



Water Level Limiter with
Level Electrode

NRG 16-38S

NRG 16-39S

EN
English

Original Installation &
Operating Manual

850978-00

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How to use this Manual

This Installation & Operating Manual describes the correct use of NRG 16-38S and NRG 16-39S level electrodes. 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

1 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.

NRGT .. / NRR.. / NRS.. / URS .. / URB .. / SRL .. / etc.

Equipment and type designations of GESTRA AG.

SELV

Safety Extra Low Voltage

Operating point (of the plant)

The operating point describes the operating parameters within which a plant or boiler is operated in its nominal range. In a steam boiler, for example, these parameters would be output: capacity, pressure and temperature.

The pressure at the operating point does not have to match the design pressure, but is the same or lower.

Usage for the intended purpose

The NRG 16-38S and NRG 16-39S level electrodes are combination devices and consist of one or two level electrodes for water level limitation as well as the NRGT 26-2 level transmitter for water level control.

The NRG 16-38S, NRG 16-39S level electrode is used as a water level limiter and level measurement system for steam and hot-water plants on seagoing vessels, mobile offshore platforms or inland vessels.

Use as a water level limiter

The NRG 16-11 level electrodes together with the NRS 1-50 level switch are used as a water level limiter. Water level limiters switch off the heating when the water drops below the set minimum level (LW).

Use as a level control system

The NRGT 26-2 level transmitter can be used to continually measure the water level in steam boiler and hot-water plants, or in condensate and feedwater tanks. The calibrated measuring range from 0% to 100% constitutes the linear profile of the 4 – 20 mA current output.

- The transmitter's 4 – 20 mA actual value output can be used with a suitable level controller, as a water level controller with MIN/MAX alarm, for example.

Effects of the measurement medium

- The NRGT 26-2 level transmitter can be used in media with different conductivities and in insulating media. However, a conductivity of less than 100 $\mu\text{S}/\text{cm}$ has a major influence on the measured capacitance, which is why it is extremely important to recalibrate the measuring range at the operating point* when bringing into service, see page 27.

** Operating point of the plant, see page 5.*

- To achieve the best possible reproducibility and maintain high-quality measurements (see "Technical data" on page 8 and 9), the sensor must be installed in a protective tube (see "Installation example" on page 18).
- The dielectric constant of the monitored fluid may require an adjustment to the measurement frequency, if it deviates significantly from that of the usual water ($\epsilon_r = 80$). To do this, please contact GESTRA AG Service.



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 can find the latest Installation & Operating Manuals for other system components 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.



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.

Function

The **NRG 16-38S** level electrode is a combination device and consists of
1 NRG 16-11 level electrode (water level limiter) and
1 NRGT 26-2 level transmitter (continuous level measurement).

The **NRG 16-39S** level electrode is also a combination device and consists of
2 NRG 16-11 level electrodes (water level limiter) and
1 NRGT 26-2 level transmitter (continuous level measurement).

NRG 16-11/NRS 1-50 water level limiter

The water level limiter is a device combination and consists of one or two NRG 16-11 level electrodes and **one** NRS 1-50 level switch.

When the water drops below the minimum level, the level electrode is no longer immersed and the NRS 1-50 level switch triggers an alarm. This “Low Water (LW)” switchpoint is determined by the length of the electrode extension.

After the switch-off delay has elapsed, both output contacts of the NRS 1-50 level switch open the safety circuit for heating. To compensate for the movements of the ship, the switch-off delay is factory set at 15 seconds.

The NRG 16-11 level electrode uses the principle of conductive measurement and monitors itself. I.e. a leaking or contaminated electrode insulator and/or a fault in the electrical connection also trigger an alarm.

The level electrode is installed inside the steam boilers or hot-water plants.

A protective tube installed at the plant (see section **installation example** (page 18) ensures the function is provided.

Continuous level measurement NRGT 26-2

The NRGT 26-2 level transmitter is a compact device and consists of a capacitive level electrode with integrated level transmitter. The device works according to the capacitive fill level measurement principle and delivers a measuring current of 4 – 20 mA which is proportional to the fill level. The level in steam boilers or hot-water plants is continuously using the level transmitter.

Technical data

NRG 16-38S, NRG 16-39S

Design

■ NRG 16-38S

- 1 NRG 16-11 level electrode
- 1 NRGT 26-2 level transmitter
- Both devices mounted in a DN 100 flange. **Fig. 4**

■ NRG 16-39S

- 2 NRG 16-11 level electrodes
- 1 NRGT 26-2 level transmitter
- All devices mounted in a DN 150 flange. **Fig. 5**

Service pressure

PN 40, 32 bar (abs) at 238°C

Mechanical connection

NRG 16-38 S: Flange DN 100, PN 40, EN 1092-1

NRG 16-39 S: Flange DN 150, PN 40, EN 1092-1

Materials

Flange: 1.0460 / A 105

Screw-in body/measurement electrode: 1.4571, X6CrNiMoTi17-12-2

Electrode extension NRG 16-11: 1.4401, X5CrNiMo17-12-2

Electrode insulation NRG 16-11: Gylon®

Spacer NRG 16-11: PEEK

Protective tube NRGT 26-2: 1.4571, X6CrNiMoTi 17-12-2

Electrode insulation NRGT 26-2: PTFE

Centring NRGT 26-2: PTFE

Measurement electrode NRGT 26-2: 1.4404, X2CrNiMo 17-12-2

Delivery lengths

400 mm, 1000 mm, 1500 mm, 2000 mm

Electrical connection

NRG 16-11: Four-pin connector, M16 cable gland

NRGT 26-2: M12 – connector, A-coded

Protection

IP 65 acc. to EN 60529

Admissible ambient temperature

Max. 70°C

Technical data

NRG 16-38S, NRG 16-39S

NRGT 26-2 level transmitter

Measurement quality

The information below applies to a compensated fluid conductivity range from 0.5 – 10000 $\mu\text{S}/\text{cm}$ based on 25°C.

