

Level Electrodes

NRG 16-61

NRG 17-61

NRG 19-61

NRG 111-61

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Content of this Manual

Product:

- Level Electrode NRG 16-61
- Level Electrode NRG 17-61
- Level Electrode NRG 19-61
- Level Electrode NRG 111-61

First edition:

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Scope of delivery/Product package

- 1 x NRG 1x-61 level electrode
- 1 x sealing ring
 - ◆ D 27 x 32, form D, DIN 7603-2.4068, bright annealed for NRG 16-61, NRG 17-61, NRG 19-61
 - ◆ D 33 x 39, form D, DIN 7603-2.4068, bright annealed for NRG 111-61
- 1 x electrode extension
- 1 x Installation & Operating Manual

Accessories

- 1 x measuring surface extension, optional
- 1 x M12 CAN bus connector, 5-pole, A-coded, with 120 Ω terminating resistor

How to use this Manual

This Installation & Operating Manual describes how to correctly use NRG 16-61, NRG 17-61, NRG 19-61 and NRG 111-61 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 that the 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



Press the rotary knob

Hazard symbols in this Manual



Danger zone / Dangerous situation



Danger of death from electric shock

Types of warning

DANGER

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

WARNING

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

CAUTION

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

ATTENTION

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

Specialist terms/Abbreviations

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

IEC 61508

International standard IEC 61508 describes both the type of risk assessment and actions taken to provide appropriate safety functions.

SIL (safety integrity level)

Safety integrity levels SIL 1 to 4 are used to quantify risk reduction. SIL 4 is the highest level of risk reduction. International standard IEC 61508 forms the basis for establishing, testing and operating technical safety systems.

CAN (Controller Area Network) bus

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

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

Equipment and type designations of GESTRA AG, see page 8.

SELV

Safety Extra Low Voltage

Usage for the intended purpose

NRG 1x-61 level electrodes are used in conjunction with the URS 60/URS 61 safety control unit as safety high-level limiters for steam boilers and hot water installations.

- Safety high-level limiters prevent the defined maximum high water (HW) level from being exceeded, e.g. by switching off the feedwater supply.
- Viewing and operation take place using the URB 60 or SPECTOR*control* operating terminal.

Admissible system components, dependent on the required safety integrity level

The level electrodes can be operated with the following system components:

	High water level electrodes	Safety control unit as a level limiter	Operating unit	Monitoring unit
SIL 3 to IEC 61508	NRG 16-61 NRG 17-61 NRG 19-61 NRG 111-61	URS 60 URS 61	URB 60 SPECTOR <i>control</i>	SRL 6-60

Fig. 1

Key to Fig. 1:

NRG = level electrode

URS = SPECTOR*connect* safety control unit

URB = visual display and operating unit

SRL = monitoring unit



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

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

Improper use



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

Do not use the equipment in potentially explosive atmospheres.



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 a **boiler pressure of 0 bar**.



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.

- Always allow the level electrode to cool.
- Perform all installation and maintenance work only when the level electrodes have been allowed to cool.



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

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



Danger to life from faulty NRG 111-61 level electrodes due to the sudden escape of hot steam or hot water.

Mistakes during transport or installation can cause the ceramic in the NRG 111-61 level electrode to break, so that hot steam or hot water escapes through the pressure relief hole.

- Before and after installation, check that the level electrode is completely undamaged.
- 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 1x-61 level electrodes 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.
Company	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and refits may only be performed by authorised staff who have undergone specific training.
Refits	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Fig. 2

Notes on product liability

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

Functional safety, safety integrity level (SIL)

In combination with the URS 60/URS 61 safety control unit, NRG 16-61, NRG 17-61, NRG 19-61 and NRG 111-61 level electrodes are suitable for use with safety functions up to SIL 3.

They are elements of a safety circuit up to SIL 3 as per IEC 61508 in the SPECTOR*connect* system, and can transmit alarm notifications.

When combined with the accessories, you will have a type B subsystem in accordance with IEC 61508. The technical and safety characteristics in Fig. 4 below are based solely on NRG 1x-61 level electrodes.

