GESTRA®

Level Controller

NRR 2-40

spector bus

CANopen

EN
English

Original Installation Instructions

810369-06

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Important Notes

Usage for the intended purpose

Use the level controller NRR 2-40 only in conjunction with GESTRA level electrode NRG 26-40 for controlling liquid levels of conductive fluids.

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 equipment are live during operation.
This presents the danger of electric shock.
Cut off power supply before mounting or removing the terminal strips and the housing cover.

Attention

The name plate specifies the technical features of the equipment. Note that any piece of equipment without its specific name plate must neither be commissioned nor operated.

LV (Low Voltage) Directive and EMC (Electromagnetic Compatibility)

The level controller NRR 2-40 meets the requirements of the Low Voltage Directive 2014/35/EU and the EMC Directive 2014/30/EU.

ATEX (Atmosphère Explosible)

According to the European Directive 2014/34/EU the equipment must **not** be used in potentially explosive areas.

Explanatory Notes

Scope of supply

NRR 2-40

1 Level controller NRR 2-40 plug-in unit in plastic case with box terminals
1 Terminating resistor 120 Ω
1 Installation & operating manual

Description

The level controller NRR 2-40 in conjunction with level electrode NRG 26-40 is designed for level control and monitoring. The level controller features the following functions:

- Two level limit values with one switchpoint each (high-level alarm, low-level alarm).
- Three-position or modulating control within a predefined proportional band.
- Water level is maintained within the defined control band of the electrode.

The NRR 2-40 features an optional output for a standard signal 4 – 20 mA.

The level data are transferred from the level electrode NRG 26-40 to the level controller or an additional system component via a CAN data bus.

Function

At regular intervals the level electrode NRG 26-40 sends a data telegram to the level controller NRR 2-40. The data are transferred via a CAN bus to DIN ISO 11898 using the CANopen protocol. The transmitted measuring data are then evaluated and allocated to the manually adjusted switchpoints. Optionally a standard signal 4 – 20 mA is established for external level indication. A relay de-energizing delay can be set manually with the control terminal and display unit URB 1. To guarantee the correct functioning and safety of the system the data transmitting cycle is constantly monitored by the level controller. If the CAN bus line is interrupted the level controller sends a visual signal to indicate a malfunction and the relays 1 and 4 will be instantaneously de-energized. (fail safe position).

GESTRA's control terminal & display units URB enable advanced features such as adjustable energizing and de-energizing delays of the output relays (1 to 25 sec.)

System components

NRG 26-40
Level electrode NRG 26-40, PN 40

Design

NRR 2-40

Enclosure of insulating material with terminals for installation in control cabinets.
The terminals are externally accessible.
Clipping onto a 35 mm standardized supporting rail (DIN EN 50022).
External dimensions: 73 x 100 x 118

Technical Data

NRR 2-40

Type approval no.
NRR 2-40: TÜV · XX-399

Input/Output
Interface for CAN bus to DIN ISO 11898 CANopen.
Feedback potentiometer 1000 Ω.

Output voltage supply for electrodes
Power supply 24 V DC, short-circuit protected.
Analog output 4-20 mA, load 500 Ω for indication of actual value (optional).
Analog control output for manipulated variable, 4-20 mA, max. load 500 Ω (optional).
4 volt-free relay contacts. Max. contact rating with switching voltages of 24 V AC, 115 V AC and 230 V AC: 4 A resistive, 0.75 A inductive at cos φ 0.5.
Max. contact rating with a switching voltage of 24 V DC: 4 A. Contact material: silver, hard-gold plated.

Interference suppression
Provide contactor with an external RC combination (100 Ω / 47 nF).

Relay de-energizing delay
Output "MIN", "MAX" 3s

Indicators and adjustors
1 red LED for switchpoint "MAX"
1 red LED for switchpoint "MIN"
2 green LEDs for "Opening control valve" and "Closing control valve"
One green LED "Power"
1 red LED "Bus malfunction"
1 ten-pole code switch for setting node ID and baud rate
4 pushbuttons

Proportional range X_p
1 % to 100 %

Valve position feedback
0 Ω to 1000 Ω (only when used as three-position stepping controller)

Switching range (dead band X_{sh}
0 % (factory setting) up to 15 %

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

Power consumption
10 VA

Protection
Housing: IP 40 to DIN ISO 60529
Terminal strip: IP 20 to DIN ISO 60529

