



Level Electrode

NRG 26-60

EN
English

Original Installation &
Operating Manual

819875-00

Contents

Content of this Manual	4
Scope of delivery/Product package	4
How to use this Manual	5
Illustrations and symbols used	5
Hazard symbols in this Manual	5
Types of warning	6
Specialist terms/Abbreviations	7
Usage for the intended purpose	8
Applicable directives and standards	8
Admissible system components	9
Improper use	9
Basic safety notes	10
Required personnel qualifications	11
Notes on product liability	11
Function	12
Technical data	15
Name plate/Identification	17
Factory settings	18
Overall view of the NRG 26-60	19
Dimensions of the NRG 26-60	20
Preparing for installation	21
Installation	22
Sealing surface dimensions for NRG 26-60.....	23
Example	23
Installing two level electrodes in a flange.....	24
Installation examples with dimensions	25
Aligning the terminal box	30
Functional elements	31
Connecting the CAN bus system	32
Bus line, cable length and cross-section	32
Example	32
Important notes on connecting the CAN bus system.....	33
Pin assignment of the CAN bus connector and coupling for non pre-wired control cables.....	33

Contents

Bringing into service	34
Changing the factory settings if necessary	34
Notes on changing the communication parameter “GrP or bd.rt”	36
Changing the controller group “GrP”	37
Changing the baud rate “bd.rt”	37
Performing a calibration to the lower bound of the active measurement range “CAL.L” (0 % calibration value)	38
Performing an independent quick calibration to a water level > 25 % of the active measurement range “CAL.P”	38
Performing a calibration to the upper bound of the active measurement range “CAL.H” (100 % calibration value)	39
Setting the filter constant “Filt”	39
Manually triggering a display test	39
Activating URB 2 compatibility “ConP”	40
Check the MIN and MAX limit values of the NRR 2-6x level controller by raising or lowering the level	40
Starting, operation and testing	41
System malfunctions	43
Causes	43
Indication of system malfunctions using fault codes	44
Faults during use	46
Checking installation and function	48
Taking out of service	49
Cleaning the level electrode	50
Cleaning interval	50
Disposal	50
Returning decontaminated devices	50
EU Declaration of Conformity	51

Content of this Manual

Product:

NRG 26-60 level electrode

First edition:

BAN 819875-00/08-2019cm

© Copyright

All rights reserved. Any misuse, particularly reproduction and dissemination to third parties, is not permitted. The General Terms & Conditions of GESTRA AG apply.

Scope of delivery/Product package

- 1 x NRG 26-60 level electrode
- 1 x Sealing ring D 27 x 32, form D, DIN 7603-2.4068, bright annealed
- 1 x Installation & Operating Manual

How to use this Manual

This Installation & Operating Manual describes the correct use of the NRG 26-60 level electrode. It applies to persons who integrate this equipment in control systems, install, bring into service, operate, maintain and dispose of this equipment. Anyone carrying out the above-mentioned activities must have read this Installation & Operating Manual and understood its contents.

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

Availability of this Installation & Operating Manual

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

Illustrations and symbols used

1. Action to be taken
- 2.

- Lists
 - ◆ Bullet points in lists

A Keys to illustrations



Additional information



Read the relevant Installation & Operating Manual

Hazard symbols in this Manual



Danger zone/Dangerous situation

Types of warning

DANGER

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

WARNING

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

CAUTION

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

ATTENTION

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

Specialist terms/Abbreviations

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

CAN (Controller Area Network) bus

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

NRG .. / URS .. / URB .. / SRL .. / etc.

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

SELV

Safety Extra Low Voltage

Operating point (of the system)

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

The design data may be much higher, however.

A boiler operated at 10 bar and 180 °C, for example, may be designed for 60 bar of pressure and a temperature of 275 °C, meaning that this does not have to be the operating point.

Usage for the intended purpose

Use as a water level controller

The level electrode NRG 26-60 can be used together with a NRR 2-60 / NRR 2-61 level controller to continuously measure the water level in steam and water boilers, or in condensate and feedwater tanks.

- Together with the NRR 2-60 / NRR 2-61 level controller, the electrode is used as a water level controller with MIN/MAX alarm.

Influences of the measured medium

- The NRG 26-60 level electrode can be used in media with varying conductivity. Conductivities of less than 100 $\mu\text{S}/\text{cm}$ can heavily influence the measured capacity, however. As a result, it is very important to recalibrate the measurement range see page 38 at the operating point* after a cold start.

* *Operating point of the system, see page 7.*

- In order to achieve the greatest possible degree of reproducibility and maintain the measurement quality (see "Technical data" on page 15), it is necessary to install the sensor in a protective tube (see "Installation examples with dimensions" on page 25).
- The dielectric constant of the measured medium may require an adjustment to the measurement frequency if it deviates significantly from the usual water ($\epsilon_r = 80$). Please contact GESTRA Service.

Visualisation and operation

- Visualisation and operation take place using the URB 60 or SPECTORcontrol operating terminal.

Applicable directives and standards

The NRG 26-60 level electrode has been tested and approved for use in the scope governed by the following directives and standards:

Directives:

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

Standards:

- | | |
|--------------|---|
| ■ EN 60730-1 | Automatic electrical controls – Part 1:
General requirements |
|--------------|---|

Standards documents:

- VdTÜV Bulletin BP WASS 0100-RL
Requirements for water level control and limiting equipment

Usage for the intended purpose

Admissible system components

In accordance with EU Pressure Equipment Directive 2014/68/EU and the technical rules of VdTÜV Bulletin BP WASS 0100-RL, the level electrode can be operated with the following system components.

Level control and limiter electrode	Control unit as level controller and limit indicator	Operating unit
NRG 26-60	NRR 2-60 NRR 2-61	URB 60, SPECTOR <i>control</i>

Fig. 1

Key to Fig. 1:

NRG = level electrode

NRR = level controller, continuous

URB = visual display and operating unit



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

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

Improper use



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

Do not use the equipment in potentially explosive atmospheres.



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

The name plate indicates the technical features of the equipment.

Basic safety notes



Danger to life from scalding if the level electrode is removed under pressure. Steam or hot water can spurt forcefully out of the equipment.

- Only remove the level electrode at **0 bar boiler pressure**.



Risk of severe burns when working on level electrodes that have not been allowed to cool. Level electrodes become very hot during operation.

- Always allow level electrodes to cool.
- Perform all installation and maintenance work only on a level electrode that has been allowed to cool.



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

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



Danger to life from faulty NRG 26-60 level electrode due to the sudden escape of hot steam or hot water.

Impacts during transport or installation can lead to damage or leaks on the NRG 26-60 level electrode, causing pressurised hot steam or hot water to escape through the pressure relief hole.

- Avoid damage during transport or installation, such as from impacts on the electrode rod.
- Before and after installation, check that the level electrode is completely undamaged.
- When bringing the level electrode into service, check that it is tight.



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

- The NRG 26-60 level electrode 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 brought into service by suitable, trained staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and conversions may only be performed by authorised staff who have undergone specific training.
Conversions	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Fig. 2

Notes on product liability

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

Function

The NRG 26-60 level electrode functions according to capacitive measurement and converts the fill level information into a data telegram. The measurement range of 0 - 100 % is scalable along the effective length of the electrode rod.