Breakdown of safety function failure rates (HW pump switch-off)

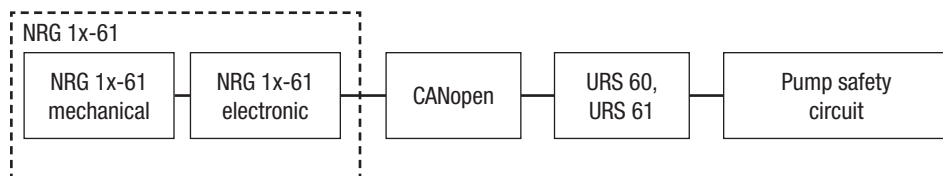


Fig. 3

The CANopen interface is a “black channel” type, and can be ignored during calculation due to the low failure rate of < 1FIT.

Check the safety function regularly

Check level electrode function at least once a year by bringing the system to the maximum water level ($T1 = 1$ year), see page 54.

Reliability data to IEC 61508

Description	Characteristic values
Safety integrity level	SIL 3
Architecture	1oo1
Type of equipment	Type B
Hardware fault tolerance	HFT = 0
Overall failure rate for dangerous undetected failures	$\lambda_{DU} = < 20 * 10^{-9} \text{ 1/h}$
Overall failure rate for dangerous detected failures	$\lambda_{DD} = < 5000 * 10^{-9} \text{ 1/h}$
Safe failure fraction	SFF > 99.0%
Test interval	T1 = 1 year
Probability of dangerous failure on demand	PFD < $20 * 10^{-5}$
Diagnostic coverage. Percentage of dangerous failures detected by a test.	DC > 99.0%
Mean time to dangerous failure	MTTF _D > 30 a
Mean time to failure	MTTF > 10 a
Diagnostic interval	T2 = 1 hour
Performance level (to ISO 13849)	PL = d
Probability of dangerous failure on demand per hour	PFH < $20 * 10^{-9} \text{ 1/h}$
Ambient temperature as a basis for calculation	Tu = 60 °C
Mean time to repair	MTTR = 0 (no repair)
Fraction of undetected dangerous failures that have a common cause	beta = 2%
Fraction of detected dangerous failures that have a common cause	beta d = 1%

Fig. 4

Function

If the water rises above the maximum level, the level electrode is immersed and the URS 60/URS 61 safety control unit triggers an alarm. This “High Water (HW)” switchpoint is determined by the length of the electrode extension.

The level electrode uses the principle of conductive measurement and monitors itself. This means that a fault in the electrical connection or electronic measuring equipment also triggers an alarm.

The level electrode is installed on the inside of steam boilers, tanks and feed lines in hot water installations. A protective tube provided on site keeps it functioning reliably (see page 33 “Installation examples”).

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

If a level electrode is installed outside the boiler in a level pot that can be shut off, the connecting pipes must be flushed regularly. An SRL 6-60 monitoring unit is additionally required to monitor the flushing times and flushing process.

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.

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

The data are transferred to the URS 60/URS 61 safety control unit in the form of a black channel data telegram via the CANopen protocol using a CAN bus to ISO 11898, and saved there.

These data telegrams contain the following information:

- Level electrode alarms if water rises above the maximum level
- Fault indications on the occurrence of faults in electronic or mechanical parts
- Excessive temperature in the level electrode terminal box

Behaviour in the event of an alarm

The High Water alarm state is indicated by the NRG 1x-61 level electrode and transmitted to the URS 60/URS 61 safety control unit via CAN bus. Once the time delay has elapsed, the alarm signal triggers the safety shutdown in the safety control unit. The safety control unit does not lock independently during this process.

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

- Fault in the sensors (open circuit, short circuit, faulty component, excessive temperature)
- Communication failure

Function

Behaviour in the event of faults

The safety functions of the equipment are monitored in the sensors through periodic self-tests. Fault indications are updated with each self-test. If there are no faults, the display automatically goes blank. Alarm and fault indications are shown by LEDs or an operating unit. They are also saved in the level electrode and transferred to the URS 60/URS 61 safety control unit using the CANopen protocol.