Reading deviation:	$\pm 1\%$	of set measuring range at the operating point
Display reading resolution:	0.1%	
Resolution, internal processing:	15 bit	
Resolution, 4 – 20 mA output:	15 bit	
Sensitivity (minimum conductivity)		
Water $\geq 0.5 \mu\text{S}/\text{cm}$		(“Influence of the fluid to be monitored”)

Supply voltage

24 V DC $\pm 20\%$

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 = 75°C is measured in the electrode tip

Analogue output

1 x actual value output 4 – 20 mA, proportional to fill level, galvanically isolated

Maximum output load 500 Ω

Electrical connection

M12 connector, 5-pin, A-coded

Indicators and controls

1 x green 4-digit, 7-segment display for showing status information

1 x red LED for indicating an error state

1 x green LED for indicating an OK state

1 x rotary knob IP65 with button for menu navigation and test function

Protection class

III Safety Extra Low Voltage (SELV)

IP rating to EN 60529

IP 65

Weight

NRG 16-38 S: approx. 17 kg

NRG 16-39 S: approx. 25.5 kg

Product package

NRG 16-38S

1 level electrode NRG 16-38S

1 Installation & Operating Manual

1 cable jack

PHOENIX CONTACT SACC-M12FS-5PL SH (52851)

1 STARLOCK® lock washer 11.5/4.8

NRG 16-39S

1 level electrode NRG 16-39S

1 Installation & Operating Manual















1 cable jack

PHOENIX CONTACT SACC-M12FS-5PL SH (52851)

2 STARLOCK® lock washers 11.5/4.8

Example name plate/identification

NRGT 26-2

 Betriebsanleitung beachten! See installation instruction!  Vor dem Öffnen des Deckels Gerät freischalten! Before removing cover isolate from power supplies! ❶									
❷									
❸									
❹	❺								
❻	❼								
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- ❶ Safety note
- ❷ Equipment designation
- ❸ Equipment function
- ❹ Nominal pressure rating
- ❺ Connection thread
- ❻ Material of screw-in thread
- ❼ IP rating
- ❽ Maximum pressure and temperature ratings
- ❾ Power supply
- ❿ Frequency in case of AC devices
- ⓫ Power consumption
- ⓬ Measuring range, length/height in mm
- ⓭ Component identification
- ⓮ Mark of conformity
- ⓯ Disposal information
- ⓰ Manufacturer
- ⓱ Protection class
- ⓲ Material number-serial number

Optional information

- ⓳ Cell constant in 1/cm
- ⓴ Measuring range in ppm
- ⓵ Measuring range in μS/cm
- ⓶ Hardware interface
- ⓷ Delay time
- ⓸ Additional data
- ⓹ Set limit with TRV (T_{max})
- ⓺ Cutout relay/specification of functional safety

Fig. 1



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

Example name plate/identification

NRG 16-11, NRG 16-38S, NRG 16-39S



Fig. 2

- ❶ Equipment designation
- ❷ Function symbol
- ❸ Safety note
- ❹ Material number-serial number
- ❺ Nominal pressure rating
- ❻ Connection thread
- ❼ Material of screw-in thread
- ❽ IP rating
- ❾ Component type approval
- ❿ Nominal size of connecting flange
- ⓫ Electrode length on delivery
- ⓬ Maximum pressure and temperature ratings
- ⓭ Manufacturer
- ⓮ Mark of conformity
- ⓯ Disposal information

Optional information

- ⓰ Gasket/cell constant/additional data
- ⓱ Device combination

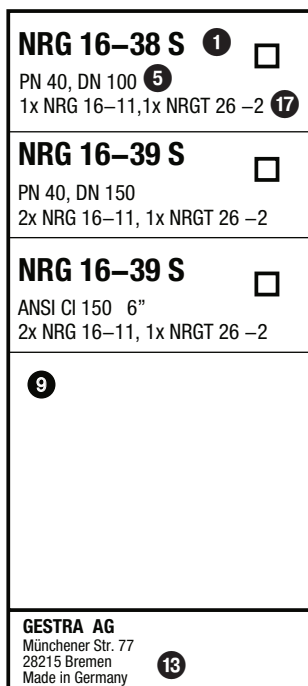


Fig. 3

Dimensions NRG 16-38S, NRG 16-39S

NRG 16-38S, NRG 16-39S

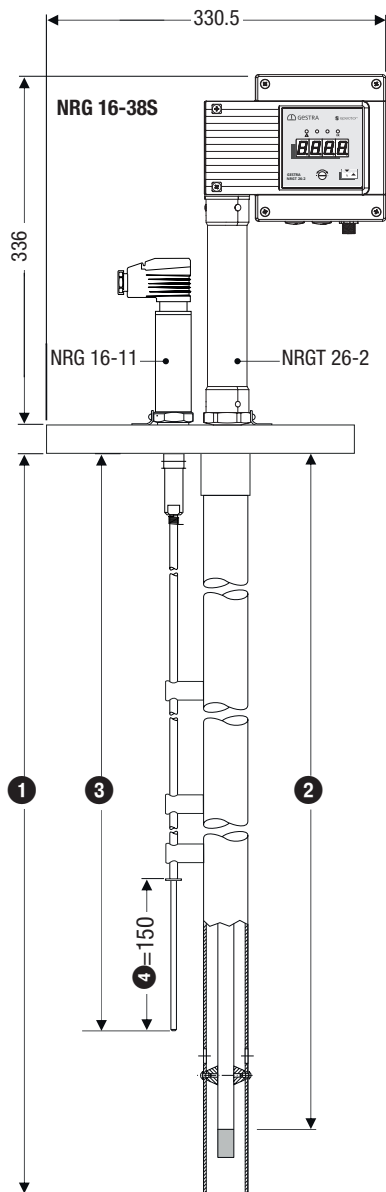


Fig. 4

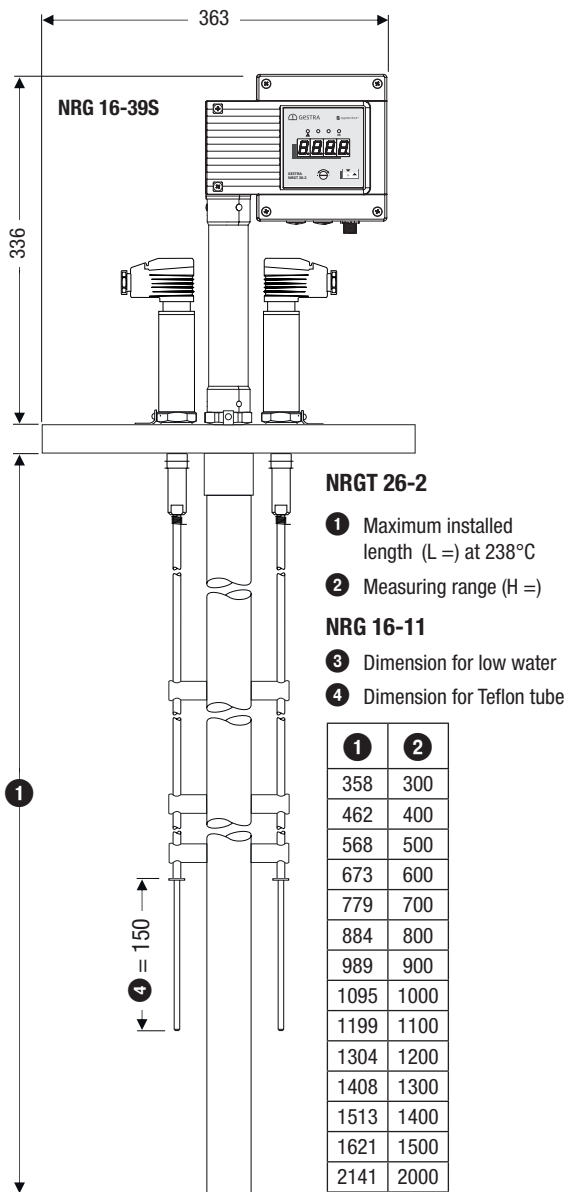


Fig. 5

Basic safety notes



Danger to life from scalding if the level electrode is removed under pressure. Steam or hot water may escape explosively.