Admissible ambient temperature
0 °C to 55 °C

Body material
Front panel: polycarbonate, grey
Housing: polycarbonate, black

Weight
approx. 0.8 kg

Technical Data – continued –

Corrosion resistance

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

Name plate / marking

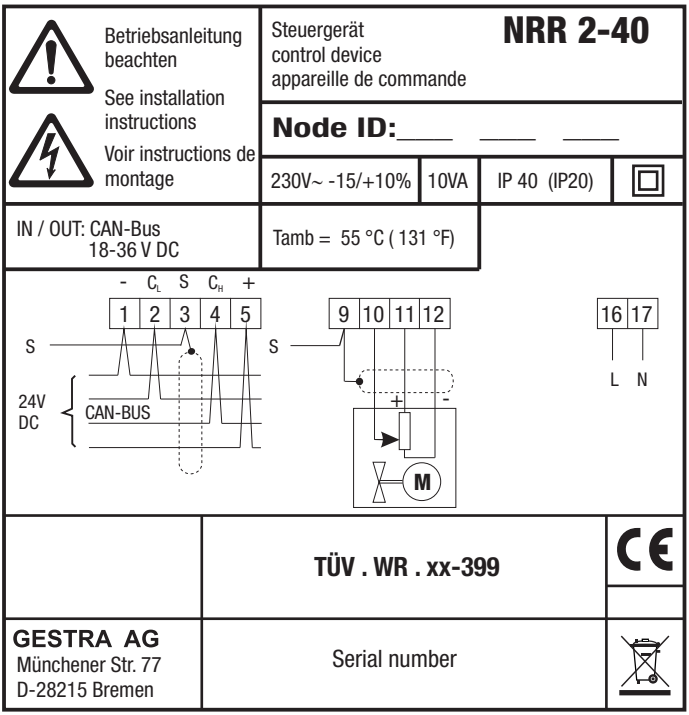

Fig. 1

Dimensions

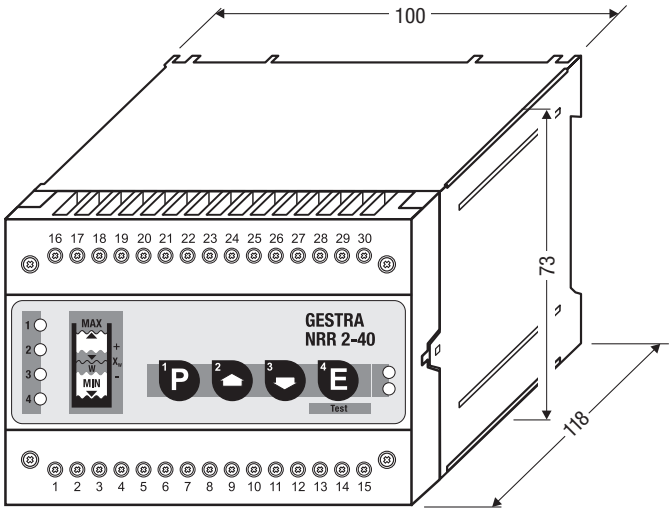

Fig. 2

Design

NRR 2-40

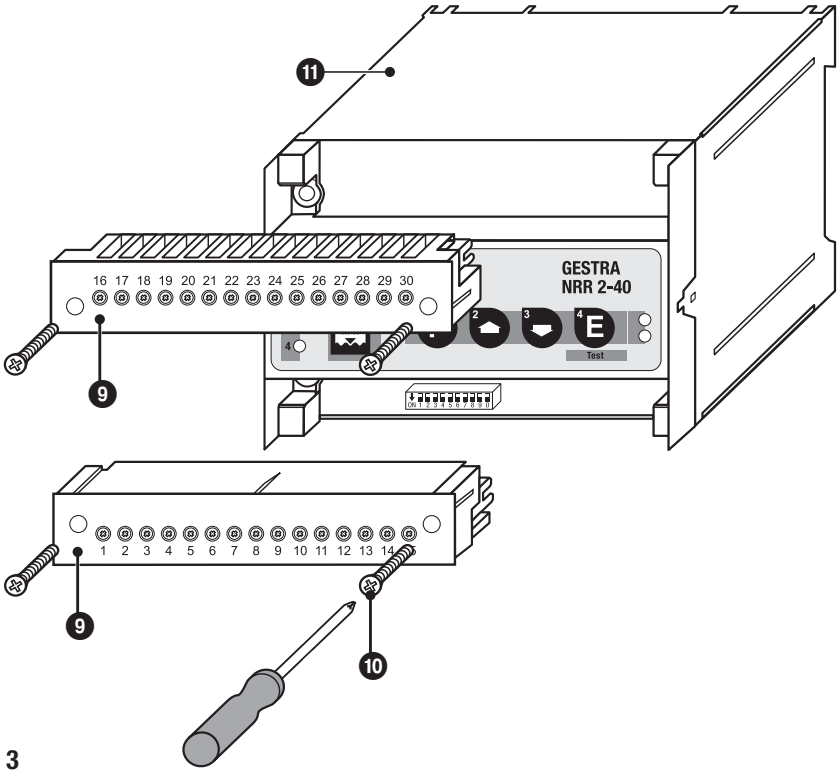

Fig. 3

Functional Elements

NRR 2-40

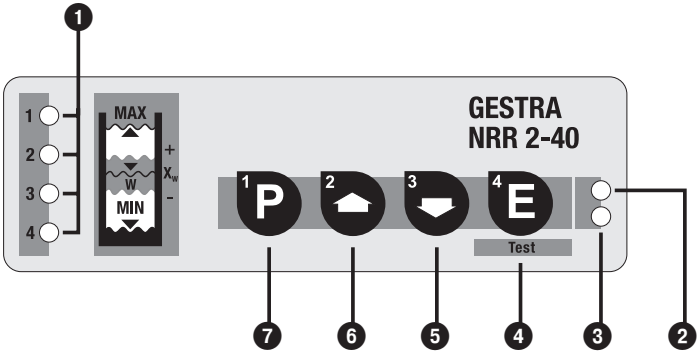

Fig. 4

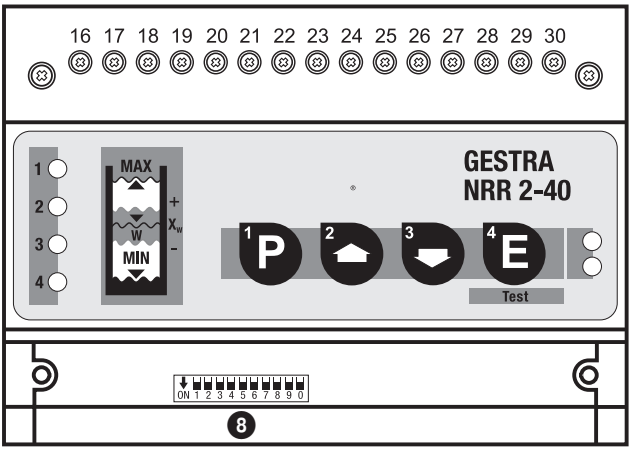

Fig. 5

Design / Functional Elements / Installation

Key

		Alarm	Malfunction
❶	Status LED	**Alarm**	**Malfunction**
	LED 1 Switchpoint 1	MAX alarm	Multifunction
	LED 2 Closing control valve	Not assigned	Multifunction
	LED 3 Opening control valve	Not assigned	Multifunction
	LED 4 Switchpoint 4	MIN alarm	Multifunction

❷ LED Bus status

❸ LED Power

❹ Enter / Test

❺ Increase button

❻ Increase button

❼ Program button

❽ Code switch, 10 poles

❾ Terminal strip

❿ Screws for terminal strip

⓫ Body

⓬ Supporting rail TS 35 x 15 DIN EN 50022

Installation

NRR 2-40

Mounting on supporting rail

1. Clip control unit onto the supporting rail.
   Supporting rail TS 35 x 15, DIN EN 50022.
2. Align level controller. **Fig. 7**

Tools

■ Screwdriver (5.5/100)