Simulating the alarm state *

The triggering of an alarm can be simulated by pressing the rotary knob of the NRG 1x-61, pressing the appropriate button on the URS 60/URS 61, or using the URB 60. The equipment will then behave as if a normal alarm had been triggered.



* The tables on pages 47 - 49 clearly show the relationship between the equipment status, the display and the alarm LEDS.

Setting the limit value

The limit value is set by shortening the electrode, see page 25.

Technical data

Model and mechanical connection

- | | |
|------------------------|--|
| ■ NRG 16-61, NRG 17-61 | Thread G $\frac{3}{4}$ A, EN ISO 228-1, see Fig. 8 |
| ■ NRG 19-61 | Thread G $\frac{3}{4}$ A, EN ISO 228-1, see Fig. 9 |
| ■ NRG 111-61 | Thread G1 A, EN ISO 228-1, see Fig. 10 |

Nominal pressure rating, admissible service pressure and temperature

- | | | |
|--------------|--------|-------------------------|
| ■ NRG 16-61 | PN 40 | 32 bar (abs) at 238 °C |
| ■ NRG 17-61 | PN 63 | 46 bar (abs) at 260 °C |
| ■ NRG 19-61 | PN 160 | 100 bar (abs) at 311 °C |
| ■ NRG 111-61 | PN 320 | 183 bar (abs) at 357 °C |

Materials

- | | |
|-----------------------------------|--------------------------------|
| ■ Terminal box | 3.2581 G AlSi12, powder-coated |
| ■ Sheath | 1.4301 X5 CrNi 18-10 |
| ■ Electrode extension | 1.4401 or 1.4404 |
| ■ Electrode insulation: | |
| ◆ NRG 16-61, NRG 17-61 | PEEK |
| ◆ NRG 19-61 | PEEK and PTFE |
| ◆ NRG 111-61 | Special ceramic |
| ■ Screw-in body: | |
| ◆ NRG 16-61, NRG 17-61, NRG 19-61 | 1.4571, X6CrNiMoTi17-12-2 |
| ◆ NRG 111-61 | 1.4529, X1NiCrMoCuN25-20-7 |

pH value

- | | |
|--------------|-------------------------|
| ■ NRG 111-61 | Maximum admissible = 10 |
|--------------|-------------------------|

Electrode lengths supplied

- 500 mm, 1000 mm, 1500 mm
- The electrode extension can be shortened

Conductivity range at 25 °C

- | | |
|-----------------------------------|--|
| ■ NRG 16-61, NRG 17-61, NRG 19-61 | 0.5 µS/cm to 10,000 µS/cm |
| ■ NRG 111-61 | 0.1 µS/cm to 100 µS/cm, with measuring surface extension |

Sensitivity

- 0.1 µS/cm at an immersion depth of 5 mm, with measuring surface extension

Supply voltage

- 24 V DC \pm 20%

Power consumption

- Max. 7 W

Technical data

Current input

- Max. 0.3 A

Internal fuse

- T2A

Safety cutout at excessive temperature

- Cutout occurs at an excessive temperature of 75 °C in the electrode tip

Electrode voltage

- Approx. 2 V_{SS} at no load

Input/output

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

Indicators and controls

- 1 x green 4-digit, 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

- NRG 16-61, NRG 17-61, NRG 19-61 approx. 2.1 kg
- NRG 111-61 approx. 2.7 kg

Admissible installation positions

- Vertical
- Oblique to a maximum inclination of 45°, with the electrode rod limited to a length of 1000 mm maximum.