- Only remove the level electrode with boiler not under pressure (**0 bar boiler pressure**).



Risk of severe burns if work is performed on a level electrode that has not been allowed to cool. The level electrode becomes very hot during operation.

- Allow the level electrode to cool down.
- Only carry out all installation and maintenance work on a cooled-down level electrode.



There is a danger of death from electric shock during work on electrical systems.

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



Risk to life in the event of a faulty level electrode due to suddenly escaping hot steam or hot water.

Jolts and impacts during transportation or during installation may result in damage or leaks to the level electrode. Hot steam or hot water under pressure may escape through the relief hole in this case.

- To prevent damage during transport and installation, do not expose the electrode rod to major jolts or impacts.
- Before and after installing the level electrode, check that it is intact and do not install any damaged components.
- Check that the level electrode is not leaking when bringing into service.



Attempts to repair the equipment will cause the plant to become unsafe.

- NRG T 26-2 and NRG 16-11 level transmitters 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 (EU Pressure Equipment Directive) and may only be installed, electrically connected and 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.

Notes on product liability

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

Installation

NRG 16-38S, NRG 16-39S

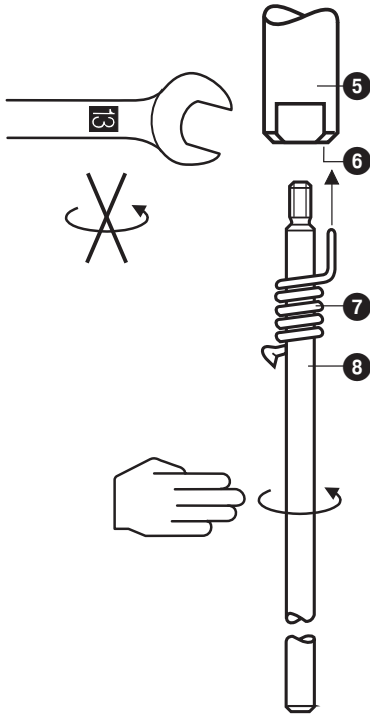


Fig. 6

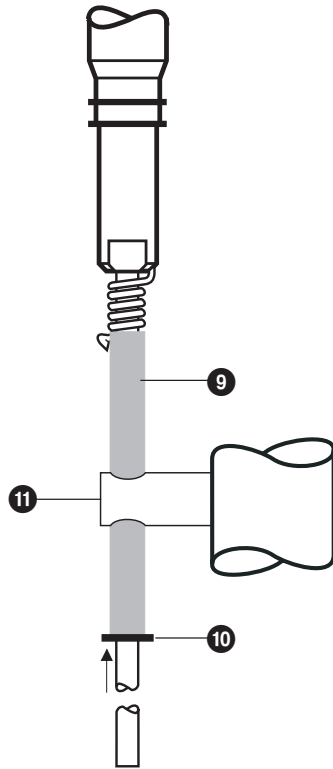


Fig. 7

Key

- | | |
|-------------------------|--------------------------|
| 5 Measurement electrode | 9 PTFE insulating hose |
| 6 Hole | 10 STARLOCK® lock washer |
| 7 Retaining spring | 11 Spacer |
| 8 Electrode extension | |

Tools

- | | |
|------------------------------|-------------------------------------------------------|
| ■ Hacksaw | ■ Size 18 (19) open-ended spanner |
| ■ Flat file, cut 2 | ■ Size 1 screwdriver |
| ■ Size 13 open-ended spanner | ■ Size 2.5 screwdriver, fully insulated to VDE 0680-1 |
| ■ Size 17 open-ended spanner | |

Installation

NRG 16-38S, NRG 16-39S, step 1

1. Mark the dimension for low water on the electrode extension ⑧ and slide the retaining spring ⑦ out of the hole ⑥ of the measurement electrode ⑤. Mark the dimension for low water and the dimension ④ (150 mm above low water, see Fig. 4 and Fig. 5 on page 12) on the protective tube of the level transmitter. Fig. 6, Fig. 7
2. Unscrew the electrode extension ⑧ from the measurement electrode ⑤ and remove the retaining spring ⑦. Pull the electrode extension ⑧ through the spacers ⑪, remove the lock washer ⑩ and shorten the electrode extension ⑧.
3. The electrode extension ⑧ is covered with a Teflon tube. At the lower end, lower the Teflon tube to 150 mm (dimension ④). Slide a new lock washer from below over the electrode extension up to the insulation. At the upper end, leave a length of 20 mm uninsulated for the retaining spring ⑦. New lock washers ⑩ are located on the connecting head of the level transmitter NRG 26-2.
4. If there is a spacer a within the dimension range ④, it must be disassembled from the protective tube of the level transmitter. The disassembled spacer ⑪ then has to be screwed back into the next free M4 hole of the protective tube just above the dimension range ④. To prevent vibration of the electrode extension ⑧, M4 holes for fastening the spacers are provided every 100 mm in the protective tube of the level transmitter from below from a length of 350 mm.
5. Guide the electrode extension ⑧ through the spacers ⑪, slide the retaining spring ⑦ back on and tightly screw the electrode extension into the measurement electrode ⑤.
Counter the measurement electrode 5 using a size 13 open-ended spanner. Push the retaining spring ⑦ onto the electrode extension until it is securely held in the hole ⑥.
6. If the electrode extensions ⑧ are longer than the protective tube of the NRG 26-2 level transmitter (③ > ②) in the NRG 16-39S level electrode, slide the spacers ⑪ onto the extensions and distribute them easily. The spacers must only be placed on the insulated section of the electrode extensions.

NRG 16-38S, NRG 16-39S, step 2

1. Check the sealing surfaces and place the flat seal on the connections.
2. Place the level electrode on the connection and screw together device.
Tighten the screws evenly crosswise.

ATTENTION



Incorrect installation may result in faults in the plant or the level electrode.

- Do not bend electrode extensions during installation and avoid major impacts against the electrode tips.
- Do not insulate the external electrode and transmitter housing along with the boiler.
- Install level electrode in a vertical position only.
- A protective tube must be provided on the steam generator side for installation, see installation example on page 18.