Example of Installation

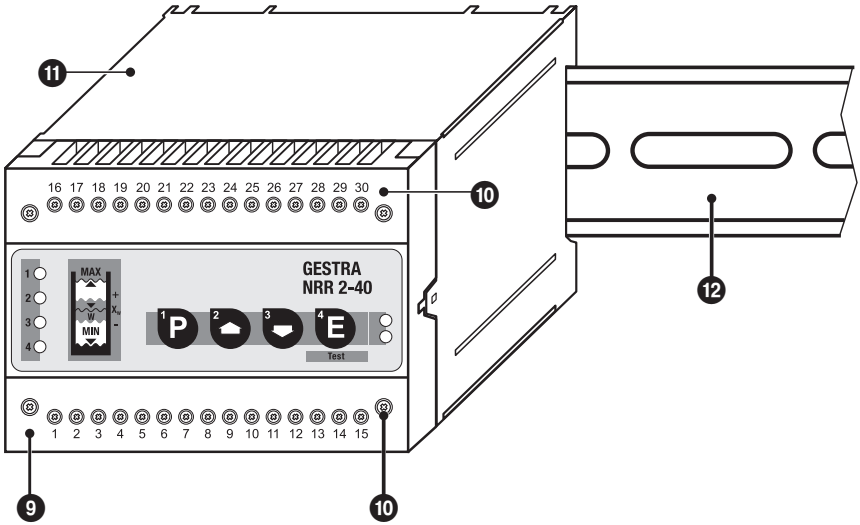

Fig. 6

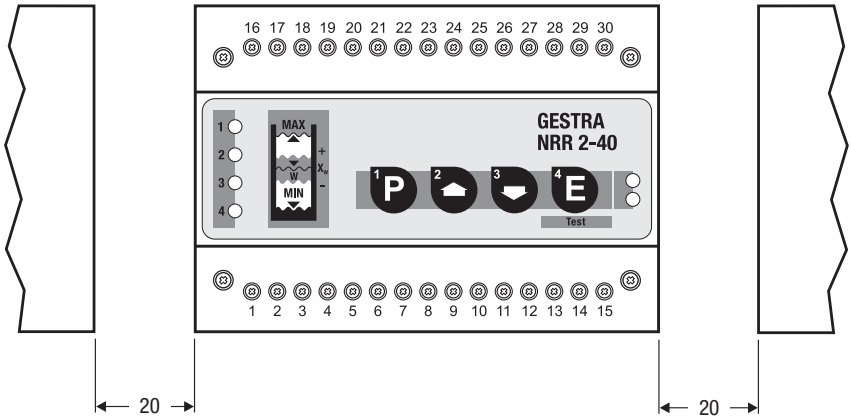

Fig. 7

Electrical Connection

Control cable

NRS, NRR, LRR, TRS, URB 1

To wire the equipment, multi-core twisted-pair control cable **must** be used for the bus line, e. g. UNITRONIC® BUS CAN 2 x 2 x ... mm² or RE-2YCYV-fl 2 x 2 x ... mm².

Control cable assemblies (2 x 2 x 0.32 mm² cable with plug and connector) of various lengths are available as add-on equipment.

NRG, LRG, EF, URZ, TRV, URB 2

The equipment is fitted with sensor plug-in connectors (5 poles, A-coded). For connecting the bus devices control cable assemblies (with plug and socket) of various lengths are available as add-on equipment.

Note that the recommended control cables are not UV-resistant and must be protected by a UV-resistant plastic tube or cable duct if the equipment is installed outdoors (except for URB 2).

The baud rate (data transfer rate) dictates the cable length and size between the bus nodes. The total power consumption must also be taken into consideration when selecting the conductor size. The total power consumption is obtained from the number of bus nodes.

If the cable length between the steam boiler and the control cabinet exceeds 15 m, we recommend that you fit a branching box that is resistant to electromagnetic interference (stock code 1501214) and use a control cable with a larger conductor size for the distance to the control cabinet.

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 0.32
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	

Set baud rate via code switch ❽. Make sure that all bus nodes feature the same settings.

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Note

- The specified max. baud rates and cable lengths are based on empirical values obtained by GESTRA. In certain cases it may be necessary to reduce the baud rate in order to ensure operational safety.
- The type and design of the data cable has a strong influence on the electromagnetic compatibility (EMC) of the equipment. Take special care when connecting the equipment.
- If you do not use the control cable assemblies connect the connectors and jacks for the control cables as indicated in the assignment diagram for sensor plug-in unions.

CAN bus voltage supply

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

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

Control units with voltage supply	Qty.	X	Power output per item	=	Sum
		X	6 W	=	W
	Please enter data.		Sum 1	=	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
	Please enter data.		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 electrically isolated from dangerous contact voltages and must meet at least the requirements on double or reinforced isolation acc. to DIN EN 50178 or DIN 61010-1 or DIN EN 60730-1 or DIN EN 60950 (safe isolation).

The power supply unit must be provided with an overcurrent protective device in accordance with EN 61010-1.

Attention

If a safety power supply unit (e. g. SITOP smart, 24 V, 2.5 A) is used for the voltage supply of the CAN bus do not tap the supply voltage from the terminals 1 and 5 of the GESTRA control devices.

SITOP smart is a registered trademark of Siemens AG, Munich

Wiring diagram

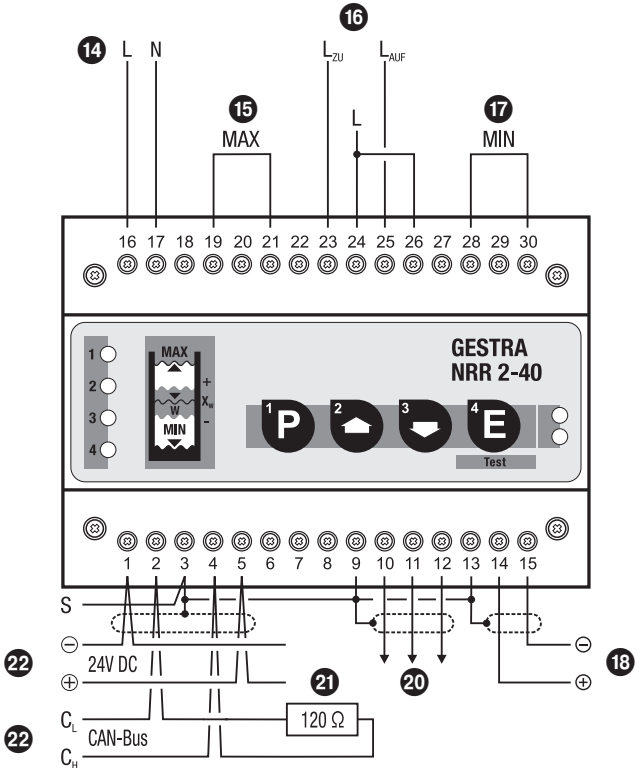


Fig. 8

NRR 2-40 as 3-position stepping controller

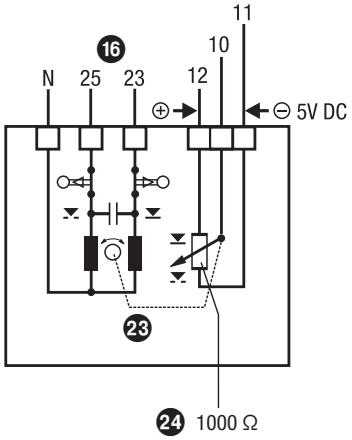


Fig. 9

Valve actuator

Electrical Connection – continued –

Wiring diagram

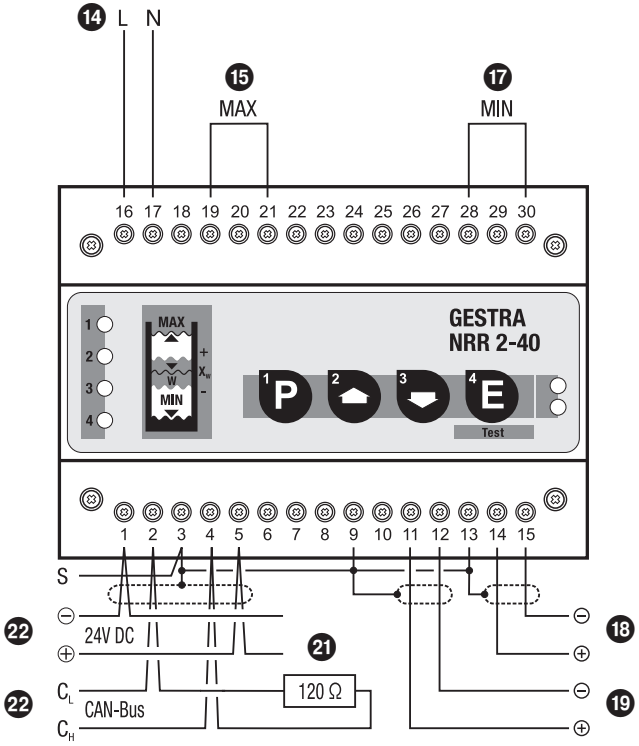


Fig. 10

NRR 2-40 as continuous controller

Electrical Connection – continued –

Key

⓮ Mains supply

⓯ MAX limit contact (MAX alarm)