Automatic self-test

An automatic self-test cyclically monitors the safety and function of the level electrode and measured value recorder.

Faults in the electrical connection or electronic measuring equipment trigger error signals and alarms.

The data are transferred to the NRR 2-6x level controller via an ISO 11898 CAN bus in the CANopen protocol.

These data telegrams contain the following information:

- Measured level value as raw data
- Measured level value scaled between 0 – 100 %, as a 16-bit data word in high resolution
- Measure level value scaled in 1 % stages without decimal places
- Status or error information
 - ◆ Error signals in the event of faults in electronic or mechanical parts
 - ◆ Temperature in the level electrode terminal box

Controller functions

The NRG 26-60 level electrode can be used together with a NRR 2-60 / NRR 2-61 level controller as a water level controller. The controller is parametrised exclusively using the URB 60 visual display and operating unit.



The alarm limits are set using the URB 60. Read the relevant Installation & Operating Manual. For information on how the alarm contacts function, please read the Installation & Operating Manual of the corresponding NRR 2-60 or NRR 2-61 level controller.

The level electrode is installed inside steam boilers, tanks or feed lines of water boilers. A protective tube provided on site keeps it functioning reliably (see page 25 “Installation examples”).

A capacitive NRG 26-60 level electrode can be installed in a protective tube or level pot together with an NRG 1x-60 or NRG 1x-61 level electrode.

Operation in external level pots

If a level electrode is installed in a lockable level pot outside the boiler, the connecting pipes must be flushed regularly.

If the steam pipe is ≥ 40 mm and the water pipe is ≥ 100 mm, installation is regarded as internal. In this case, upstream monitoring of flushing processes is not required.

Function

Display and signals, see page 41 / 43 *

The NRG 26-60 level electrode has a 4-digit green 7-segment display for showing measured values and status information, along with the fault codes. A red and green LED indicate the operating status.

Behaviour upon activation *

The display alternately shows the software version, the type and then the scaled level value.

Behaviour in normal operation (no alarm, no faults) *

The display shows the scaled level value (3-digit + 1 decimal place), e.g. 050.3, and sends CAN data telegrams with the level information to be evaluated or displayed by the bus nodes.



The scaling of the measurement 0 – 100 % is set ex-works at a maximum for the corresponding electrode length. This enables effective level measurements immediately after installation.

Adjusting the measurement range while bringing into service (CAL.L, CAL.P or CAL.H)

The measurement range should be adjusted to the level of the sight glass while bringing into service, using the parameters CAL.L, CAL.P or CAL.H, see page 38 - 39. This is the only way to gain all the benefits of a high measurement resolution in the sight glass.

Behaviour in the event of an alarm (level value above or below limit) *

The scaled level value is transferred by CAN data telegram to the level controller NRR 2-60 or NRR 2-61. Depending on how the alarm limit values are set in the level controller, an alarm is generated after the delay time has elapsed.

Behaviour in the event of faults *

A fault code, e.g. E.005, appears permanently in the display. See page 44 for fault codes.

The faulty state is transferred by CAN data telegram to the level controller NRR 2-60 or NRR 2-61. Here, the fault message triggers an immediate alarm. For information about how the display and contacts work, see the “System malfunctions” section of the Installation and Operation Manual of the NRR 2-60 or NRR 2-61.



Alarms and faults in the electrode cannot be acknowledged.

When the alarm or fault is cancelled, the message in the display also disappears. The NRR 2-60 / NRR 2-61 level controller returns to normal operation.



* A detailed allocation between the respective device status, the display and the alarm LEDs can be found in the tables on pages 41 - 42.

Function

Parametrising/changing the factory settings.

You can adjust the electrode's parameters to the on-site system conditions if necessary. You can adjust the parameters or change the factory settings using a rotary knob on the terminal box, see page 34 ff.

Technical data

Model and mechanical connection

- Thread G $\frac{3}{4}$ A, EN ISO 228-1, see Fig. 6

Nominal pressure rating, admissible service pressure and temperature

- PN 40 32 bar (g) at 238 °C

Materials

- Terminal box: 3.2581 G AISi12, powder-coated
- Sheath: 1.4301 X5 CrNi 18-10
- Electrode rod insulation: PTFE
- Screw-in body: 1.4571, X6CrNiMoTi17-12-2

pH value

- Maximum admissible = 10

Max. installed length at 238 °C, all measurements in mm

Max installed length:	373	477	583	688	794	899	1004
Measuring range:	300	400	500	600	700	800	900

Max installed length:	1110	1214	1319	1423	1528	1636	2156
Measuring range:	1000	1100	1200	1300	1400	1500	2000



The electrode rod **must not be shortened**.

Measurement quality

The following information applies for a fluid conductivity range of 100 – 10000 μ S/cm compensated to 25 °C.

- Measured value deviation: +/- 1 % from the set measurement range in the operating point
- Display measured value resolution: 0.1 %
- Internal processing resolution: 15 bit with sign (16 bit)

Supply voltage

- 24 V DC +/-20 %

Power consumption

- max. 7 VA

Technical data

Current input

- max. 0.3 A

Internal fuse

- T 2 A

Safety cutout at excessive ambient temperature

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

Input/output

- Interface for CAN bus to ISO 11898, CANOpen, insulated
- M12 CAN bus connector, 5-pole, A-coded
- M12 CAN bus socket, 5-pole, A-coded

Indicators and controls

- 1 x 4-digit green 7-segment display for showing status information
- 1 x red LED for indicating an alarm
- 1 x green LED for indicating OK
- 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

Admissible ambient conditions

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

Weight

- Approx. 2.1 kg

Admissible installation positions

- Vertical
- Oblique to a maximum inclination of 45°. The length of the electrode rod is limited to 688 mm maximum.

Name plate/Identification






Safety note →	 Betriebsanleitung beachten See installation instructions Voir instructions de montage		
Equipment designation →	NRG 26 - 60		
Equipment function →	Niveauelektrode Level electrode Électrode de niveau		
Nominal pressure rating, connection thread, screw-in body material →	PN40	G3/4	1.4571 IP65 ← IP rating
Admissible service pressure, admissible temperature →	 32 bar (464psi) 238°C (460°F)		
Admissible ambient temperature →	T 70°C (158 °F)		
Measuring range →	H= _____ mm		
Power consumption →	7 VA	24 V \pm 20%	← Supply voltage
Data interface →	IN/OUT: CAN-Bus		
Current approval →	TÜV. xx .xx-xxx		← CE marking
Manufacturer →	GESTRA AG Münchener Str. 77 28215 Bremen GERMANY	 	← Appointed authority ← Protection class ← Disposal information
Serial number →			

Fig. 3



The date of production is stamped on the screw-in body of every level electrode.

