TRV 5-40 and made available for the CAN bus in the form of a data telegram.

The CANopen protocol is used for the data transfer via CAN bus.

The control unit TRS 5-40 can be used

- as MIN and MAX temperature monitor in combination with the temperature transmitter TRV 5-40 and with one temperature sensor TRG 5-6x each and
- as temperature controller in combination with the temperature transmitter TRV 5-40 and with one temperature sensor TRG 5-6x (MIN or MAX)

The control unit TRS 5-40 is also available with two actual value outputs 4 - 20 mA.

The equipment combinations can be used for controlling or monitoring temperatures in steam boilers and (pressurised) hot water installations to TRD and EN 12952 and EN 12953.

Function

The control unit TRS 5-40 evaluates the data telegram coming from the temperature transmitter TRV 5-40 at regular intervals. This data telegram contains:

- Actual value and ajdusted switchpoint for measuring channel 1,
- Actual value and ajdusted switchpoint for measuring channel 2,
- Temperature in the housing of the temperature transmitter.

In addition, the following error messages are also included in the data telegram:

- Malfunction in the temperature sensor (sensor damaged, short circuit),
- Temperature in the housing of the temperature transmitter too high,
- Communication error.

The output relays 1 – 4 are assigned to the measuring channels 1 and 2 as follows:

- Measuring channel 1: Output relay 1
- Measuring channel 2: Output relays 2, 3 and 4.

To activate or de-activate the measuring channels and to set the functions use the code switch or the operating & display unit URB 2.

Use the operating & display unit URB 2 to set the MIN / MAX temperature switchpoints for the temperature control as well as to establish the actual value outputs.

If there is an error message relay(s) 1 and/or 4 will be de-energized.

System components

TRG 5-6x
Temperature sensor Pt 100.

TRV 5-40
Temperature transmitter for temperature sensor Pt 100
Data exchange: CAN bus to ISO 11898 via CANopen protocol.

Technical Data

TRS 5-40

DIN registration number
TR / TW 118206

Input / output
Interface for CAN bus to ISO 11898 CANopen
with power supply 18 – 36 V DC, short-circuit protected

Outputs
4 volt-free relay contacts
Contact material AgNi 0.15
Max. contact rating with switching voltages 24 V AC/DC, 115 V AC and 230 V AC:
Resistive / inductive 4 A.
Contactors must be provided with interference suppressors (RC combinations) as specified by the manufacturer.
2 Analog outputs 4 – 20 mA, load 500 Ω for actual value indication (optional)
Channel 1: e.g. inlet temperature
Channel 2: e.g. return temperature

Switching hysteresis
for MAX switchpoints –2 °C,
for MIN switchpoints + 2 °C

Indicators and adjustors
2 test buttons for checking relays,
4 LEDs for alarm and error messages,
1 LED Power,
1 LED Bus status,
1 10-pole code switch for setting the node ID, the baud rate and the system configuration

Mains voltage
230 V +10 / –15 %, 50 – 60 Hz
115 V +10 / –15 %, 50 – 60 Hz (optional)
24 V +10 / –15 %, 50 – 60 Hz (optional)

Power consumption
10 VA

Protection
Housing: IP 40 to EN 60529
Terminal strip: IP 20 to EN 60529

Admissible ambient temperature
0 – 55 °C

Housing
Housing material: Base: polycarbonate, black; Front panel: polycarbonat, grey
Conductor size: 1 x 4.0 mm^2 solid per wire or
1 x 2.5 mm^2 per stranded wire with sleeve to DIN 46228 or
2 x 1.4 mm^2 per stranded wire with sleeve to DIN 46228; terminal strips can be detached
Fixing of housing: Mounting clip on supporting rail TH 35, EN 60715