⓰ Activation control of valve actuator

Fill control: ▼ = Valve CLOSED 23
▼ = Valve OPEN 25

Discharge control: ▼ = Valve OPEN 23
▼ = Valve CLOSED 25

⓯ MIN limit contact (MIN alarm)

⓲ Actual value output 4-20 mA (optional)

⓳ Controller output, analogue, manipulated variable Y, 4-20 mA

⓴ Input for feedback potentiometer 1000 Ω

㉑ Terminating resistor 120 Ω, RES 1 or RES 2

㉒ CAN bus line, twisted pair control cable

㉓ Valve actuator

㉔ Feedback potentiometer 1000 Ω for actuator

CAN bus wiring diagram

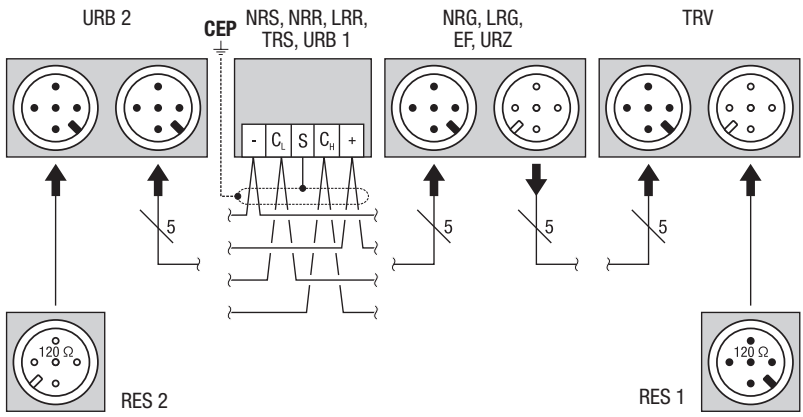


Fig. 11

Attention

- Wire equipment in series. Star-type wiring is not permitted!
- Link screens of control cables such that electrical continuity is ensured and connect them **once** to the central earthing point (CEP). If equipotential bonding currents are to be expected, for instance in outdoor installations, make sure that the screen is separated from the central earthing point (CEP).
- To protect the switching contacts fuse circuit with T 2.5 A or according to TRD regulations (1.0 A for 72 h 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, **Fig. 11**
- Do **not** interrupt the CAN bus network during operation with one or more system components!

  If the CAN bus network is interrupted the safety circuit will be opened.

  If the control unit has to be replaced, detach terminal strips ❾.
  Fig. 3

  Before taking the CAN bus line from the terminal strip, make sure that all connected system components are out of service.

Electrical Connection – continued –

Note

- Link screen only to terminal 3, ensure electrical continuity and connect it once to the central earthing point (CEP).
- The loop resistance must be below 10 Ω.
- 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. Provide connected contactors with RC combinations, e. g. 0.1 µF/100 Ω.
- Even in correctly wired systems high frequency interference caused by the installation can lead to system outages and malfunction alarms. For more information please refer to the fault-finding list in the section **Malfunctions – Troubleshooting**.

Tools

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

Basic Settings

Bus cable

All devices (level, conductivity) 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 – 123**.

The equipment has already been configured at our works for operation with other GESTRA components and can be used straight away without having to set the node ID.

If several identical systems are to communicate in a CAN bus network, set a different node ID for each system (e. g. limiter, controller, etc).

If the length of the CAN bus cable exceeds 125 m change the settings of the code switch ❽, Fig. 15. Note that the baud rate setting must be identical for all bus-based equipment!

For more information on switch positions see **Basic Settings Switch positions**.

Basic Settings – continued –

Node ID

Water level limiter

NRS 1-40	NRG 16-40 (1)	NRG 16-40 (2)	Reserved	Reserved	
X	X + 1	X + 2	X + 3	X + 4	
1	2	3			Factory setting

Safety system for steam boilers with superheater

NRS 1-40.1	NRG 16-40 (1)	NRG 16-40 (2)	TRV 5-40	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
1	2	3	4		Factory setting

Safety system (e. g. hot-water generating units)

NRS 1-40.1	NRG 16-40 (1)	NRG 16-40 (2)	Limiter 3	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
1	2				Factory setting

Safety system (e. g. hot-water generating units)

NRS 1-40.2	TRV 5-40 (1)	TRV 5-40 (2)	Limiter 3	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
6	7	8	9	10	Factory setting
	TRS 5-40 (1)	TRS 5-40 (2)			
	X + 1 + 90	X + 2 + 90			
	97	98			

High level alarm

NRS 1-41	NRG 16-41	Reserved	Reserved	Reserved	
X	X + 1	X + 2	X + 3	X + 4	
6	7	8	9	10	Factory setting

Further components

SRL 6-40		
X = (sensor: level limiter // hi alarm) + 2		Factory setting
ORT 6		
98		Factory setting

On-off level control

Reserved	NRS 1-42	NRG 16-42		
X – 1	X	X + 1		
19	20	21		Factory setting

Modulating level control

URZ 40	NRS 2-40	NRR 2-40	NRG 26-40	Reserved	
X – 2	X – 1	X	X + 1	X + 2	
38	39	40	41	42	Factory setting

Automatic continous blowdown control

EF 1-40	Reserved	LRR 1-40	LRG 1-4...	Reserved	
X – 2	X – 1	X	X + 1	X + 2	
48	49	50	51	52	Factory setting

Control unit

URB 1, URB 2		
60		Factory setting

Factory setting

The level controller features the following factory set default values:

- Baud rate: **250 kb/s**
- Proportional range X_P: **20 %**
- Node ID: **40**
- Switchpoint 1: **80 %**
- Switchpoint 4: **20 %**
- Dead band: **0 %**
- Relay de-energizing delay, switchpoint 1: **1s**
- Relay de-energizing delay, switchpoint 4: **1s**
- Relay de-energizing delay, switchpoint 1: **3s**
- Relay de-energizing delay, switchpoint 4: **3s**

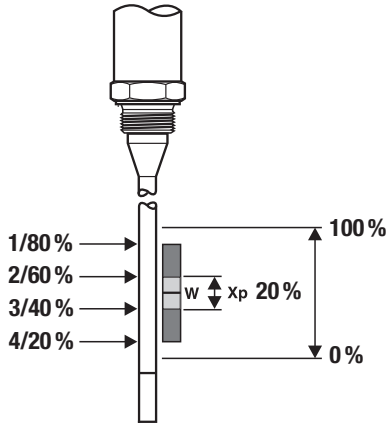


Fig. 12

Function of the controller

The controller NRR 2-40 is specially designed for level control in steam boilers and feedwater deaerators. The NRR 2-40 is a proportional controller with steady-state deviation.
The positive and negative deviation lies within the proportional band (X_P) preselected by the user.