Installing two level electrodes in a flange

Turn the NRG 26-2 electrode tip

1. Undo and remove the rear panel of the second electrode terminal box opposite the operating unit.
2. Unfasten the electrode wiring from the PCB.
3. Slacken the nut in the terminal box of the second electrode using a size 19 open-ended spanner.
4. Screw in the second electrode and tighten the nut in the terminal box to a torque of 25 Nm.
5. Reconnect the electrode wiring to the PCB.
6. Close the rear panel of the second electrode terminal box and screw back on.

Installation example

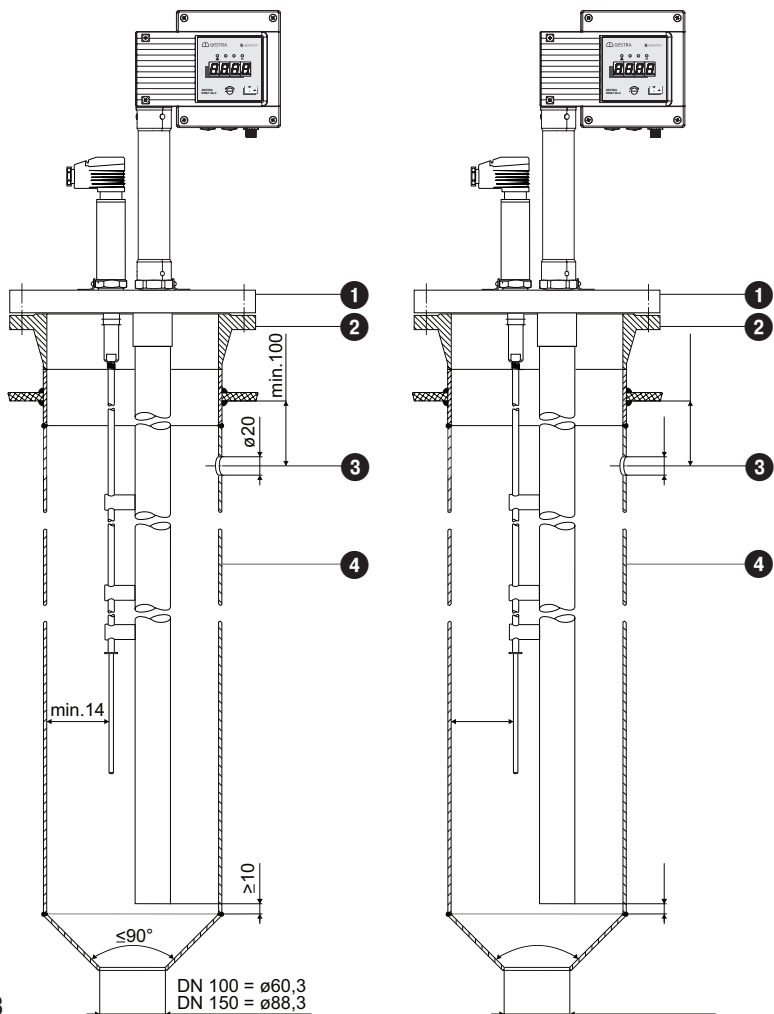


Fig. 8

Key

- ❶ Flange PN 40, DN 100, EN 1092-1 (NRG 16-38S)
- ❷ Flange PN 40, DN 150, EN 1092-1 (NRG 16-39S)
- ❸ Pressure relief hole $\varnothing = 20$ mm
- ❹ Protective foam tube DN 100 (NRG 16-38S), protective foam tube DN 150 (NRG 16-39S)

Electrical connection

Connecting the NRG 26-2 level transmitter

- Use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm². Use the supplied M12 cable jack for this purpose.

Connecting the 24 V DC power supply

- The NRG 26-2 level transmitter is supplied with 24 V DC voltage.
- A safety power supply unit that delivers a Safety Extra Low Voltage (SELV) and is isolated from connected loads must be used to supply the equipment with 24 V DC.

Connecting the actual value output (4 – 20 mA)

- Please note the maximum output load of 500 Ω.
- Maximum cable length = 100 m.

Pin assignment of the M12 connector for non pre-wired control cables

If non pre-wired control cables are used, you must wire the cable to match the pin assignment of the M12 connector.

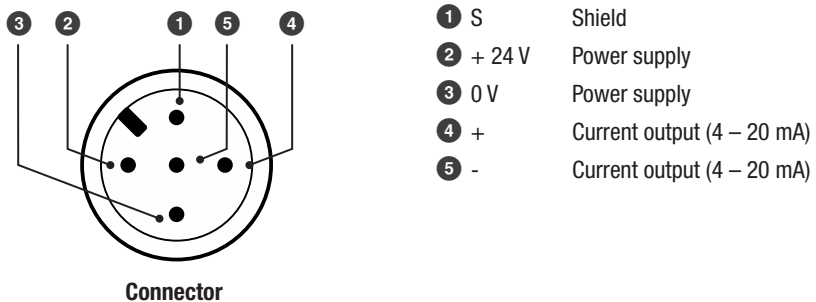


Fig. 9

Electrical connection

NRG 16-11 with four-pin connector

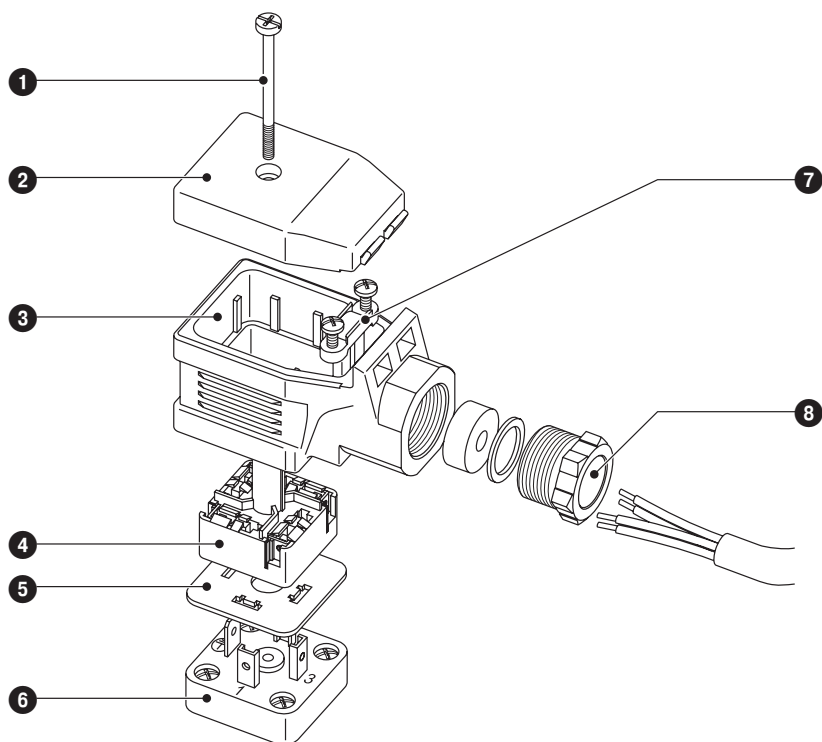


Fig. 10

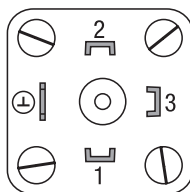


Fig. 11 Connection of level electrode with four-pin connector

Key

- | | |
|------------------------|----------------------------------------|
| 1 M 4 screw | 5 Sealing washer |
| 2 Cover | 6 Contact plate of the level electrode |
| 3 Connector upper part | 7 Strain relief |
| 4 Connecting plate | 8 M16 cable gland (PG 9) |

Electrical connection

Connecting the level electrode NRG 16-11

To connect the level electrode(s), please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm².