Factory settings

The NRG 26-60 level electrode is delivered ex-works with the following settings:

Parameter	Display in menu	Parameter values	Unit	
		NRG 26-60		
Controller group	GrP	0001	---	
Baud rate	bd.rt	0050	KBit/s	
Lower bound calibration	CAL.L	variable	0 %	Raw value (hex) approx. 50 mV at ADC
Measurement range section calibration	CAL.P	variable	25 %	Raw value (hex)
Upper bound calibration	CAL.H	variable	100 %	Raw value (hex) approx. 2.0 V at ADC
Filter constant	FiLt	0005	Seconds	
Compatibility mode	ConP	oFF	---	

Fig. 4

Overall view of the NRG 26-60

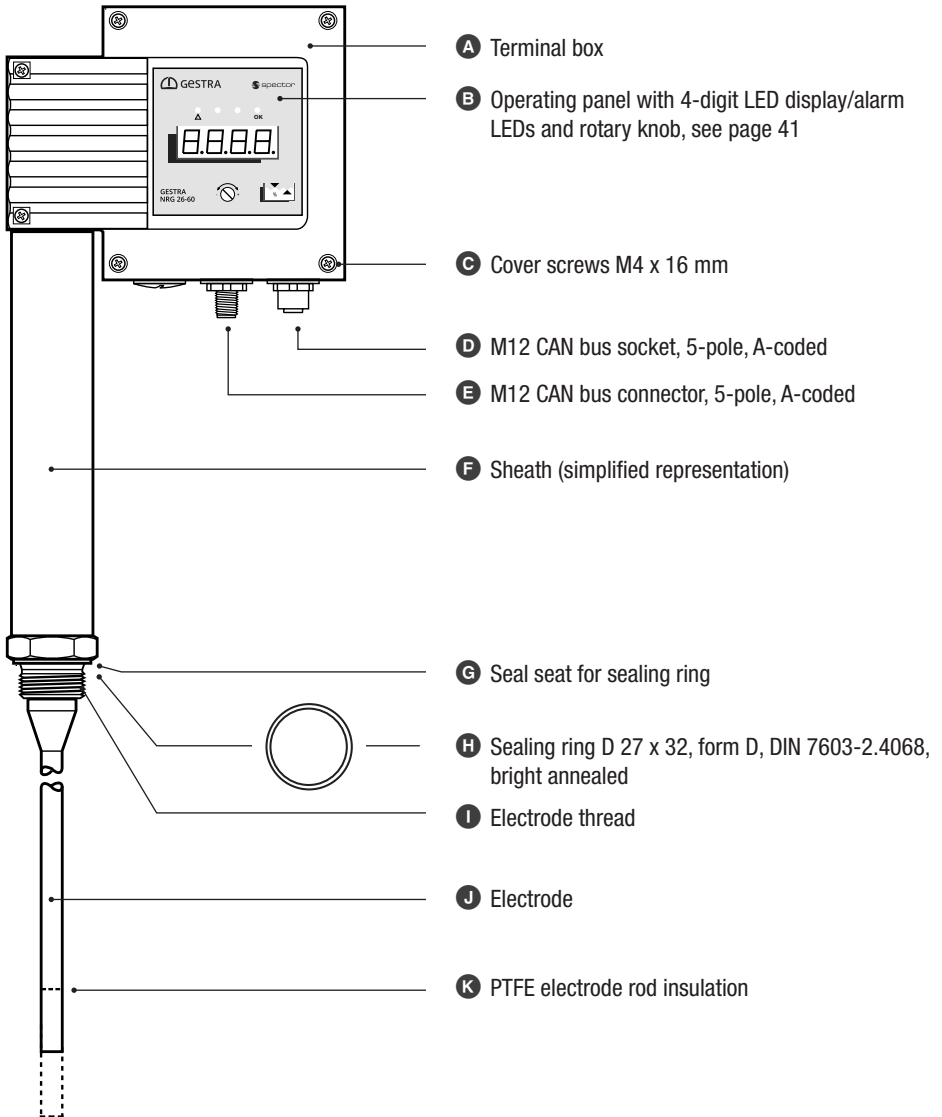
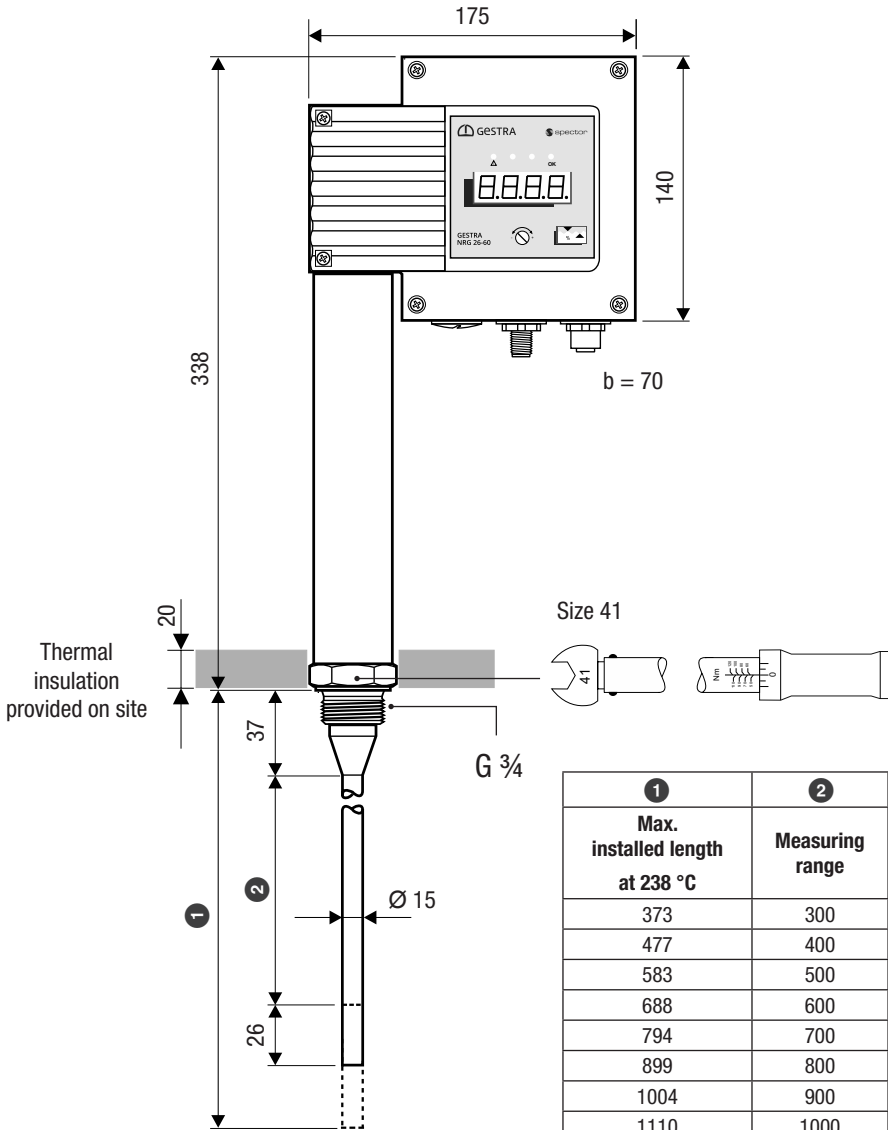


Fig. 5

Dimensions of the NRG 26-60



1	2
Max. installed length at 238 °C	Measuring range
373	300
477	400
583	500
688	600
794	700
899	800
1004	900
1110	1000
1214	1100
1319	1200
1423	1300
1528	1400
1636	1500
2156	2000

Fig. 6

All lengths and diameters in mm

Preparing for installation



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

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

You will need the following tools:

- Torque wrench (with size 41 open-ended spanner attachment), see page 20:

Installation

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if level electrodes are unscrewed under pressure.