If is possible to control electric and pneumatic (optional) actuators.
The control of electric actuators is effected by an analogue signal which, in combination with an active position feedback coming from the valve, is converted in the controller into a three-position stepping signal. The control pulses for the electric actuator are transmitted by the relay integrated in the controller.

The control of pneumatic valve actuators is effected by an analogue signal 4 – 20 mA. The analogue signal is transmitted directly from the proportional controller to the positioner of the pneumatic control valve, which means that an active position acknowledgement is not possible.

X_P-Werte:

X_P > large permanent deviation, valve reacts sluggishly.
X_P < no permanent deviation, valve may be hunting, recommended X_P value 20 % to 60 %.

Basic Settings – continued –

Establishing / changing node ID

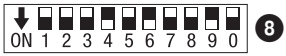
If several identical systems are to communicate in a CAN bus network, allocate a different node ID for each system (e. g. limiter, controller, etc). In most cases it is sufficient to commission the equipment with the default factory settings.

To set the code switch ❽ remove the lower terminal strip ❾.

Attention

- We recommend that you commission the CAN bus devices with the default factory setting.
- Do **not** use a node ID for more than one piece of equipment in the CAN bus system.

Code switch settings



		Node ID	40
S 1	OFF	1	
S 2	OFF	2	
S 3	OFF	4	
S 4	***ON***	8	
S 5	OFF	16	
S 6	***ON***	32	
S 7	OFF	64	

Fig. 13 (Factory setting)

		Node ID	75
S 1	***ON***	1	
S 2	***ON***	2	
S 3	OFF	4	
S 4	***ON***	8	
S 5	OFF	16	
S 6	OFF	32	
S 7	***ON***	64	

Fig. 14 (Example 1)

S 8	S 9	S 0	Baud rate	Cable length
OFF	***ON***	OFF	250 kBit/s	125 m
ON	***ON***	OFF	125 kBit/s	250 m
OFF	ON	***ON***	100 kBit/s	335 m
ON	ON	***ON***	50 kBit/s	500 m
OFF	***ON***	***ON***	20 kBit/s	1000 m
ON	***ON***	***ON***	10 kBit/s	1000 m

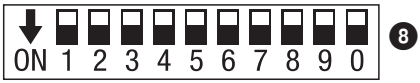
Fig. 15 (Factory setting 250 kBit/s)

Basic Settings – continued –

Dead band

To prevent oscillation or repeated activation-deactivation cycles of the controlled system, a deadband can be defined for the septpoint “W”.
The setpoint is defined by the proportional range which is limited by the switchpoints 2 and 3. To set the code switch ❽ remove the terminal strip ❾.

Code switch settings



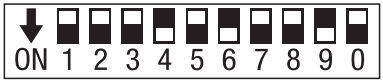
S 1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Deadband
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	0 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	OFF	OFF	1 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	OFF	2 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	***ON***	OFF	3 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	5 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	OFF	***ON***	7 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	***ON***	10 %
OFF	OFF	OFF	OFF	OFF	OFF	OFF	***ON***	***ON***	***ON***	15 %

Fig. 16

Establishing / changing the dead band

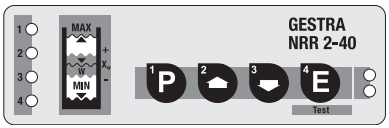
Write down the node ID and baud rate settings.

Node ID in this example: 40
Baud rate in this example: 250 kBit/s



Switch off mains voltage.

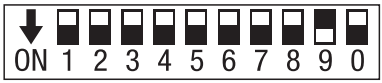
The four status LEDs go out.
The LED “Power” goes out.



Establishing / changing the dead band – continued –

To set the dead band refer to **Fig. 16**.

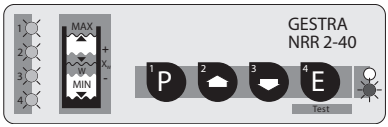
Dead band in this example: 2 %



Apply mains voltage.

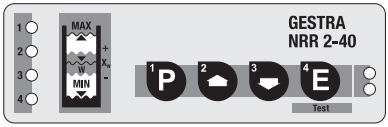
The four status LEDs are flashing rapidly.
If the LED “Power” is alight, the adjustment was successful.

If the LED “Bus status” above the LED “Power” is alight, repeat the adjustment procedure.



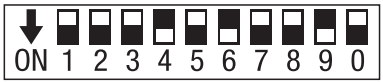
Switch off mains voltage.

The four status LEDs go out.
The LED “Power” goes out.



Write down the node ID and baud rate settings.

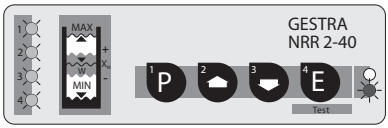
Node ID in this example: 40
Baud rate in this example: 250 kBit/s



Apply mains voltage.

The four status LEDs are flashing rapidly.
The LED “Power” is illuminated.

The system is ready for operation.



Commissioning Procedure

Using operating device URB... for parameter setting

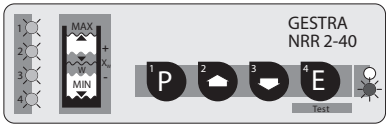
When using the operating device URB ... all parameters can be set via its user interface.

NRR 2-40

Apply mains voltage.

The four status LEDs are flashing rapidly.
The LED “Power” is illuminated.

The system test takes 2 seconds.



Measuring range

Ⓐ Desired measuring range [mm]

Ⓑ Max. measuring range

Ⓒ Lower measuring point

Establish the appropriate measuring range Ⓐ for your level monitoring sytem.

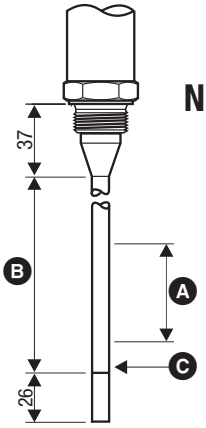


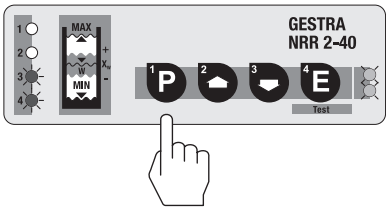
Fig. 17

Setting measuring range

Press button P for 3 sec.

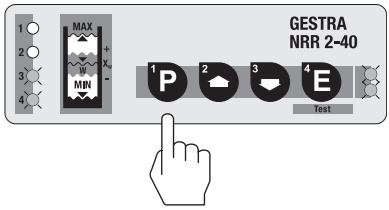
Lower liquid level until the lower limit of the control range Ⓐ is reached.