Length maximum 100 m with an electrical conductivity of the boiler water > 10 µS/cm at 25°C.

Wire the terminal strip as shown in the wiring diagram. **Fig. 12, Fig. 13.**

Connect the shields to terminals 5 and 13 of the NRS 1-50 level switch and to the central earthing point (CEP).

NRG 16-11 with four-pin connector

1. Undo the screw **1**. **Fig. 10**
2. Remove the connector upper part **3** from the level electrode and leave the sealing washer **5** on the contact plate **6**.
3. Remove the cover **2**.
4. Press the connecting plate **33** out of the connector upper part **3**.

The connector upper part can be turned in increments of 90°.

5. Remove the cable gland **8** and the strain relief **7** from the connector upper part **3**.
6. Pull the cable through the cable gland **8** and the connector upper part **3** and wire the terminals of the connecting plate **4** according to the wiring diagram. **Fig. 9**
7. Press the connecting plate **4** into the connector upper part and align the cable.
8. Secure the cable with the strain relief **7** and the cable gland **8**.
9. Put on the cover **2** and insert the screw **1**.
10. Put the connector upper part onto the level electrode and tighten it with the screw **1**.

Electrical connection

Connecting the level electrode NRG 16-11 with NRS 1-50, ONE electrode

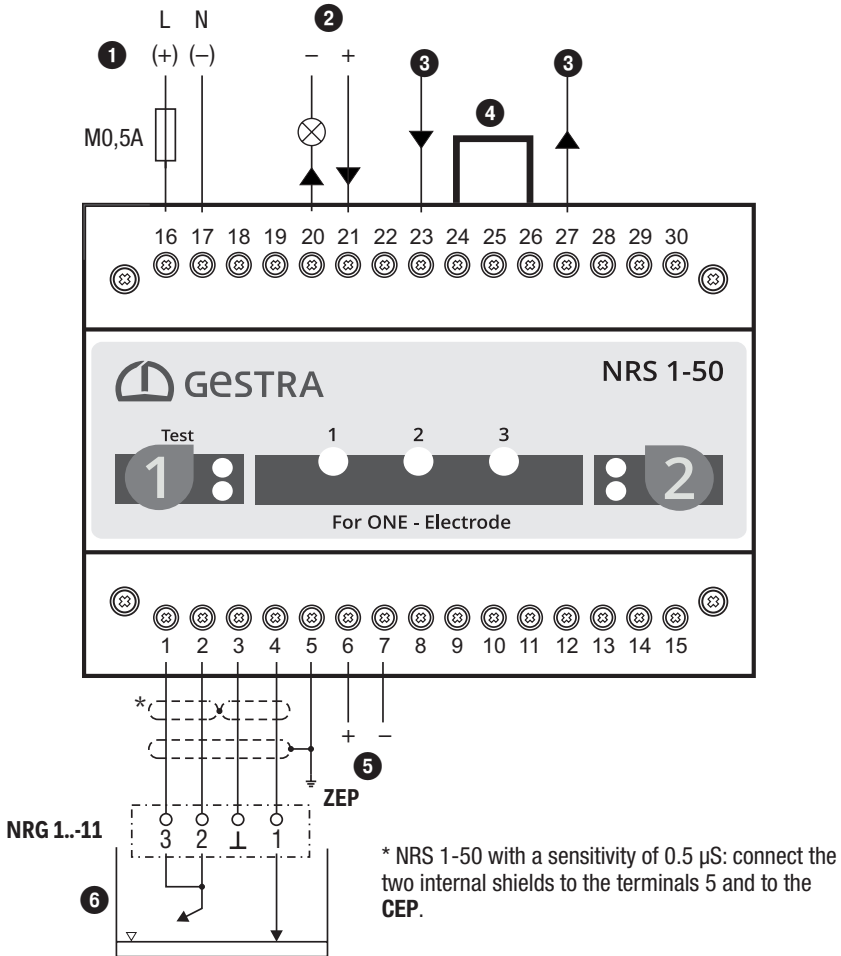


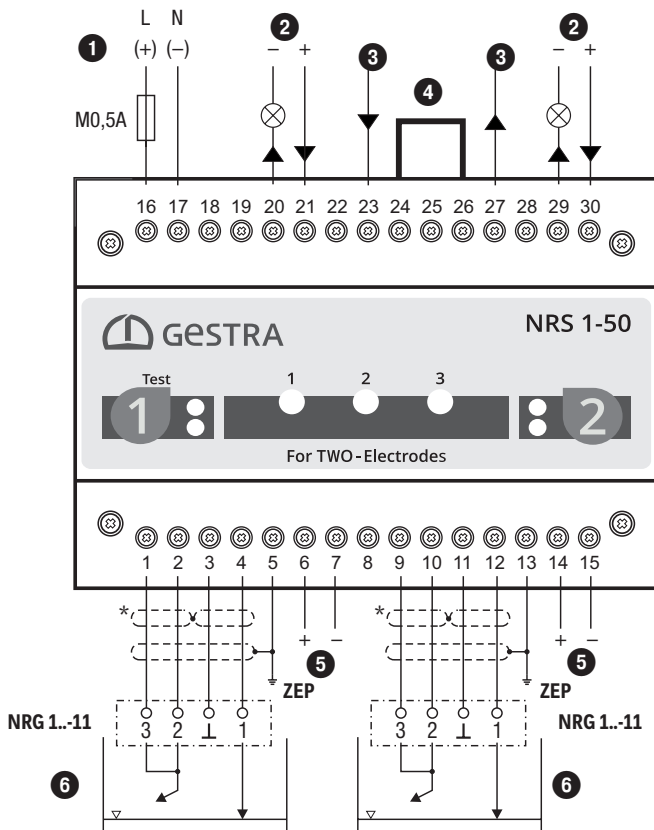
Fig. 12

Key

- Supply voltage
 - Signal output 1 for external alarm 24 V DC, 100 mA (semiconductor output)
 - Safety circuit, input and output
 - Wire bridge, at the site of installation, for use as a water level limiter according to EN 12952/EN 12953
 - Standby input, 24 VDC, for connecting SRL 6-50 monitoring unit
 - NRG 1...-11 or NRG 16-36 level electrode
- CEP** Central earthing point in control cabinet

Electrical connection

Connecting the level electrode NRG 16-11 with NRS 1-50, TWO electrodes



* NRS 1-50 with a sensitivity of 0.5 μ S: connect the two internal shields to the terminals 5/13 and to the CEP.