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



WARNING



Hot level electrode can cause severe burns.

The level electrode becomes very hot during operation.

- Perform installation and maintenance work only on a level electrode that has been allowed to cool.
- Only remove level electrodes that have cooled down.



ATTENTION



Incorrect installation can lead to malfunctions in the system or the level electrode.

- Inspect the sealing surfaces of tank threaded standpipes or flange covers to ensure they are perfectly machined, see Fig. 7.
- Take care not to bend level electrodes during installation!
- Avoid hard impacts against the electrode rod.
- The level electrode may be inclined at 45° only when being used in a two-hole flange, with the length of the electrode rod limited to 688 mm maximum, see Fig. 13.
- Do **not** install the body **A** or upper part of the cover tube **F** of the level electrode in the boiler thermal insulation!
- Do not install in the screwed socket.
- Pay attention to the minimum clearances when installing the level electrode, see installation examples Fig. 9 to Fig. 13.
- To prevent current leaks, maintain a minimum distance of 14 mm between the electrode and earth (flange or tank wall).
- Check the boiler connection and flange during the preliminary boiler inspection.

Installation

1. Inspect the sealing surfaces of the tank threaded standpipe or flange cover.

Sealing surfaces must be perfectly machined as shown in Fig. 7.

Sealing surface dimensions for NRG 26-60

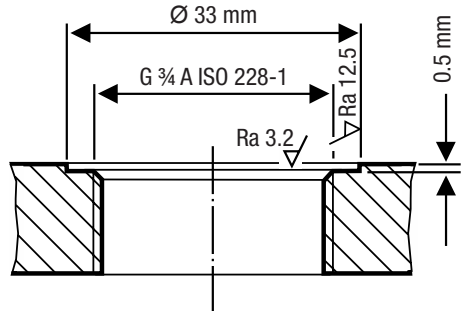


Fig. 7

2. Push the supplied sealing ring **H** onto the seal seat **G** of the electrode, or lay it on the sealing surface of the flange.

! DANGER



Danger to life from escaping hot steam if incorrect or defective seals are used.

- Only use the supplied sealing ring for sealing the electrode thread **I**.
- ◆ **Sealing ring D 27 x 32**
DIN 7603-2.4068, bright annealed

Prohibited seal materials:

- Hemp, PTFE tape
- Conductive paste or grease

Example

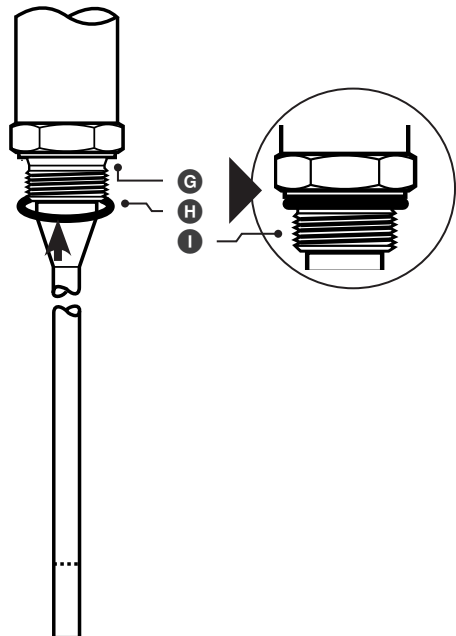


Fig. 8

Installation

3. If necessary, apply a small quantity of silicone grease (e.g. Molykote® III) to the electrode thread ①.
4. Screw the level electrode into the threaded standpipe of the tank or flange cover, and tighten securely using a torque wrench (with size 41 open-ended spanner attachment).

Tighten to the torques stated below.

Tightening torque when cold:

- NRG 26-60 = 160 Nm

Installation example with dimensions, see Fig. 9, page 25

Installing two level electrodes in a flange

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

Installation example with dimensions, see Fig. 11, page 27

Installation examples with dimensions

Protective tube (provided on site) for internal installation, combined with other GESTRA AG devices.

Image not to scale.

Key, see page 30

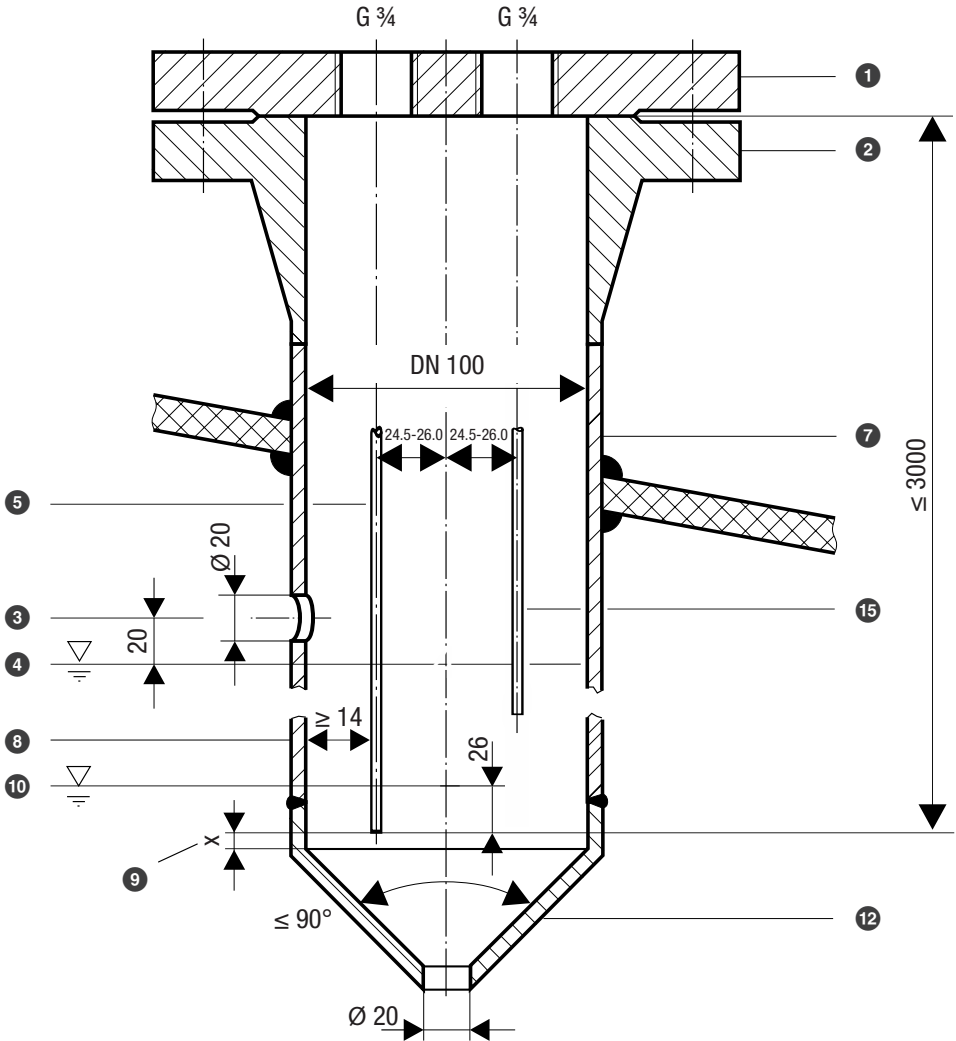


Fig. 11 All lengths and diameters in mm

Installation examples with dimensions

Level pot (\geq DN 80) for external use.