Weight
approx. 0.8 kg

Name plate / Marking

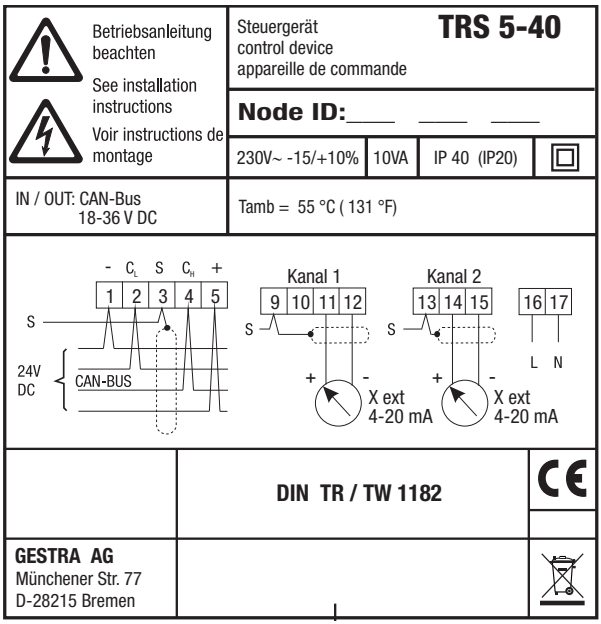

Fig. 1

Dimensions TRS 5-40

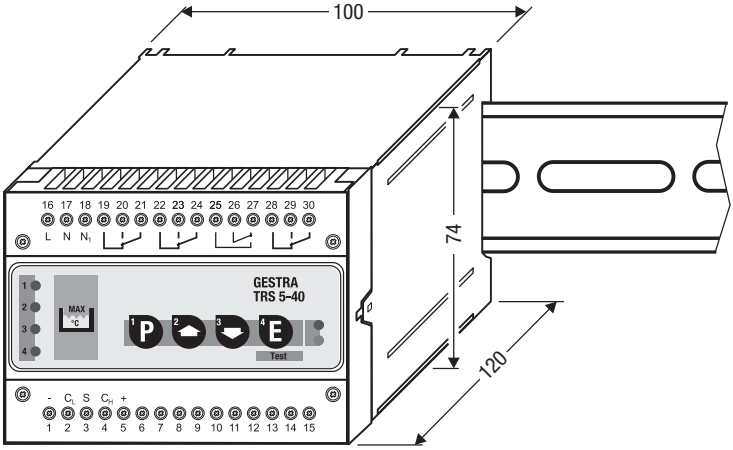

Fig. 2

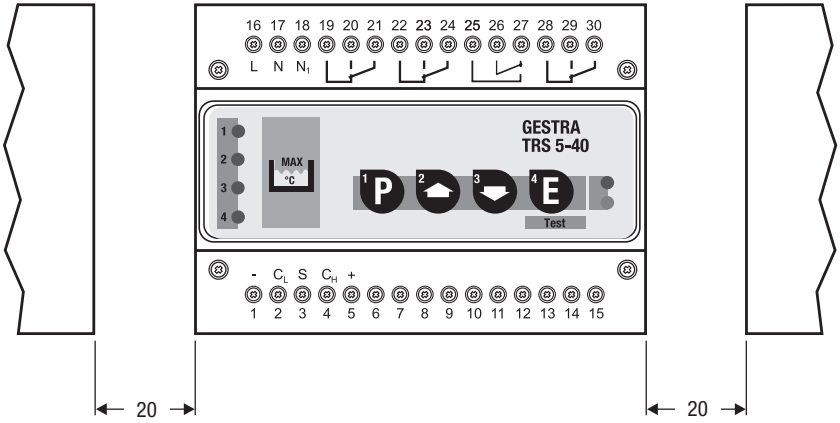

Fig. 3

Installation

Mounting control unit TRS 5-40

The control unit TRS 5-40 is clipped onto the support rail type TH 35, EN 60715. **Fig. 4** Ⓖ

Tools

- Screwdriver 5.5/100

Functional Elements

TRS 5-40

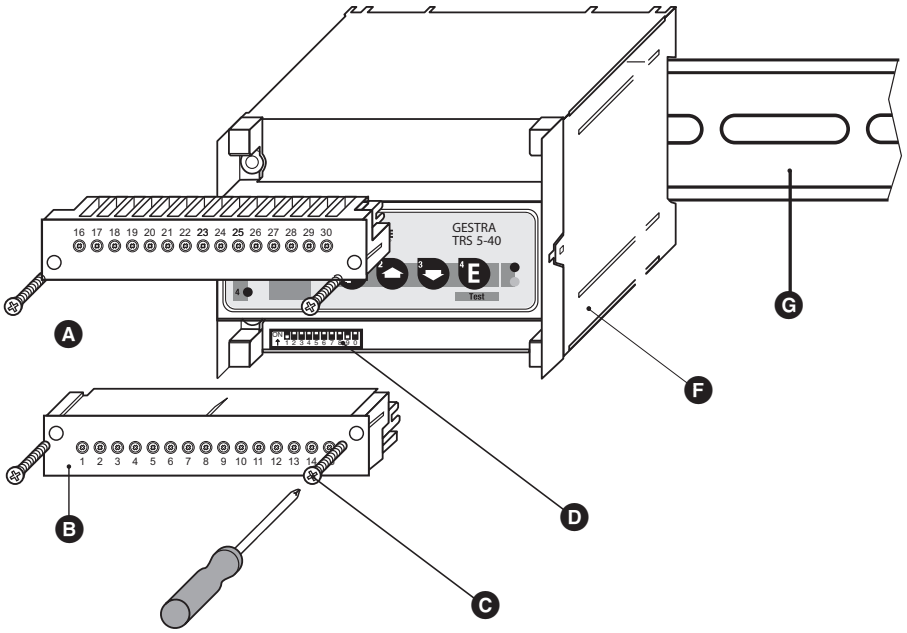

Fig. 4

The code switches are accessible after removing the lower terminal strip.
The terminal strips can be unplugged after undoing the right and the left fixing screws.