Fig. 13

Key

- ❶ Supply voltage
 - ❷ Signal output 1/2 for external alarm 24 V DC, 100 mA (semiconductor output)
 - ❸ Safety circuit, input and output
 - ❹ Bridge, at the site of installation, for use as a water level limiter according to EN 12952/EN 12953
 - ❺ Standby input 1/2, 24 VDC, for connecting SRL 6-50 monitoring unit
 - ❻ NRG 1...-11 or NRG 16-36 level electrode
- CEP** Central earthing point in control cabinet

Bringing NRG 16-11/NRS 1-50 into service

Information on bringing the device into service, on faults and how these can be remedied can be found in the operating instructions for the NRS 1-50 level switch and for the NRG 16-11 water level limiter.

Bringing NRG 26-2 into service

- Before bringing into service, check that the level transmitter is correctly connected.
- Next, switch on the supply voltage.

Changing the factory settings if necessary

You will need the following tools

- Size 2.5 slotted screwdriver

Notes on bringing into service for the first time



When the equipment is brought into service for the first time, the scale of the 0 – 100% measuring range is factory-set to maximum for the electrode length used.

After installation, set the measuring range to suitable values for your specific plant.

Parameter change with enabled password protection



If password protection is enabled, the password must be entered before a parameter is changed, 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 (no parameters) are excluded from the password protection. This information can be queried 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 29.

Default ex-works password

The default password is “1902” and cannot be changed. Password protection is available from software version S-16 onwards.

Bringing NRG T 26-2 into service

Selecting and setting a parameter:

-  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.


The following parameters are shown in succession by turning the rotary knob to the right:

“Actual value” → °C.in → CAL.L → CAL.P → CAL.H → FilT → diSP
→ InFo → PW → “Actual value”





Key of the parameters, see page 26



If no input is made for 30 seconds, the actual value display appears again automatically.


-  When you have selected the parameter, press the rotary knob until:
 - “PASS” appears on the display, prompting you to enter a password; move on to step 3.**or (without password protection enabled)**
 - the current parameter value flashes on the display; move on to step 8.

With password entry:

- Release the rotary knob.
-  Next, press and hold the rotary knob until “0000” appears on the display and the right-hand digit flashes.
-  Enter the password “1902”. You can jump to the next flashing digit by briefly pressing the rotary knob.
- / + reduce/increase the value.
-  After the last digit, press the rotary knob until “donE” is displayed. The display then alternates between the selected parameter and its current value.
-  Keep pressing the rotary knob until the current parameter value flashes on the display. Move on to step 8.

Bringing NRG T 26-2 into service

Without password entry:


8.  Set the desired value.
- / + reduce/increase the value

Each parameter has an individual permissible value range.

A short press can be used to jump to the next digit in order to offer a comfortable setting in the event of larger value changes.



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 of the parameters:

- 099.9 = actual value display; the current level reading based on the 0 – 100% calibration
- °C.in = show ambient temperature of the terminal box
- CAL.L = calibrate start of measuring range to 0%
- CAL.P = calibrate measuring range to an intermediate value above 25% (alternative to CAL.H)
- CAL.H = calibrate end of measuring range to 100%
- Filt = filter constant
- diSP = triggering of a display test
- InFo = show software version and equipment type
- PW = activate/deactivate password protection

Bringing NRG T 26-2 into service



Always perform calibration with the boiler fluid at the operating point

If you set the measuring range while the fluid is cold, the settings will change on exposure to heat and the set measuring range then need to be corrected at the operating point.

Perform calibration to the bottom limit of the active measuring range “CAL.L” (0% calibration value)



Bring the level to 0% and perform calibration.

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

1. Reduce the level of water in the boiler to 0% limit of the desired measuring range.
2. Select the parameter “**CAL.L**”. After approx. 3 seconds, the old value is shown in hexadecimal.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.
5. Continue with calibration “**CAL.P**” or “**CAL.H**”.

Perform independent quick calibration to a water level > 25% of the active measuring range “CAL.P”



Alternatively to completely filling the boiler, this parameter enables partial filling. The value set for partial filling is extrapolated to 100% of the boiler level.

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

1. Increase the level of water in the boiler to > 25% of the desired measuring range.
2. Select the parameter “**CAL.P**”. After approx. 3 seconds, the old value is shown in hexadecimal.
3. Press and hold the rotary knob until the value (e.g. 0025) appears. The last digit flashes.
4. Set the desired reading to > 25% to match the set level.
5. Save your setting by pressing the rotary knob for approx. 1 second.

Bringing NRG T 26-2 into service

Perform calibration to the top limit of the active measuring range "CAL.H" (100% calibration value)



Calibration with "CAL.H" ensures the best possible accuracy for setting the measuring range.

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

1. Increase the level of water in the boiler to 100% limit of the desired measuring range.
2. Select the parameter "CAL.H". After approx. 3 seconds, the old value is shown in hexadecimals.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.

Setting the filter constant "Filt"



Here, you can set a damping time constant to smooth the output signal for the level controller and the display.

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

1. Select the parameter "Filt". First of all, the current filter constant is displayed.
2. Press and hold the rotary knob until the current time constant flashes on the display.
3. Set the desired time constant (1 to 30 seconds).
4. Save your setting by pressing the rotary knob for approx. 1 second.

Manually triggering 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 digits and decimal points run across the display from right to left:
"...., 1, 2, 3, 4, 5, 6, 7, 8, 9,"
4. Check all digits and decimal points to see if they 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 level transmitter with an identical one from GESTRA AG.

Bringing NRG T 26-2 into service

Viewing the software version and equipment type "InFo"

Pay attention to the setting instructions on page 25 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. The menu can be exited again by a long press of the button (message "donE") or by waiting (message "quit").

Activating/deactivating 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 the rotary knob until "PASS" appears.
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 jump to the next flashing digit by briefly pressing the rotary knob.
6. After the last digit, press the rotary knob until "donE" is displayed.

The following may appear on the display:

- **donE** correct password entered
 - **FAiL** incorrect password entered
 - **quit** timeout. Password entry 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 the rotary knob until "donE" is displayed.

Bringing NRG T 26-2 into service

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.

Checking the level display by raising or reducing the level

ATTENTION



Incorrectly installed or bent level electrodes result in a loss of function that can jeopardise plant safety.