Image not to scale.

Key, see page 30

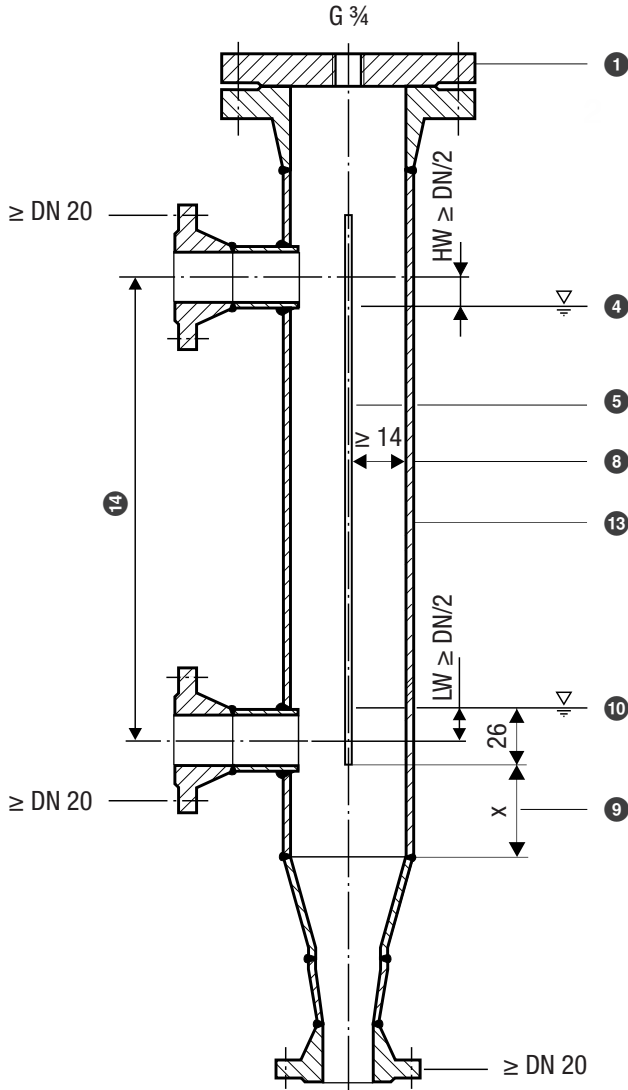


Fig. 12

All lengths and diameters in mm

Installation examples with dimensions

Oblique installation, e.g. in steam boilers.

The level electrode must not be at an incline of more than 45°, and the length of the electrode rod is limited to 688 mm maximum.

Image not to scale.

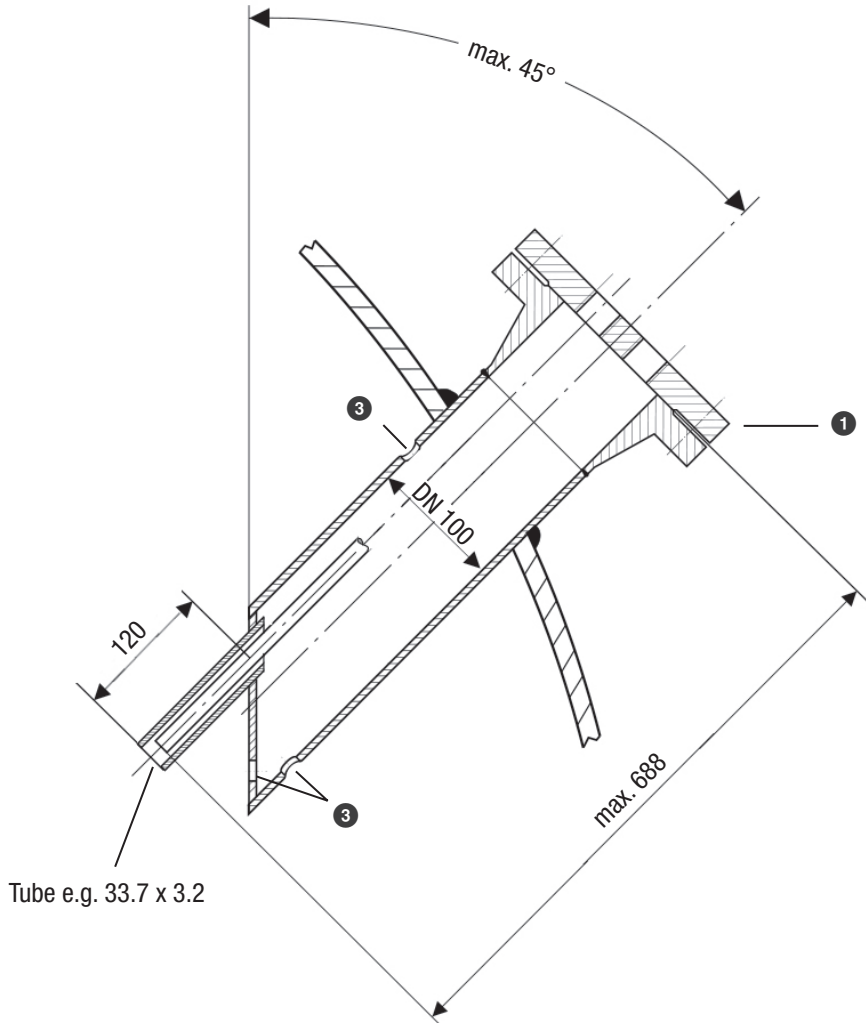


Fig. 13

All lengths and diameters in mm

Installation examples with dimensions

Key Fig. 9 to Fig. 13

- 1 Fig. 9, 10: Flange (PN 40, DN 50) DIN EN 1029-01 (single electrode)
Fig. 12: Flange (PN 40, \geq DN 80) DIN EN 1029-01 (single electrode)
Fig. 11, 13: Flange (PN 40, DN 100) DIN EN 1029-01 (electrode combination)
- 2 Fitting in connection flange (perform preliminary check of the fitting when checking the boiler)
- 3 Vent hole \varnothing 20 mm
- 4 Highest possible HW mark
- 5 Electrode rod
- 6 Protective tube DN 80 (in France as per AFAQ \geq DN 100)
- 7 Protective tube DN 100
- 8 Distance between electrode rod and protective tube \geq 14 mm
- 9 Minimum dimension (x) = 10 mm below the installed length (installed length see page 15 / 20)
- 10 Lowest possible LW mark (end of measuring range)
- 11 Reducer DIN 2616-2, K-88.9 x 3.2 - 42.4 x 2.6 W
- 12 Reducer DIN 2616-2, K-114.3 x 3.6 - 48.3 x 2.9 W
- 13 Level pot \geq DN 80
- 14 Centre distance of connection
- 15 Additional electrode

Aligning the terminal box

If necessary, you can orientate the display in the desired direction by rotating the terminal box.