If necessary first use button to adjust the upper limit of the control range.



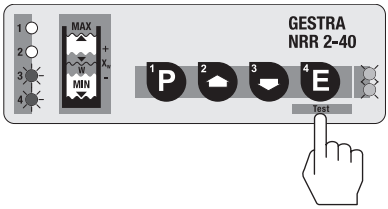
Press button P briefly.

Attention:
In the event of a system malfunction, the LED(s) “Bus status” and/or “Power” will be flashing **rapidly** when in program mode. Quit program mode and analyse the system malfunction (see pages 36 – 39)



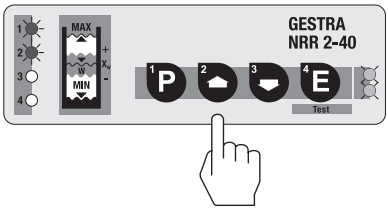
Press button E briefly.

The min. limit of the control range is now saved.



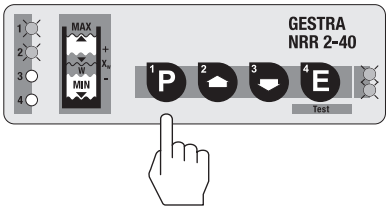
Press button 2 briefly.

Raise the liquid level in the vessel until the maximum limit of the control range A is reached.



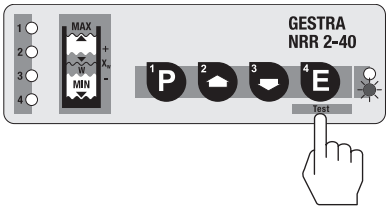
Press button P briefly. Wait for 30 sec. before continuing the procedure.

To compensate for transient fluctuations of the water level a filter is installed in the preamplifier of the electrode. If the setting is confirmed too quickly an incorrect 100 % will be saved.



Press button E twice briefly.

The max. limit of the control range is now saved. The NRR 2-40 is now again in operating mode.



Switchpoints and proportional range

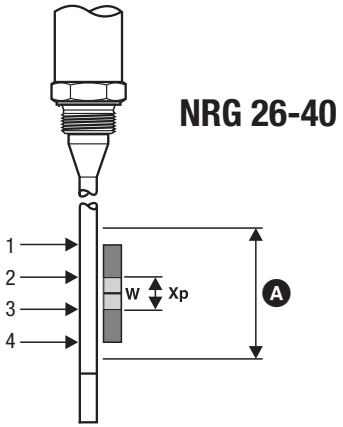


Fig. 18 *You can establish two switchpoints and the proportional band X_P within the control range.*

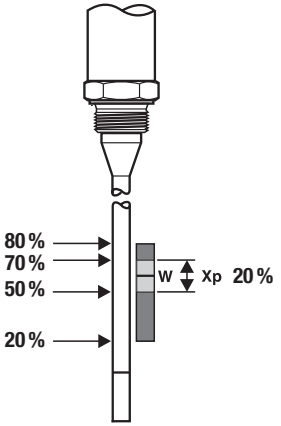


Fig. 19 (example)

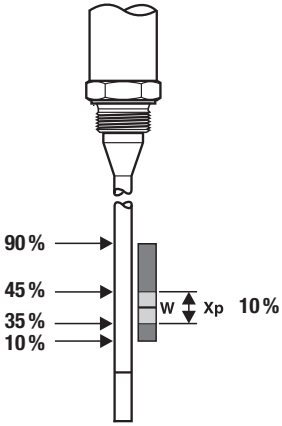


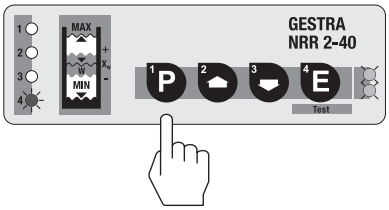
Fig. 20 (example)

Establishing switchpoints and proportional range

Press button P briefly.

Raise or lower the liquid level in the vessel to the desired value.

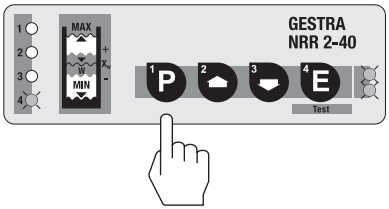
Use button ▼ if you first want to establish a different switchpoint or the proportional band.



Press button P briefly.

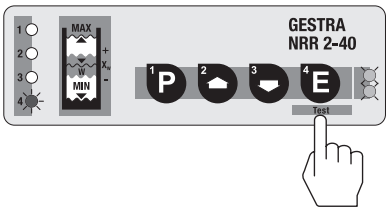
Lower or raise the liquid level until switchpoint 4 within the control range is reached.

Attention:
In the event of a system malfunction, the LED(s) “Bus status” and/or “Power” will be flashing **rapidly** when in program mode.



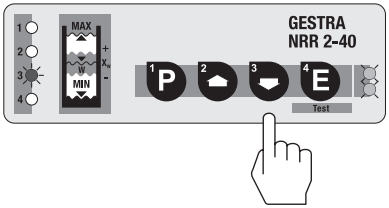
Press button E briefly.

Switchpoint 4 is now saved.



Press button ▼ briefly.

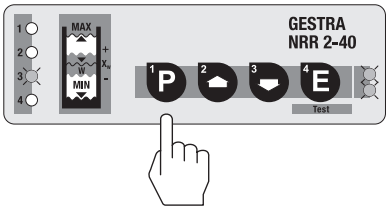
The lower limit of the proportional band X_P (switchpoint 3) is now selected.



Press button P briefly.

Lower or raise the liquid level until switchpoint 3 within the control range is reached.

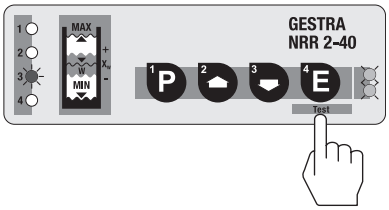
Example:
Liquid level switchpoint 3 = 40 % and liquid level switchpoint 2 = 60 % make an **X_P value (60 % – 40 %) = 20 %**.
The setpoint is **50 %**.



Establishing switchpoints and proportional range – continued –

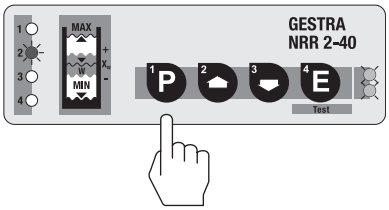
Press button E briefly.

Switchpoint 3 is now saved.



Press button P briefly.

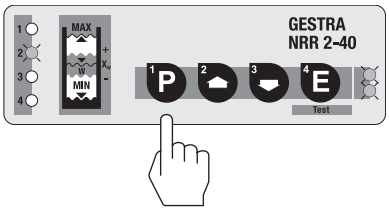
The upper limit of the proportional band X_P (switchpoint 2) is now selected.



Press button P briefly.