Therefore, proceed as follows when bringing into service and when replacing level electrodes:

- Check the level display by bringing the system to multiple level states in the measuring range of the level electrode. Always perform this check with the plant at its operating point.
- Do not allow any plant to go into operation without a successful check having been carried out.
- The NRG T 26-2 level transmitter may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

Checking function by initiating a test function

Check the function by initiating the test function with the rotary knob, see page 33. Test table.

Checking the switchpoints

Checking the “Low Water (LW)” switchpoint can only be carried out by lowering the water level. In this process, the level switch must initiate an alarm and, once the switch-off delay has elapsed, open the safety circuit. Switch-off of the heating is locked in the safety circuit and can only be unlocked again once the level electrodes are submerged. For this purpose, the alarm 1 LED must light up and no errors can be displayed (diagnosis LED does not light up). Please carry out the check of the switchpoint during the process of bringing the system into service, after each change of the level electrodes and at regular intervals, e.g. once a year.

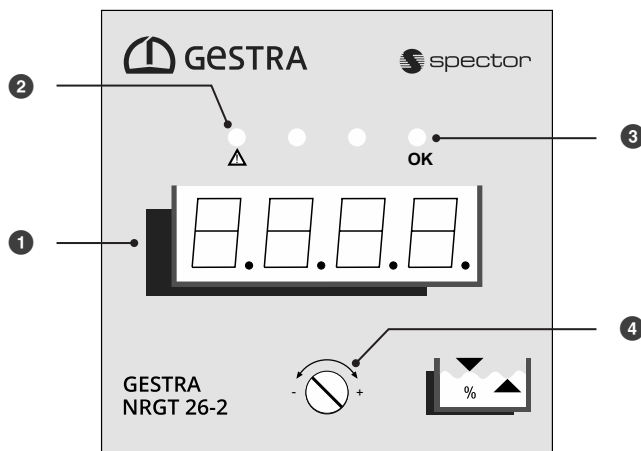


Fig. 14
Example NRG 26-2

The operating panel:

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

Notes on the priority of the various indications



Fault indications are displayed based on their priority. Messages with a higher priority are always displayed before messages with a low priority. If several indications need attention, the display does not alternate between them.

Priority of error code display

Higher-value error codes overwrite the lower-value ones in the display! Fault indications according to the error code table, see page 35 onwards.

Starting, operation and testing

Indications and LEDs and the associated operating states of the level transmitter:

Starting		
Switch on supply voltage	All LEDs light up – test Display: S-xx = software version t-08 = equipment type NRG T 26-2	The system is started and tested. The LEDs and display are tested.

Normal operation		
The electrode rod is immersed within the set measuring range	Indication: e.g. 047.3 LED 2: Operating LED lights up green	Display of the current level in % of the calibrated measuring range.

Additional specifications and tables, see the following pages.

Behaviour in the event of a fault (error code display)		
If an error occurs	Display: e.g. E005	An error code is permanently displayed, error codes see page 35
	LED 1: Fault LED lights up red	A fault indication is active
	LED 2: Operating LED is OFF	A fault is present
<ul style="list-style-type: none"> ■ In the event of a fault or error state, an analogue value of 0 mA is displayed. 		



Electrode faults cannot be acknowledged.

When a fault is corrected, the message disappears from the display, and the level transmitter returns to normal operation.

Starting, operation and testing



If password protection is enabled, the password must be entered before performing the test function.

Testing		
Checking the safety function via simulation in operating mode		
<p>In operating mode: Press the rotary knob on the NRGT 26-2 and hold until the end of the test:</p> <p>The test function of the equipment toggles the output between levels 0% and 100% and the actual value output delivers the corresponding signal, 4 mA or 20 mA.</p>	<p>Display: 0000 (%) or 0100 (%)</p>	<p>The test simulates water falling below the LW mark or rising above the HW mark.</p> <p>The relevant simulated reading is displayed during each test.</p>
	<p>LED 2: Operating LED lights up green</p>	<p>Test function is active</p>
	<p>LED 1: Fault LED is OFF</p>	<p>No fault</p>
	<ul style="list-style-type: none"> ■ The secure current output can be simulated and tested ■ When the rotary knob is released, the test ends ■ A test cycle (bringing the system to 100%, actual value and 0%) takes approx. 3 s. This cycle time may be longer if internal test functions are running at the same time. 	



Faulty equipment jeopardises plant safety.

- If the level transmitter does not behave as described above, the equipment may be faulty.
- Perform failure analysis.
- The NRGT 26-2 level 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 in the event of incorrect installation, 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 beginning systematic troubleshooting!

Installation:

- Check that the installation location complies with the admissible ambient conditions in terms of temperature, vibration, interference sources, minimum distances, etc.

Wiring:

- Does the wiring conform to the wiring diagrams?
- Does the 4 – 20 mA current loop have the correct polarity and is it closed?
- Is the 4 – 20 mA current loop below the overall output load of 500 Ω ?

ATTENTION



An open circuit in the 4 – 20 mA current loop can cause a system shutdown and a malfunction is indicated.

- Bring the plant into a safe operating state before commencing work on the installation.
 - Switch off voltage to the plant and secure against switching on again.
 - Check that the plant is not carrying live voltage before commencing work.
-

System malfunctions

Display of system malfunctions using the error codes

- ① Display of actual value/error code/limit value, green, 4 digits

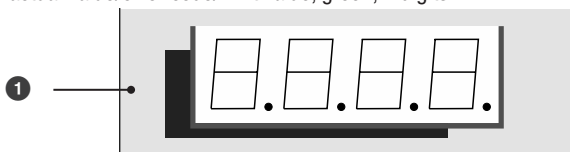


Fig. 15

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.001	MinCh1Err	Channel 1 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check the installation location. Broken electrode rod? If necessary, replace the level transmitter
E.002	MinCh2Err	Channel 2 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check the installation location. Broken electrode rod? If necessary, replace the level transmitter
E.003	MaxCh2Err	Channel 2 reading above maximum, possible internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.004	Ch1Ch2DiffErr	Difference between channels 1 and 2 exceeds 10% fault tolerance, internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.005	MaxCh1Err	Channel 1 reading above maximum, possible internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.006	MinTSTCh1Err	Channel 1 reading internal capacitance (47pF)	Replace the level transmitter
E.007	MaxTSTCh1Err	Channel 1 reading reference capacitance (1nF 47pF)	Replace the level transmitter
E.008	MinTSTCh2Err	Channel 2 reading internal capacitance (47pF)	Replace the level transmitter
E.009	MaxTSTCh2Err	Channel 2 reading reference capacitance (1nF 47pF)	Replace the level transmitter
E.010	PWMTSTCh1Err	Channel 1 reading with disabled measurement signal	Replace the level transmitter
E.011	PWMTSTCh2Err	Channel 2 reading with disabled measurement signal	Replace the level transmitter
E.012	FreqErr	Measurement signal frequency	Replace the level transmitter.