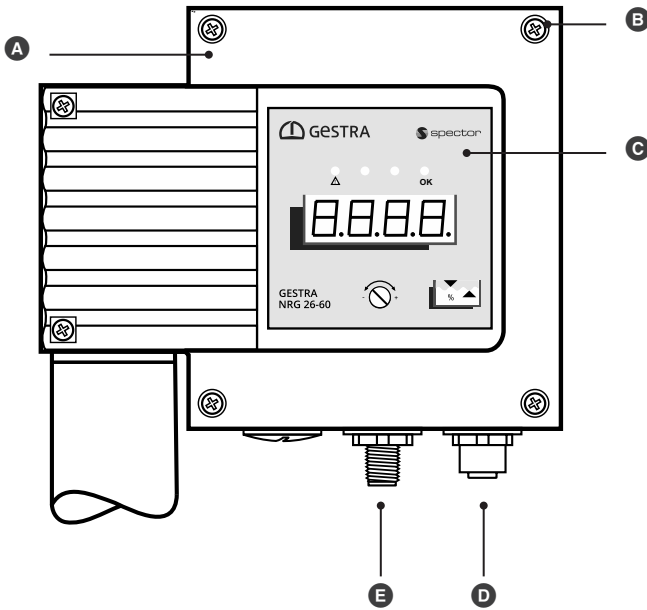
ATTENTION



Rotating the terminal box \geq 180° will damage the level electrode's internal wiring.

- Never rotate the terminal box more than 180 degrees in either direction.
-

Functional elements



- A** Terminal box
- B** Cover screws M4 x 16 mm
- C** Operating panel with 4-digit LED display/alarm and status LEDs and rotary knob, see page 41
- D** M12 CAN bus socket, 5-pole, A-coded
- E** M12 CAN bus connector, 5-pole, A-coded

Fig. 14

Connecting the CAN bus system

Bus line, cable length and cross-section

- A shielded, multi-core, twisted-pair control cable, e.g. UNITRONIC® BUS CAN 2 x 2 x .. mm² or RE-2YCYV-fl 2 x 2 x .. mm² must be used as the bus line.
- Pre-wired control cables (with plug and coupling) are available as accessories in various lengths.
- The baud rate (transfer rate) is determined by the cable length between the bus terminal devices, and the wire cross-section is determined by the overall power input of the measuring sensors.
- 0.2 A at 24 V is required per sensor. With 5 sensors, there is therefore a voltage drop of approx. 8 V per 100 m when using cables of 0.5 mm². In this case, the system is operating at its limits.
- If using 5 sensors or more and a cable length ≥ 100 m, the wire cross-section needs to be doubled to 1.0 mm².
- At larger distances of > 100 m, the 24 V DC supply can also be connected on site.

Example

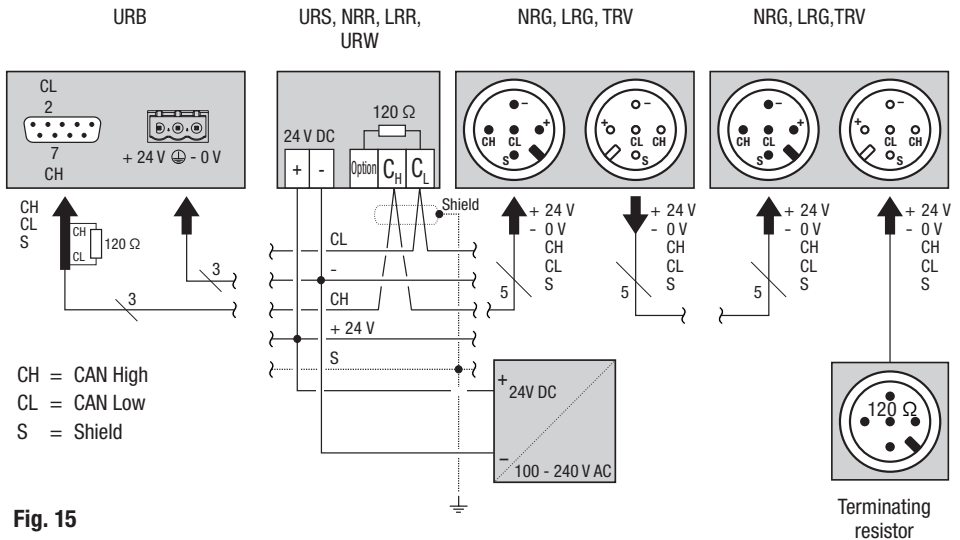


Fig. 15

Connecting the CAN bus system

Important notes on connecting the CAN bus system

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

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

If non pre-wired control cables are used, you must wire the CAN bus connector and couplings as shown in the wiring diagram **Fig. 16**.

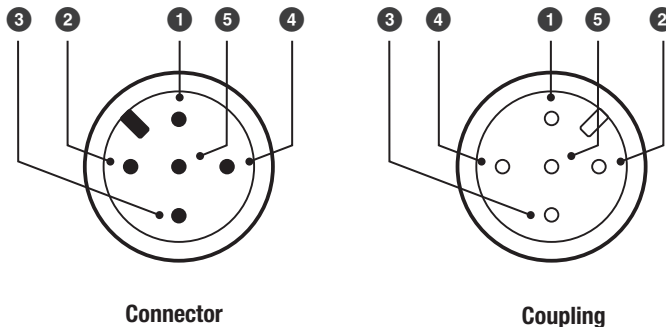


Fig. 16

- | | |
|----------|--------------------|
| ① S | Shield (screen) |
| ② + 24 V | Power supply |
| ③ - 0 V | Power supply |
| ④ CH | CAN High data line |
| ⑤ CL | CAN Low data line |

Bringing into service

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

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

Next, switch on the supply voltage.

Changing the factory settings if necessary

You will need the following tools

- Slotted screwdriver, size 2.5

Note on commissioning




During commissioning, the scaling of the measurement 0 – 100 % is set ex-works at a maximum for the corresponding electrode length.

After installation, set the measurement range to effective, system-specific values.

Bringing into service

Select and set a parameter:

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

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


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


“Actual value” → GrP → bd.rt → °C.in → CAL.L → CAL.P → CAL.H → Filt → diSP → ConP → “Actual value”

Key to parameters, see page 36.



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

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


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

Each parameter has an individual, admissible value range.

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



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

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

Bringing into service

Key to parameters:

- 099.9 = actual value display, the currently measured value, based on the calibration 0 - 100 %
- GrP = controller group (effect on URB 60 / SPECTOR*control*)
- bd.rt = baud rate
- °C.in = display ambient temperature of housing
- CAL.L = lower bound calibration to 0 %
- CAL.P = measurement range calibration to an intermediate value above 25 % (alternative to CAL.H)
- CAL.H = upper bound calibration to 100 %
- Filt = filter constant
- diSP = display test trigger
- ConP = activation of compatibility mode; for operation with SPECTORconnect, do not change setting (ConP = OFF)

Notes on changing the communication parameter “GrP or bd.rt”



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

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

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



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

Bringing into service

Changing the controller group “GrP”



For setting the controller group, please also pay attention to the information in the Installation & Operating Manual of the NRR 2-60 or NRR 2-61 level controller.