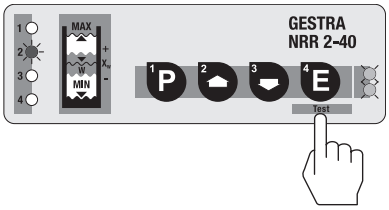
Lower or raise the liquid level until switchpoint 2 within the control range is reached.

Example:
Liquid level switchpoint 3 = 40 % and
liquid level switchpoint 2 = 60 %
make an **X_P value** of **20 %**



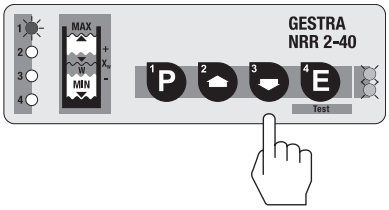
Press button E briefly.

Switchpoint 2 is now saved.



Press button briefly.

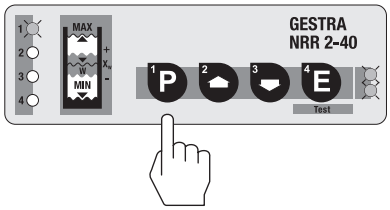
Switchpoint 1 is now selected.



Establishing switchpoints and proportional range – continued –

Press button P briefly.

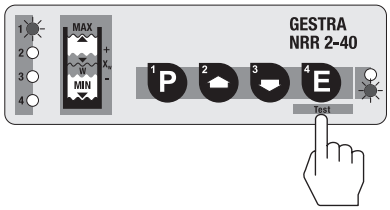
Lower or raise the liquid level until switchpoint 1 within the control range is reached.



Press button E twice briefly.

Switchpoint 1 is now saved.

The NRR 2-40 is now again in operating mode.



Calibrating the feedback potentiometer of an external control valve

The feedback potentiometer of an external control valve with electric actuator has to be calibrated **manually** before commissioning.

1. Ascertain the total resistance of the feedback potentiometer.
2. Set the control valve manually to mid-position.
3. Adjust manually the position of the feedback potentiometer until the partial resistance values of the measured total resistance are equal.

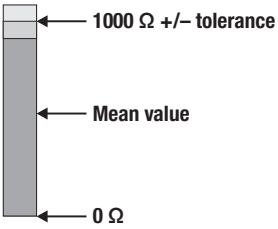


Fig. 21

Attention

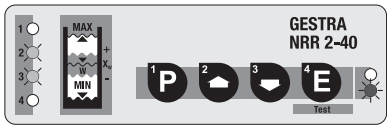
- For the GESTRA level controller NRR 2-40 a **1000 Ω** feedback potentiometer in an external control valve is required!
- If the terminals for the feedback potentiometer are not wired or the feedback potentiometer is defective the NRR 2-40 will work as **two-position controller**!
- Use the control and display units URB 1 and URB 2 for semi-automatic calibration of the feedback potentiometer of an external control valve **without** measurement of the resistance value. If you use the URB 1 or URB 2 please refer to the operating manual for more information.

Operation

NRR 2-40

Normal operation, controller is working.

The green LEDs 2 and 3 are flashing when the external control valve is being opened or closed. All LEDs go out once the setpoint is reached. The LED “Power” is illuminated.

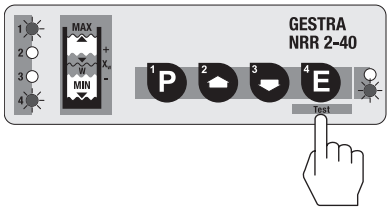


Test

NRR 2-40

Press button E briefly.

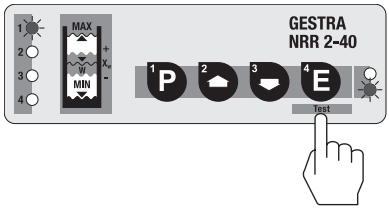
The test mode (relay test) remains active for 5 seconds.



Hold down button E.

LED 4 goes out.

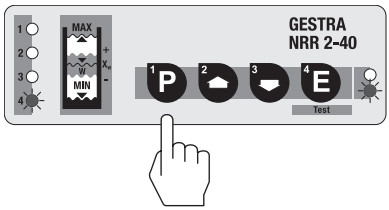
A MIN alarm is simulated for switchpoint 4.



Hold down button P.

LED 1 goes out.

A MAX alarm is simulated for switchpoint 1.

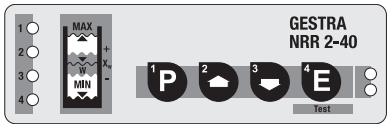


Alarm

NRR 2-40

The are two alarm conditions:

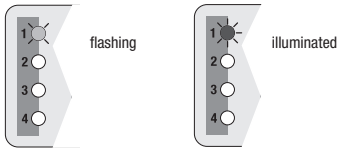
- **MAX alarm**
- **MIN alarm**



MAX alarm

LED 1 is flashing rapidly.

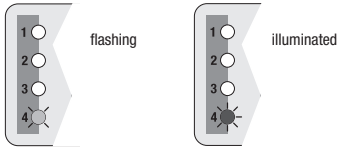
LED 1 is illuminated after the de-energizing delay has been elapsed.



MIN alarm

LED 4 is flashing rapidly.

LED 4 is illuminated after the de-energizing delay has been elapsed.



Operational malfunctions

Fault finding list for troubleshooting

Equipment does not work – no function

Fault: LED “Power ON” is not illuminated.
Remedy: Switch on mains voltage. Wire equipment according to the wiring diagram.

Equipment is not working – a malfunction is indicated

Fault: In spite of correct wiring and commissioning of the equipment an error message is indicated.
Remedy: The error message is caused by the high-frequency interference coming from the system. For the interference suppression of the voltage supply we supply hinged-shell ferrite rings, stock code # 147253.
The 230 V supply lines should be looped five to ten times through the ferrite ring. If several controllers are used in one system, they can be fed from the interference suppressed supply lines.
For the interference suppression of the bus line we supply hinged-shell ferrite rings, stock code # 147254. The hinged-shell ferrite rings are clamped onto the bus lines near the terminal strip of the control unit.

Equipment does not work accurately

Fault: Incorrect function at analogue output. The connected actual value indicator shows incorrect readings.
Remedy: Correct the switchpoint settings.
Correct the control range setting of the electrode.

Fault: Switchpoints and the indicated actual value drift steadily towards 100 %
Remedy: Dirt has deposited on the electrode rod. Remove the level electrode and clean the electrode rod.

Fault: MAX level is signalled although the water level is below the MAX limit.
Remedy: Dirt has deposited on the electrode rod. Clean the electrode rod.
Sealing / insulation of level electrode defective. Replace level electrode.

Fault: Liquid level below MIN switchpoint but no switching function.
Remedy: Check the installation of the level electrode. Maybe there is no vent hole in the protection tube. If electrode is installed in external level pot: Open the isolating valves.

Fault: Level exceeds MAX switchpoint but there is no indication.
Remedy: Level switch defective. Replace equipment.