System malfunctions

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.013	VMessErr	4 – 20 mA analogue output error	Check wiring and output load. Is the connection connected or is the polarity reversed? Connect the measurement device to the M12 connector. If the error message disappears after a measurement device is connected, the wiring at the site of installation must be checked.
E.014	ADSReadErr	16-bit AD converter is not responding	Replace the level transmitter
E.015	UnCalibErr	Factory calibration invalid (not measuring range calibration)	Replace the level transmitter
E.016	PlausErr	Plausibility error, measuring range	Check calibration of the measuring range, carry out again
E.017	ENDRVErr	Second shutdown path of 4 – 20 mA analogue output faulty	Replace the level transmitter
E.019	V6Err	System voltage 6 V outside the limits	Replace the level transmitter
E.020	V5Err	System voltage 5 V outside the limits	Replace the level transmitter
E.021	V3Err	System voltage 3 V outside the limits	Replace the level transmitter
E.022	V1Err	System voltage 1 V outside the limits	Replace the level transmitter
E.023	V12Err	System voltage 12 V outside the limits	Replace the level transmitter
E.025	ESMG1Err	µC error	Replace the level transmitter
E.026	BISTErr	µC periphery self-test error	Replace the level transmitter
E.027	OvertempErr	PCB temperature, ambient temperature > 75°C	Check the installation location. Reduce the ambient temperature at the terminal box (cool if necessary)

All error codes not documented E 018, E 024 are intended as a reserve



Virtually all of the aforementioned error codes can be caused by EMC interference. This is less likely to be the case for permanent errors, but should be considered for sporadic error codes.

System malfunctions

Faults during use

The measuring range limits 0% and 100% are clearly outside the sight glass level.	
Possible causes if there are no fault indications	Remedy
The measuring range is incorrectly set.	<ul style="list-style-type: none"> ■ Check calibration of the measuring range. ■ If necessary, carry out recalibration.

The characteristic of the measurement signal in the measuring range is reproducible, but not linear.	
Possible causes if there are no fault indications	Remedy
<p>The level electrode was installed without a protective tube.</p> <p>The protective tube is required as a counter electrode.</p>	<ul style="list-style-type: none"> ■ Install a protective tube.

The characteristic of the displayed reading appears implausible compared with the trend of the fill level in the sight glass.	
Possible causes if there are no fault indications	Remedy
The pressure relief hole is clogged or flooded, or may even be missing completely.	<ul style="list-style-type: none"> ■ Check the protective tube. ■ If necessary, add a pressure relief hole.
Stop valves of the external measuring cylinder (optional) are closed.	<ul style="list-style-type: none"> ■ Check the stop valves, open if necessary.

An electrode that has already been in operation for a long time and which is well adjusted provides increasingly imprecise readings.	
Possible causes if there are no fault indications	Remedy
Increasing fouling due to build-up of deposits on the electrode rod.	<ul style="list-style-type: none"> ■ Remove the level electrode and clean the electrode rod with a damp cloth.

A connected diagnostic tester indicates alarms, e.g. MIN or MAX, even though the fill level visible in the sight glass remains within the admissible measuring range limits.	
Possible causes if there are no fault indications	Remedy
<ul style="list-style-type: none"> ■ The measuring range is incorrectly set. ■ There is fouling of the electrode or protective tube. 	<ul style="list-style-type: none"> ■ Calibrate the measuring range at the operating point. ■ Inspect the electrode and protective tube for fouling and clean if necessary.

System malfunctions

The display or control unit reacts to changes of fill level too slowly or too quickly.	
Possible causes if there are no fault indications	Remedy
The damping coefficient "Filt" is not set to an optimum level.	Correct the damping coefficient "Filt".

The equipment fails to work. No display and the LEDs do not light up.	
Possible causes if there are no fault indications	Remedy
Supply voltage failure.	<ul style="list-style-type: none"> ■ Switch on supply voltage. ■ Check all electrical connections.

The equipment fails to work. No display and the LEDs light up.	
Possible causes if there are no fault indications	Remedy
The earth connection to the tank is interrupted.	<ul style="list-style-type: none"> ■ Clean the sealing surfaces and ■ Screw in the NRG T 26-2 level electrode with a metal sealing ring, see page 26.

Flashing values from t-71 to t-75 appear on the display	
Possible causes	Remedy
<p>The ambient temperature of the electrode terminal box is high, between 71°C and 75°C.</p> <p>If the temperature rises above 75°C, the error code E.027 (Overtemp Err) appears and the 0 mA current output causes a fault shutdown.</p>	<ul style="list-style-type: none"> ■ Reduce the ambient temperature around the terminal box, e.g. by cooling.

System malfunctions

Checking installation and function

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

- Check the level display by bringing the system to multiple level states in the measuring range of the level electrode. Always perform this check with the plant at its operating point.
- Also check that the level remains within the MIN and MAX limits, when limit indicators are connected.
- Check the switchpoints when bringing into service and every time the NRGT 26-2 level transmitter is replaced.



System malfunctions of the NRGT 26-2 level transmitter result in an output of 0 mA at the analogue output.

Please state the displayed error code in the service case.



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

DANGER



Danger of death due to scalding with escaping hot steam.

Hot steam or hot water can escape suddenly when the level electrode under pressure is unscrewed.

- Reduce the boiler pressure to 0 bar and check the boiler pressure before unscrewing the level electrode.
- Only remove the level electrode at a boiler pressure of 0 bar.

WARNING



The hot level electrode can cause severe burns.

The level electrode becomes very hot during operation.

- Always let the level electrode cool down before performing installation and maintenance work.
- Only remove cooled level electrodes.

Proceed as follows:

1. Reduce the boiler pressure to 0 bar.
2. Allow the level electrode to cool to room temperature.
3. Switch off the supply voltage.
4. Undo the plug-in connection (M12 connector).
5. Then remove the level electrode.



If twisting of the terminal box of **>180°** in relation to the electrode or the complete removal of the terminal box is necessary during disassembly, proceed as described on page 17.

Cleaning the measurement electrode of the level transmitter

Cleaning interval

We recommend cleaning the electrode at least once a year, depending on the operating conditions, e.g. during maintenance work.



To clean the electrode rod, take the level transmitter out of service and remove it, see page 40.

Cleaning

- Clean the PTFE protective cover by wiping with a clean, damp cloth.
- Do not bend the electrode rod during cleaning and avoid major impacts.

Disposal

Dispose of the level 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 decontamination declaration.



The return confirmation and decontamination declaration 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 decontamination declaration) 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.

Notes



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

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