Note the setting instructions on page 35 and proceed as follows:

1. Select the parameter “**GrP**”.
2. Press and hold the rotary knob until the current controller group ID flashes on the display.
3. Set the desired controller group (1 to 4). The controller groups correspond to the following CAN bus node IDs:
 - Controller group 1 = node-ID 40
 - Controller group 2 = node-ID 45
 - Controller group 3 = node-ID 60
 - Controller group 4 = node-ID 65
4. Save your set value by pressing the rotary knob for approx. 1 second.

Changing the baud rate “bd.rt”



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

Note the setting instructions on page 35 and proceed as follows:

1. Select the parameter “**bd.rt**”.
2. Press and hold the rotary knob until the current baud rate flashes on the display.
3. Set the desired baud rate (50 kBit/s or 250 kBit/s).
4. Save your set value by pressing the rotary knob for approx. 1 second.

Bringing into service

Notes on calibration



Always perform calibration at the operating point of the boiler fluid

If the medium is cold when setting the measurement range, the influence of heat alters the settings. If this is the case, the settings must be corrected at the operating point.

Performing a calibration to the lower bound of the active measurement range “CAL.L” (0 % calibration value)



The system must go to the 0 % range and be calibrated.

Note the setting instructions on page 35 and proceed as follows:

1. Reduce the water level in the boiler to the 0 % limit of the required measurement range.
2. Select the parameter “**CAL.L**”, the old value will appear in hexadecimal display after approx. 3 seconds.
3. Press and hold the rotary knob until the new value appears on the display.
4. Save your set value by pressing the rotary knob for approx. 1 second.
5. Continue with the calibration “**CAL.P**” or “**CAL.H**”.

Performing an independent quick calibration to a water level > 25 % of the active measurement range “CAL.P”



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

Note the setting instructions on page 35 and proceed as follows:

1. Raise the water level in the boiler to a value > 25 % of the required measurement range.
2. Select the parameter “**CAL.P**”, the old value will appear in hexadecimal display after approx. 3 seconds.
3. Press and hold the rotary knob until the value (e.g. 0025) appears. The last digit flashes.
4. Set the required measured value > 25 % of the set level.
5. Save your set value by pressing the rotary knob for approx. 1 second.

Bringing into service

Performing a calibration to the upper bound of the active measurement range “CAL.H” (100 % calibration value)



The calibration via “CAL.H” delivers the greatest possible precision for setting the measurement range.

Note the setting instructions on page 35 and proceed as follows:

1. Raise the water level in the boiler to the 100 % limit of the required measurement range.
2. Select the parameter “**CAL.H**”, the old value will appear in hexadecimal display after approx. 3 seconds.
3. Press and hold the rotary knob until the new value appears.
4. Save your set value by pressing the rotary knob for approx. 1 second.

Setting the filter constant “Fit”



You can set a time constant here to settle the output signal for the level controller and the display.

Note the setting instructions on page 35 and proceed as follows:

1. Select the parameter “**Fit**”. The current filter constant value 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 set value by pressing the rotary knob for approx. 1 second.

Manually triggering a display test

Note the setting instructions on page 35 and proceed as follows:

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

Replacing faulty equipment



Faulty equipment jeopardises system safety.

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

Bringing into service

Activating URB 2 compatibility “ConP”



For operation with SPECTORconnect, do not change setting (ConP = off).

1. Select the parameter “**ConP**”.
2. Press and hold the rotary knob until the current status flashes on the display.
3. Set the required status (off / on).

ConP = on: This enables the display of the higher-resolution NRG 26-60 measured values on the URB 2 operating terminal (by converting from 16 bit to 10 bit).

ConP = off: 16-bit resolution of the NRG 26-60 measured values.

4. Save your set value by pressing the rotary knob for approx. 1 second.

Check the MIN and MAX limit values of the NRR 2-6x level controller by raising or lowering the level



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

Proceed as follows every time you bring the NRG 26-60 level electrode into service or change it:

- Check the MIN and MAX limit values of the NRR 2-6x level controller by exceeding the upper or lower level at the system’s operating point.
- Never start up any system without first checking that switchpoints are correct.
- The NRG 26-60 level electrode may only be repaired by the manufacturer, GESTRA AG.
- Only replace a faulty device with an identical device from GESTRA AG.

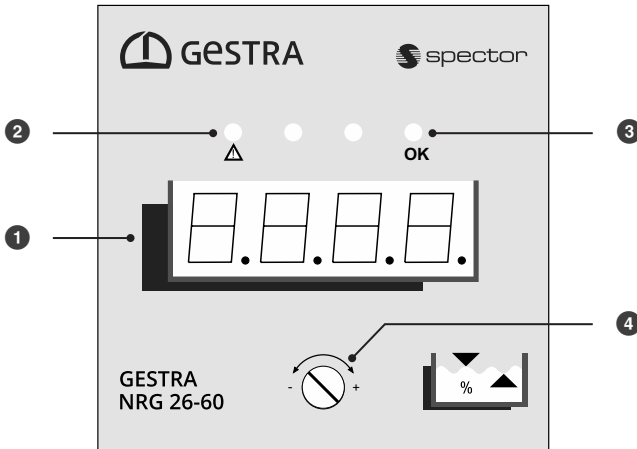


Fig. 17

The operating panel:

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

Note on the display priority of the individual messages



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

Priority in fault code display

Higher value fault codes overwrite lower value codes in the display! Fault signals according to fault code table, see page 44 ff.

Starting, operation and testing

Allocation of the display and LEDs to the respective operating state of the level electrode:

Start		
Switch on supply voltage	All LEDs light up - test Display: S-xx = software version t-03 = equipment type NRG 26-60	The system is started and tested. The LEDs and display are tested.

Normal operation		
The level electrode is immersed within the set measurement range	Display: e.g. 047.3 LED 2: Operating LED lights up green	Display of the current level as a % of the calibrated measurement range.

See the following pages for more information and tables.

Behaviour in the event of a malfunction (fault code display)		
On the occurrence of a fault	Display: e.g. E005 LED 1: Alarm LED lights up red	A fault code is permanently displayed, fault codes see page 44 A malfunction is active
	LED 2: Operating LED is OFF	A fault is present
<ul style="list-style-type: none"> ■ The malfunction or faulty state is transferred to the level controller NRR 2-60 / NRR 2-61 via CAN data telegram. ■ Here, the malfunction triggers an immediate alarm. 		



Malfunctions in the electrode cannot be acknowledged.

When the malfunction is cancelled, the message in the display also disappears. The NRR 2-60 / NRR 2-61 level controller returns to normal operation.



Faulty equipment jeopardises system safety.

- If the level electrode does not behave as described above, it may be faulty.
- Perform failure analysis.
- The NRG 26-60 level electrode may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

System malfunctions

Causes

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

Check the installation and configuration before systematic troubleshooting!

Installation:

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

Wiring:

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

Configuration of the level electrode:

- Is the level electrode set to the correct controller group GrP = 1, 2, 3 or 4.