Key

- **A** Upper terminal strip
- **B** Lower terminal strip
- **C** Fixing screws (cross recess head screws M4)
- **D** Code switch for setting node ID, baud rate and system configuration
- **F** Housing
- **G** Supporting rail type TH 35, EN 60715

Electrical Connection

Bus cable, cable length and size

Note that screened multi-core twisted-pair control cable is required, e. g. UNITRONIC®
BUS CAN 2 x 2 x ... mm² or RE-2YCYV-fl 2 x 2 x ... mm².

Control cable assemblies (cable with plug and connector) of various lengths are available as add-on equipment.

The cable length dictates the baud rate (data transfer rate) between the bus nodes, and the total power consumption of the sensor dictates the conductor size.

S 8	S 9	S 10	Baud rate	Cable length	Number of pairs and conductor size [mm²]
OFF	**ON**	**OFF**	**250 kBit/s**	**125 m**	2 x 2 x 0.34
Factory setting					
ON	ON	OFF	125 kBit/s	250 m	2 x 2 x 0.5
OFF	OFF	ON	100 kBit/s	335 m	2 x 2 x 0.75
ON	OFF	ON	50 kBit/s	500 m	on request, depending on bus configuration
OFF	ON	ON	20 kBit/s	1000 m	
ON	ON	ON	10 kBit/s	1000 m	

The baud rate is set via code switch Ⓓ **Fig. 4** (S 8 to 10). Default factory setting of control unit TRS 5-40: baud rate 250 kbit/s (cable length up to 125m). For longer cable lengths reduce baud rate accordingly. Make sure that all bus nodes feature the same settings.

Changing baud rate

To set the baud rate detach the lower terminal strip. The terminal strip can be detached after undoing the right and the left fixing screws.

Use a small screwdriver to set the baud rate via the switches S 8 to S 10 of the code switch Ⓓ **Fig. 4.** Then re-attach the terminal strip and fasten the fixing screws.

Wiring terminal strip

Wire the terminal strips according to the wiring diagram. Connect the screen only to terminal 3.

Note

The max. baud rates and cable lengths indicated above are based on empirical values obtained by GESTRA. In certain cases it may be necessary to reduce the baud rate in order to ensure troublefree operation.

Electrical Connection - continued -

CAN bus voltage supply

To ensure the troublefree operation of the CAN bus system make sure that the voltage supply is sufficient.

Please use the following table to check the voltage supply of your bus system.

Control unit with voltage supply	Qty.	x	Power output per item	=	**Sum 1**
		x	**6 W**	=	**W**

Sensor, transmitter, control units, operating & display unit URB 1	Qty.	x	Power consumption per item	=	**Sum**
		x	**3 W**	=	**W**
Operating & display unit URB 2		x	**5 W**	=	**W**
			Sum 2	=	**W**

If sum **2** exceeds sum **1** supply the CAN bus with 24 V DC coming from a separate and stabilized safety power supply unit (e. g. SITOP Smart 24 V 2.5 A).

The power supply unit must be in accordance with DIN VDE 0106 (safety separation) and fused with an overcurrent protective device to EN 61010-1 / VDE 0411.

Do not connect the CAN bus supply to the control units (terminals 1 and 5).