The equipment is working as two-position (on-off) controller

Fault: The feedback potentiometer is defective or not connected.
Remedy: Wire equipment according to the wiring diagram. Check feedback potentiometer.

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

System Malfunctions

Danger

The terminal strip of the equipment is live during operation.
This presents the danger of electric shock!
Cut off power supply before mounting or removing the terminal strips and the housing cover.

NRR 2-40

Malfunctions occur if CAN bus components have been mounted, wired 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.

There are four types of malfunctions that might occur in the controller and the measuring sensor.

- Max. admissible temperature in electrode terminal box exceeded
- No or faulty communication between controller and measuring sensor
- Malfunction in CAN bus
- Failure of 24 V power supply unit built in controller or external PSU.

System malfunctions – continued –

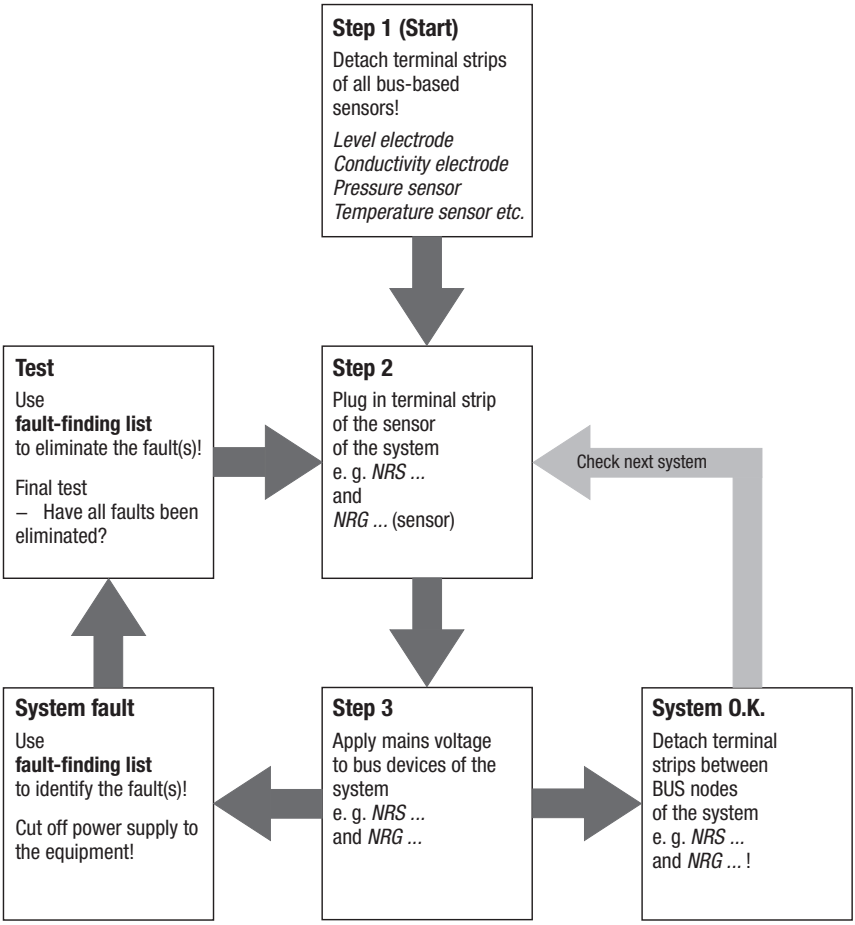
Danger

The terminal strip of the equipment is live during operation.
This presents the risk of severe cases of electric shock! Cut off power supply to the equipment before mounting or removing the terminal strips and the housing cover.

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:



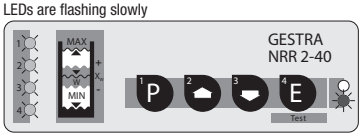
System malfunctions – continued –

System malfunction 1

LEDs 1 – 4 are flashing slowly.

MIN / MAX alarm.

LEDs are flashing slowly



Fault: The admissible temperature in the electrode terminal box is exceeded!
Remedy: Insulate the electrode flange against thermal radiation.

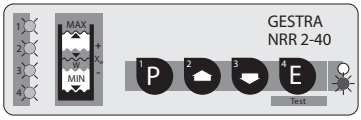
As soon as the temperature falls below the max. admissible limit, the equipment automatically switches back to normal operating mode.

System malfunction 2

LEDs 1 and 4 are flashing rapidly.

MIN / MAX alarm.

LEDs are flashing rapidly



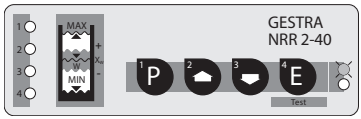
Fault: The CAN bus line between the devices is interrupted.
Remedy: Check wiring and terminals. Restart system.

Fault : The node IDs are wrong.
Remedy: Establish node IDs as specified in section “Basic Settings”.
Cut off power supply and restart system after 5 sec.

System malfunctions – continued –

System malfunction 3

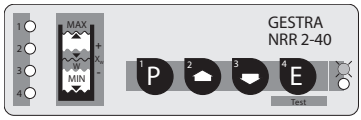
LED bus status is flashing slowly



LED is flashing slowly

Fault: A malfunction in the CAN bus has occurred.
Remedy: Restart system.

LED bus status is flashing slowly
MIN / MAX alarm.



LED is flashing slowly

Fault: The data transfer in the CAN bus is interrupted!
Remedy: The wiring of the bus lines must be in accordance with the wiring diagram (observe polarity).
As specified in the wiring diagram provide the **end-of-line bus devices** with 120 Ω terminating resistors.
Cut off power supply and restart system.

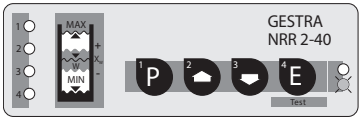
Fault: The baud rate setting(s) of at least one bus device is not correct.
Remedy: Check the baud rate settings of all bus-based devices.
The baud rates **must** be identical!
Cut off power supply and restart system after 5 sec.

Fault: The total length of the bus line does not correspond to the baud rate setting!
Remedy: Check the baud rate settings of all bus-based devices.
Cut off power supply and restart system after 5 sec.

System malfunctions – continued –

System malfunction 4

LED Power is flashing slowly.



LED is flashing slowly

Fault: The power supply unit is overloaded! The power supply unit may have been misused for supplying power to other components.
Remedy: Check the load of the power supply unit. Use the power supply unit only for the voltage supply of the bus-based equipment.
Cut off power supply and restart system.

Fault: The power supply unit is defective.
Remedy: Replace power supply unit.

Decommissioning

Danger

The equipment is live during operation.

This presents the danger of electric shock!

Cut off power supply before mounting or removing the terminal strips and the housing cover.

Disposal

Dismantle the equipment and separate the waste materials, using the material specification as a reference.
Electronic components (circuit boards) must be disposed of separately.
For the disposal of the equipment observe the pertinent legal regulations concerning waste disposal.

Annex

Note on the Declaration of Conformity / Declaration by the Manufacturer

For details on the conformity of our equipment 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.

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