Baud rate:

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

ATTENTION



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

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

System malfunctions

Indication of system malfunctions using fault codes

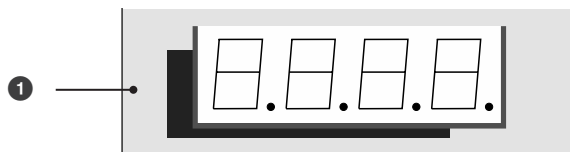


Fig. 18 ① Display of actual value/fault code/limit value, green, 4 digits

Fault code display			
Fault code	Internal designation	Possible faults	Remedy
E.001	MinCh1Err	Measured value of channel 1 below minimum, potential internal open circuit	Is the level electrode not immersed? Check the installation location, replace the level electrode if necessary
E.002	MinCh2Err	Measured value of channel 2 below minimum, potential internal open circuit	Is the level electrode not immersed? Check the installation location, replace the level electrode if necessary
E.003	MaxCh2Err	Measured value of channel 2 above maximum, potential internal open circuit	Replace the level electrode
E.004	Ch1Ch2DiffErr	Over 10% deviation between channels 1 and 2, internal short circuit	Replace the level electrode
E.005	MaxCh1Err	Measured value of channel 1 above maximum, potential internal open circuit	Replace the level electrode
E.006	MinTSTCh1Err	Measured value channel 1 internal capacity (47pF)	Replace the level electrode
E.007	MaxTSTCh1Err	Measured value channel 1 reference capacity (1nF 47pF)	Replace the level electrode
E.008	MinTSTCh2Err	Measured value channel 2 internal capacity (47pF)	Replace the level electrode
E.009	MaxTSTCh2Err	Measured value channel 2 reference capacity (1nF 47pF)	Replace the level electrode
E.010	PWMTSTCh1Err	Measured value channel 1 with deactivated measurement signal	Replace the level electrode
E.011	PWMTSTCh2Err	Measured value channel 2 with deactivated measurement signal	Replace the level electrode

System malfunctions

Fault code display			
Fault code	Internal designation	Possible faults	Remedy
E.012	FreqErr	Measurement signal frequency	Replace the level electrode
E.014	ADSReadErr	16-bit AD converter does not respond	Replace the level electrode
E.015	UnCalibErr	Factory calibration invalid (not measurement range calibration)	Replace the level electrode
E.016	PlausErr	Plausibility error in measurement range	Check the calibration of the measurement range, repeat if necessary
E.019	V6Err	System voltage 6 V outside limits	Replace the level electrode
E.020	V5Err	System voltage 5 V outside limits	Replace the level electrode
E.021	V3Err	System voltage 3 V outside limits	Replace the level electrode
E.022	V1Err	System voltage 1 V outside limits	Replace the level electrode
E.023	V12Err	System voltage 12 V outside limits	Replace the level electrode
E.024	CANErr	Communication failure	Check the baud rate, wiring and terminating resistors
E.025	ESMG1Err	μ C error	Replace the level electrode
E.026	BISTErr	μ C periphery self-test error	Replace the level electrode
E.027	OvertempErr	PCB temperature, ambient temperature > 75 °C	Check installation location. Lower the ambient temperature of the terminal box (cool if necessary)

All E.013, E.017 and E.018 fault codes not listed here are available as reserves



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

System malfunctions

Faults during use

The measurement range limits 0 % and 100 % are obviously outside the sight glass level.	
Possible causes if no error messages appear	Remedy
The measurement range has been set incorrectly.	<ul style="list-style-type: none"> ■ Check the calibration of the measurement range. ■ Repeat the calibration if necessary.

The characteristic of the measurement signal in the measurement range is reproducible, but not linear.	
Possible causes if no error messages appear	Remedy
<p>The level electrode was install 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 displayed measured value in the characteristic appears implausible when compared with the tendency of the fill level in the sight glass.	
Possible causes if no error messages appear	Remedy
The vent hole is blocked or flooded, or may be missing entirely in certain circumstances.	<ul style="list-style-type: none"> ■ Check the protective tube ■ Add a vent if necessary.
The stop valves of an external measuring cylinder (option) are closed.	<ul style="list-style-type: none"> ■ Check the stop valves and open if necessary.

A long-operating and well-set electrode delivers increasingly inaccurate measured values.	
Possible causes if no error messages appear	Remedy
Increasing contamination 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 control unit, e.g. NRR2-60, signals a MIN or MAX alarm, although the fill level is still within the permitted measurement range limits according to the sight glass.	
Possible causes if no error messages appear	Remedy
<ul style="list-style-type: none"> ■ The measurement range is set incorrectly ■ The electrode or protective tube is contaminated. 	<ul style="list-style-type: none"> ■ Calibrate the measurement range at the operating point. ■ Check the electrode and protective tube for contamination and clean if necessary.

System malfunctions

The display or control reacts too slowly or too quickly to changes in the fill level.

Possible causes if no error messages appear	Remedy
The damping coefficient "Filt" setting is invalid.	Correct the damping coefficient "Filt".

The device fails to work. Display and LEDs do not illuminate.

Possible causes if no error messages appear	Remedy
Supply voltage failure.	<ul style="list-style-type: none"> ■ Switch on the supply voltage. ■ Check all electrical connections.

The device fails to work. Display and LEDs illuminate.

Possible causes if no error messages appear	Remedy
The earth connection to the vessel is interrupted.	<ul style="list-style-type: none"> ■ Clean the sealing surfaces and ■ screw in the level electrode with a metal sealing ring, see page 23.

Flashing values from t-71 to t-75 appear in 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 fault code E.027 (Overtemp Err) appears and a fault or alarm shutoff occurs at NRR 2-60, NRR 2-61.</p>	<ul style="list-style-type: none"> ■ The ambient temperature around the terminal box must be reduced, for example through cooling.

System malfunctions

Checking installation and function

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

- Check the alarm functions by exceeding both the upper and lower limit values for MIN alarm and MAX alarm set in the level controller NRR 2-60 / NRR 2-61. In this case, the equipment must behave as if there were an alarm.
- Check the switchpoints when bringing into service and every time the NRG 26-60 level electrode is replaced.



The system faults in the NRG 26-60 level electrode lead to a fault shutoff in the level controller NRR 2-60 / NRR 2-61. The alarm contacts switch without delay. For information on precisely how the alarm contacts function, please read the Installation & Operating Manual of the corresponding NRR 2-60 or NRR 2-61.

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



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

Taking out of service

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if level electrodes are unscrewed under pressure.

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

WARNING



Hot level electrode can cause severe burns.

The level electrode is very hot during operation.

- Perform installation and maintenance work only on a level electrode that has been allowed to cool.
- Only remove level electrodes that have cooled down.

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. Unplug the connections of the CAN bus control lines and plug them into one another.
5. Next, remove the level electrode.



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

Cleaning the level electrode

Cleaning interval

We recommend cleaning the electrode at least once per year, such as during maintenance work, depending on the operating conditions.



Before cleaning the electrode rod, take the level electrode out of operation and remove it, see page 49.

Disposal

Dispose of level electrodes in accordance with statutory waste disposal provisions.

Returning decontaminated devices



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

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

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



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

Please proceed as follows:

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

EU Declaration of Conformity

We hereby declare that the NRG 26-60 level electrode conforms to the following European Directives:

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

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

The current Declaration of Conformity can be found on the internet at www.gestra.com or requested from us.



You can find our authorised agents around the world at:

www.gestra.com

GESTRA AG

Münchener Straße 77

28215 Bremen

Germany

Phone +49 421 3503-0

Fax +49 421 3503-393

E-mail info@de.gestra.com

Web www.gestra.com