Electrical Connection - continued -

Wiring diagram for control unit TRS 5-40

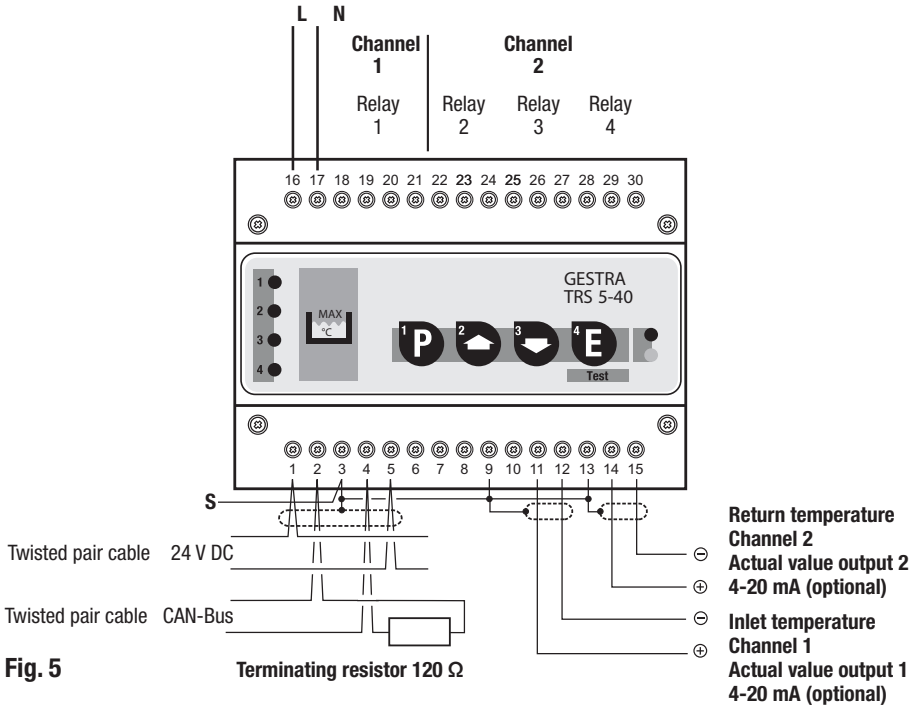

Fig. 5

Wiring diagram for CAN bus system – example –

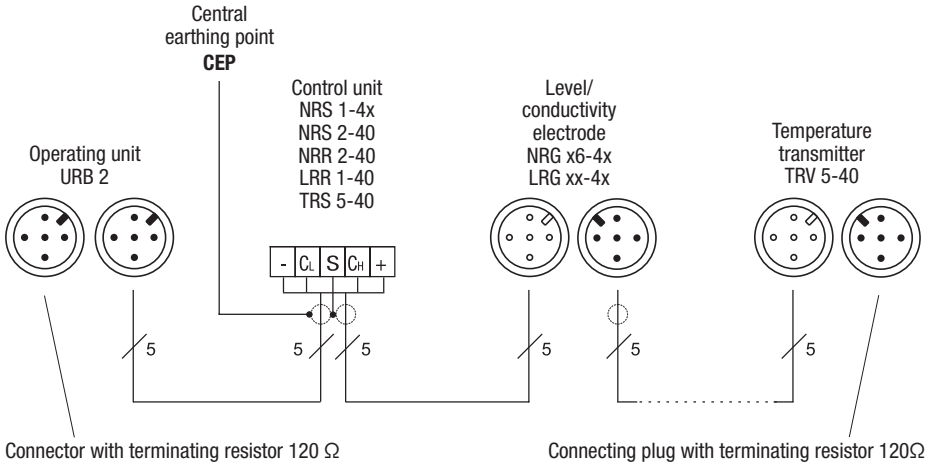

Fig. 6

Wiring diagram for control unit TRS 5-40 with closed-loop control

Pump OFF with MAX control, relay 2

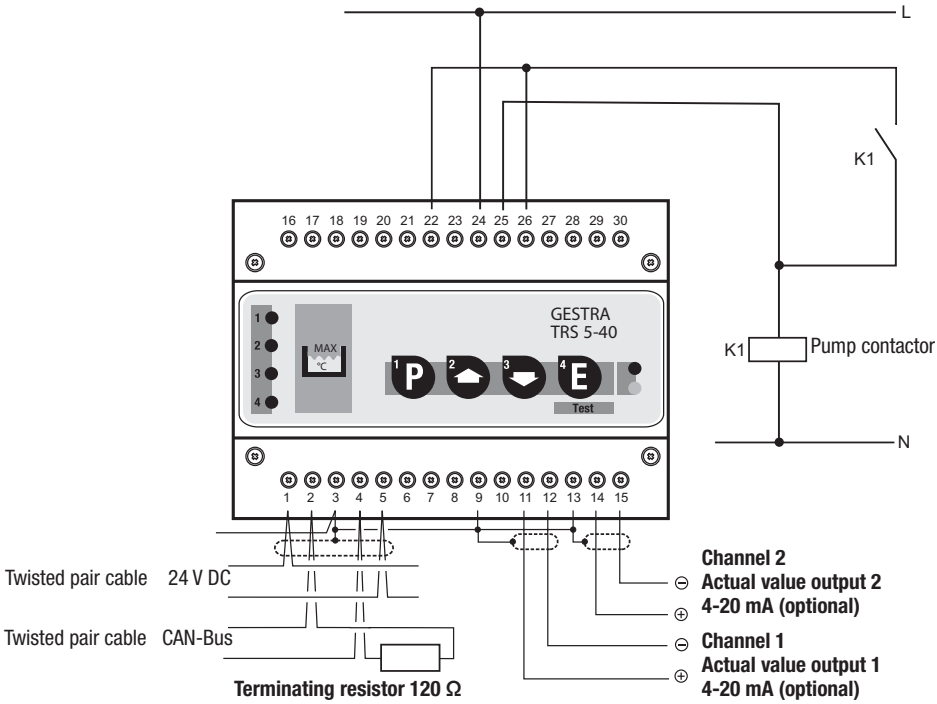

Fig. 7

Attention

- Wire equipment in series. Star-type wiring is not permitted!
- Link screens of bus cables such that electrical continuity is ensured and connect them once to the central earthing point (CEP).
- To protect the switching contacts provide the circuit with a T 2.5A or 1.0 A fuse (TRD 604, 72 hrs. operation)
- If two or more system components are connected in a CAN bus system, provide the first and the last device with a terminating resistor of 120 Ω (terminal C_L/C_H).
- The CAN bus network must not be interrupted during operation!
  Note that an interruption will cause an alarm.

Electrical Connection - continued -

Note

- Connect screen only to the respective terminals and to the central earthing point (CEP).
- The rated voltage is indicated on the name plate.
- When switching off inductive loads, voltage spikes are produced that may impair the operation of control and measuring systems.
  Connected contactors must therefore be provided with suppressors such as RC combinations.

Tools

- Screwdriver for slotted screws, size 2.5, completely insulated according to VDE 0680-1.
- Screwdriver for cross head screws, size 2.

Basic Settings

Factory setting

Control unit TRS 5-40

The control unit features the following factory set default values:

- Node ID: 95
- Baud rate: 250 kBit/s (125 m cable length)
- Configuration: Measuring channels 1 and 2 energised, measuring channel 1: MAX limit, measuring channel 2: MIN limit.

Commissioning

Danger

The terminal strips of the control unit TRS 5-40 are live during operation.
This presents the risk of severe cases of electric shock!
Always **cut off power supply** before mounting, removing or connecting the terminal strips!

Changing configuration

The configuration of the control unit TRS 5-40 can be changed via code switch Ⓓ, **Fig. 4**.

1. Switch off power supply, unscrew the right and the left fixing screws and detach the lower terminal strip Ⓑ.
2. Write down the node ID and baud rate settings.
3. Code switch Ⓓ, set S 1 to S 6 to OFF.

S 1	S 2	S 3	S 4	S 5	S 6
OFF	OFF	OFF	OFF	OFF	OFF

4. Set configuration via switches S 7 to S 0.

Switch	Position	Function
S 7	ON	Measuring channel 1 energised
S 7	OFF	Measuring channel 1 de-energised
S 8	ON	Measuring channel 2 energised
S 8	OFF	Measuring channel 2 de-energised
S 9	ON	Measuring channel 1 / Relay 1 = MIN temperature monitor
S 9	OFF	Measuring channel 1 / Relay 1 = MAX temperature monitor
S 0	ON	Measuring channel 2 / Relay 4 = MIN temperature monitor
S 0	OFF	Measuring channel 2 / Relay 4 = MAX temperature monitor

Note

The output relays 2 and 3 for the temperature control (MAX/MIN) are assigned to the measuring channel 2.

Changing configuration - continued -

5. Apply mains voltage.
   The green LED “Power” is illuminated: The modified configuration has been accepted.
6. The red LED “Bus status” is illuminated. The new configuration has not been accepted.
   Repeat the setting or replace the control unit.
7. Switch off mains voltage. Set the original node ID and baud rate.
8. Re-attach terminal strip Ⓑ and fasten fixing screws. Apply mains voltage, the control unit TRS 5-40 works now with the new configuration.

Start, Operation, Alarm and Test

TRS 5-40

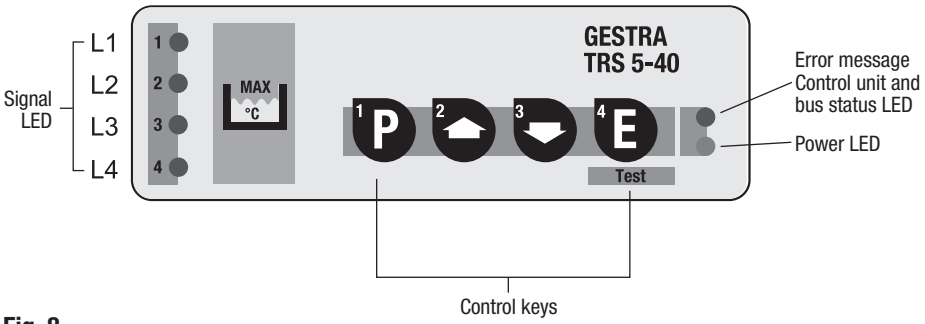

Fig. 8

Assignment of signal LED / push button / equipment:
LED 1 / Push button 1 / Output relay 1: Measuring channel 1
LED 2 / Output relay 2: Measuring channel 2, temperature control
LED 3 / Output relay 3: Measuring channel 2, temperature control
LED 4 / Push button 4 / Output relay 4: Measuring channel 2

Start		
Apply mains voltage	LED “Power” is illuminated	Mains voltage applied
	LEDs 1 – 4 are flashing	System is being started and tested. Output contacts are open.

Operation		
Temperature control Value below switchpoint MIN	LED 3 illuminated	Output relays 25/26 and 22/24 closed
Switchpoint MIN exceeded by 2 °C	LED 3 not illuminated	Output relays 25/26 open, 22/24 closed
Switchpoint MAX exceeded	LED 2 illuminated	Output relays 22/24 open
Temperature 2 °C below switchpoint MAX	LED 2 not illuminated	Output relays 22/24 closed
	LEDs 1 and 4 not illuminated	Output relays 20/21 and 29/30 closed

Alarm		
Measuring channel 1 alarm	LED 1 illuminated	Output relays 20/21 open
Measuring channel 2 alarm	LED 4 illuminated	Output relays 29/30 open

TRS 5-40 - continued -

Note

If the equipment is used as MIN temperature monitor, after the mains voltage is applied the switchpoint “MIN temperature” must be exceeded once, the measuring channel 1 / relay 1 or measuring channel 2 / relay 4 will then be energised. During this time LED 1 or – depending on the setting – LED 4 will be illuminated.

Relay test MIN / MAX		
During operation: Press button 4 (E) briefly	LEDs 1 and 4 are illuminated	The test mode remains active for 5 seconds.
Press and hold down button 4.	LED 4 not illuminated	An alarm is simulated for measuring channel 2, the output relays 29/30 are open
Press and hold down button 1 (P)	LED 1 not illuminated	An alarm is simulated for measuring channel 1, the output relays 20/21 are open.

System Malfunctions

Causes

Malfunctions occur if CAN bus components have been mounted or configured incorrectly or if electronic component parts are defective, or in the event of excessive heat in the equipment or electrical interference in the supply system.

Further malfunctions are:

- Faulty communication in CAN bus system
- 24 V PSU in control unit overloaded.

Note

Before carrying out the systematic fault finding procedure please check:

Wiring:
Is the wiring in accordance with the wiring diagrams?
Is the polarity correct throughout the whole bus line?
Is the bus line of each of the end nodes provided with a 120 Ω terminating resistor?

Configuration of temperature transmitter TRV 5-40
Is the transmitter correctly adjusted as device 1, 2, 3 or 4?

Node ID:
Are the node IDs set correctly?
Do not use a node ID twice!

Baud rate:
Is the cable length appropriate for the baud rate?
Is the baud rate setting identical for all devices?

Danger

The terminal strips of the control unit TRS 5-40 are live during operation.
This presents the risk of severe cases of electric shock!
Always **cut off power supply** before mounting, removing or connecting the terminal strips!
An alarm is raised if the CAN bus is interrupted during operation.

Systematic malfunction analysis

The sources of malfunctions occuring in CAN bus systems operating with several bus-based stations must be analysed systematically since faulty components or incorrect settings can give rise to negative interactions with intact bus devices in the CAN bus system. These unwanted interactions can cause error messages in fully functional bus devices, which will make fault detection even more difficult.

We recommend the following systematic fault finding procedure:

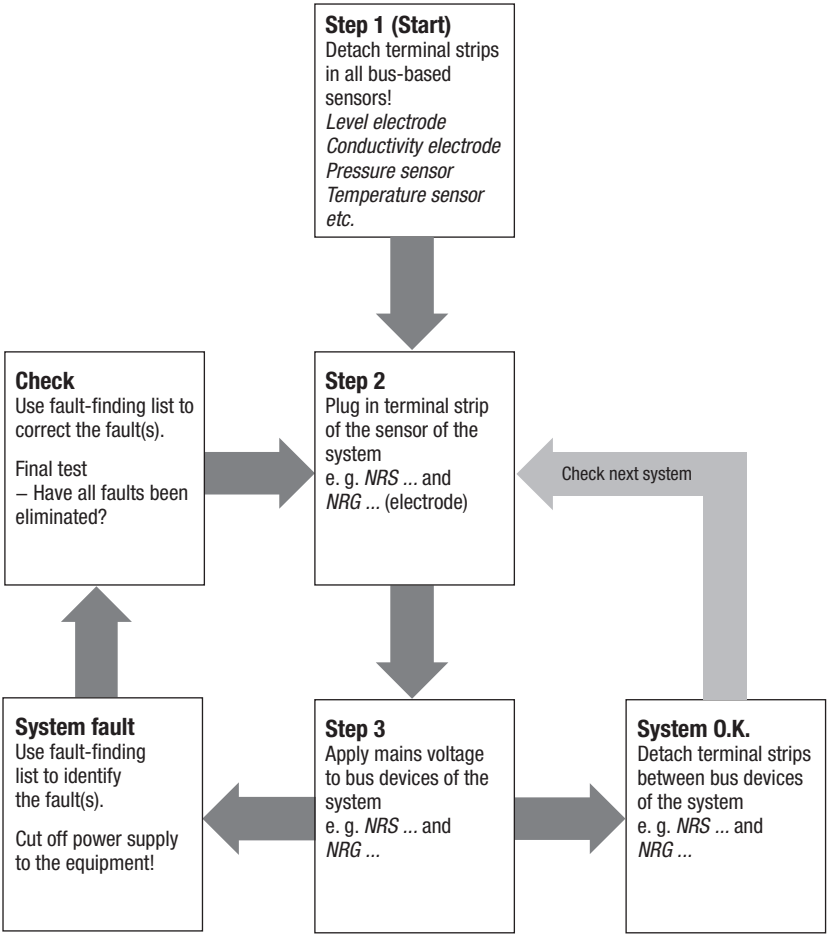

Fig. 9

System malfunctions - continued -

Indication of system malfunctions

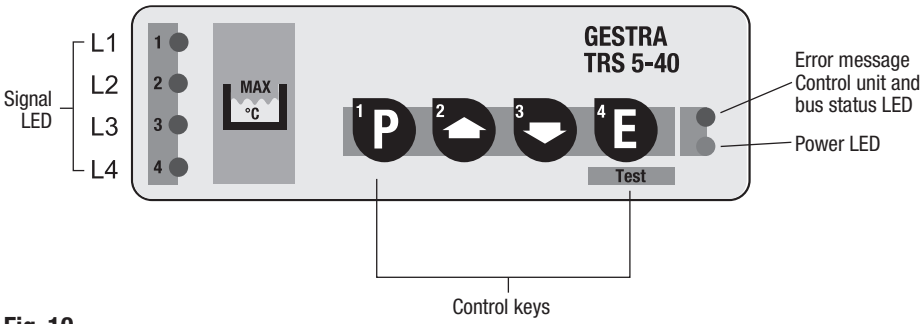

Fig. 10

Assignment of signal LED / push button / equipment:
LED 1 / Push button 1 / Output relay 1: Measuring channel 1
LED 2 / Output relay 2: Measuring channel 2, temperature control
LED 3 / Output relay 3: Measuring channel 2, temperature control
LED 4 / Push button 4 / Output relay 4: Measuring channel 2

Indication of system malfunctions		
Measuring channel 1: Alarm	LED 1 is flashing slowly	Temperature sensor interrupted / short circuited, excessively high temperature in temp. transmitter.
Measuring channel 2: Alarm	LEDs 2 – 4 are flashing slowly	Temperature sensor interrupted / short circuited, excessively high temperature in temp. transmitter.
Measuring channel 1: Alarm	LED 1 is flashing quickly	Communication between temperature transmitter and control unit disturbed, high-frequency interference
Measuring channel 2: Alarm	LEDs 2 – 4 are flashing quickly	Communication between temperature transmitter and control unit disturbed, high-frequency interference

Indication of system malfunctions in the control unit		
Malfunction in control unit	LED bus status is flashing slowly	Faulty communication in the CAN bus system. HF interference
	LED Power is flashing slowly	Bus supply voltage below 18 V.

System malfunctions - continued -

Fault finding list for troubleshooting system faults

LED 1 and / or LED 2 – 4 are flashing slowly

Fault: Sensor line interrupted or interruption in temperature sensor.
Short circuit in temperature senor.

Remedy: Check sensor lines. Check whether the temperature sensor gives correct readings (see table “Basic values of measuring resistors” in the installation manual TRV 5-40).
If the readings are not correct replace the measuring insert.

Fault: Admissible temperature limit in temperature transmitter housing exceeded.

Remedy: Check place of installation of the temperature transmitter.

LED 1 and / or LEDs 2 – 4 are flashing quickly

Fault: The **temperature transmitter** and the **control unit** cannot communicate with each other.

Remedy: Check 24 V bus supply, wiring, configuration of the low level electrodes (wire links), node ID, baud rate setting and terminating resistors. If modifications have to be made, switch off mains voltage and switch it on again after about 5 seconds.

Fault finding list for troubleshooting system malfunctions: Control Unit

LED bus status is flashing slowly

Fault: Faulty communication in the CAN bus system.

Remedy: Check 24 V bus supply, wiring, configuration of the limiter, node ID, baud rate and terminating resistors. If modifications have to be made, switch off mains voltage and switch it on again after about 5seconds.

Fault: No or faulty communication with limiters. The fault occurs at long intervals.

Remedy: There is a source of interference in the surrounding area. To suppress interferences provide contactors and actuators with RC combinations in accordance with the specifications of the manufacturer. Take action against high frequency interference.

LED Power is flashing slowly

Fault: Bus supply voltage below 18 V DC. The power supply unit of the controller is overloaded.

Remedy: Mount and connect a safety power supply unit (e. g. Siemens SITOP Power 05).

Fault: Bus supply voltage below 18 V DC. Faulty wiring (short circuit).

Remedy: Check wiring. Switch off mains voltage and switch it on again after about 1 second (the equipment restarts).

System malfunctions - continued -

Action against high frequency interference

All connected inductive loads such as contactors and actuators must be provided with RC combinations in accordance with the specifications of the manufacturer.

Should sporadic failures occur in installations susceptible to faults (e. g. malfunctions due to out-of-phase switching operations) we recommend the following actions in order to suppress interferences:

HF interference suppression of voltage supply by means of ferrite rings and
HF interference suppression of CAN bus line by means of hinged-shell ferrite rings.

Replacing control unit

1. **Cut off power supply** to the equipment!
2. Detach terminal strips Ⓐ and Ⓑ. For this purpose turn the right and left fixing screws in direction of the arrow until the terminal strip can be detached.
3. Undo the fixing slide in order to snap out the controller and take it off the supporting rail.

When ordering spare parts please state the serial number indicated on the name plate.

Malfunctions

Fault-finding list for control unit TRS 5-40

Switchpoint "MAX temperature" not yet exceeded – but MAX temperature alarm is raised

Fault: The temperature sensor is defective.
Remedy: Check whether the temperature sensor gives correct readings (see table "Basic values of measuring resistors" in the installation manual TRV 5-40). In case of incorrect readings replace the measuring element of the temperature sensor.

Temperature not below switchpoint "MIN temperature" – but MIN temperature alarm is raised

Fault: The temperature sensor is defective.
Remedy: Check whether the temperature sensor gives correct readings (see table "Basic values of measuring resistors" in the installation manual TRV 5-40). In case of incorrect readings replace the measuring element of the temperature sensor.

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

Annex

CAN bus

All devices (level, conductivity, temperature) are interconnected via CAN bus. The CANopen protocol is used for the data exchange between the equipment groups. All devices have an electronic address – the node ID. The four-core bus cable serves as power supply and data highway for high-speed data exchange.

The CAN address (node ID) can be set between 1 and 123.

Setting Node ID

The node ID of the control unit TRS 5-40 depends on the node ID setting of the temperature transmitter TRV 5-40.

Node ID of the temperature transmitter TRV 5-40	Node ID of the control unit TRS 5-40
2	92
3	93
4	94
5	95
7	97
8	98
9	99
10	100

Please set the node ID of the control unit TRS 5-40 via the 10 pole code switch Ⓓ **Fig. 4** in accordance with the node ID setting of the temperature transmitter TRV 5-40.

To set the baud node ID detach the lower terminal strip Ⓑ. The terminal strip can be detached after undoing the right and the left fixing screws.

Use a small screwdriver to set the node ID via the switches S 1 to S 7 of the code switch Ⓓ **Fig. 4**. **Table Node ID Fig. 11**. Then re-attach the terminal strips and fasten the fixing screws.

Please enter the node ID on the name plate.

Setting Node ID - continued -

Toggle switch, white

		Node ID	95
S1	**ON**	1	
S2	**ON**	2	
S3	**ON**	4	
S4	**ON**	8	
S5	**ON**	16	
S6	OFF	32	
S7	**ON**	64	

Fig. 11

(Factory setting)

Danger

The terminal strips of the control unit TRS 5-40 are live during operation.
This presents the risk of severe cases of electric shock!
Always **cut off power supply** before mounting, removing or connecting the terminal strips!

Attention

Do not use a node ID for more than one item of equipment in the CAN bus system.
The node ID 0 is not permissible.

Decommissioning

First detach the terminal strips. For this purpose turn the right and left fixing screws in direction of the arrow until the terminal strip can be detached.

Undo the fixing slide in order to snap out the controller and take it off the supporting rail.

Disposal

Dismantle the control unit and separate the waste materials, using the specifications in the table “Materials” as a reference.
Electronic component parts such as the circuit board must be disposed of separately!

For the disposal of the control unit observe the pertinent legal regulations concerning waste disposal.

For your notes

Agencies all over the world: **www.gestra.de**

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