Example name plate/Identification of NRG 1x-61








 Betriebsanleitung beachten! See installation instruction!	
 Vor dem Öffnen des Deckels Gerät freischalten! Before removing cover isolate from power supplies!	
1	
2	
3	
4	5 6 7
 bar (psi)	8
 °C (°F)	Tamb = T °C (°F)
9	10
L/H=	
ppm	µS/cm
11	
12	
13	
14 UK CA	15 EAC CE 
16 GESTAMP AG Münchener Str.77 28215 Bremen Made in Germany	17 
18  12345678-12345678	

Fig. 5

- 1 Safety note
- 2 Equipment designation
- 3 Equipment function
- 4 Nominal pressure rating
- 5 Connection thread
- 6 Material of screw-in body
- 7 IP rating
- 8 Operating data (maximum pressure and temperature)
- 9 Supply voltage
- 10 Power consumption
- 11 Data interface
- 12 Safety integrity level
- 13 Type-approval number
- 14 Conformity marking
- 15 Disposal information
- 16 Manufacturer
- 17 Protection class
- 18 Material number-serial number



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

Factory settings

NRG 1x-61 level electrodes are delivered ex works with the following settings:

- Baud rate: 50 kbit/s
- Limiter ID: 0005
- PW: oFF

Overall view

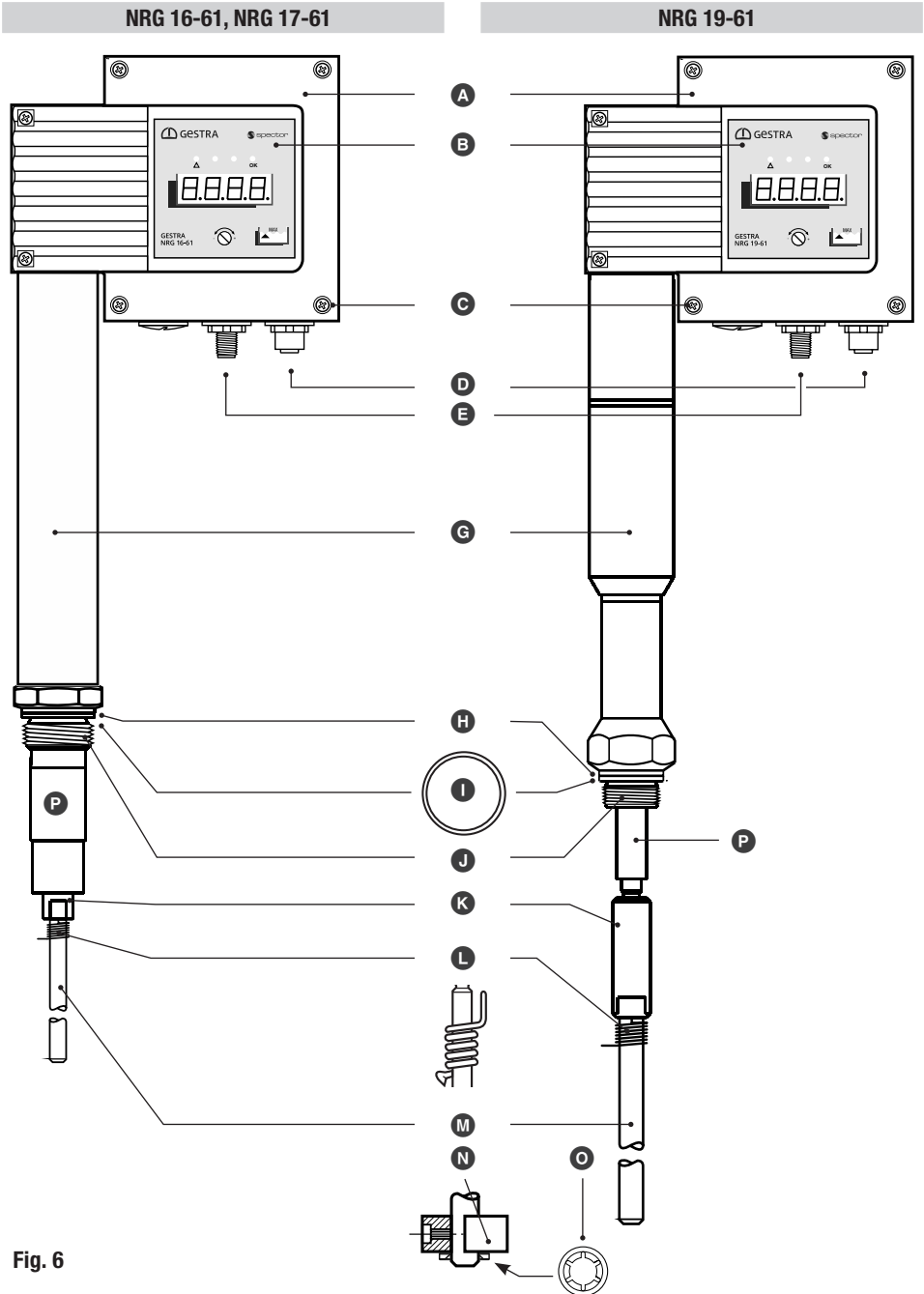


Fig. 6

Overall view

NRG 111-61

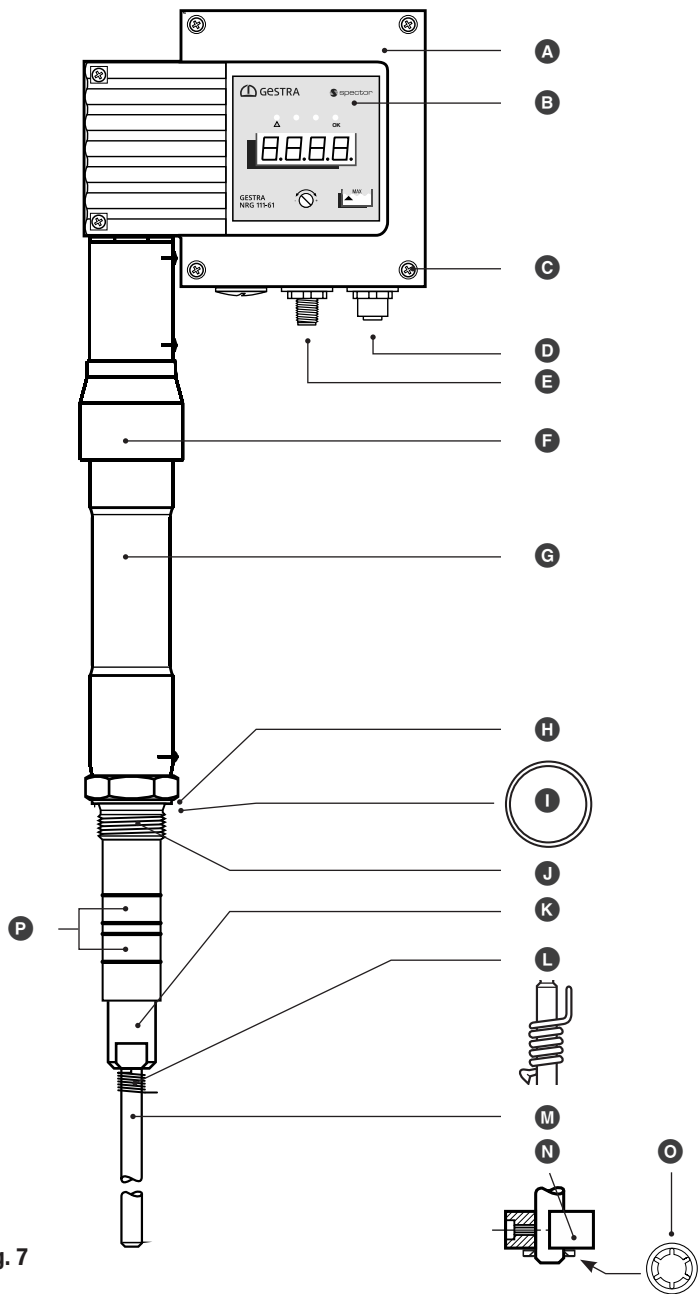


Fig. 7

Overall view

Key to Fig. 6 and Fig. 7

- A** Terminal box
- B** Operating panel with 4-digit LED display/alarm LEDs and rotary knob, see page 47
- C** Cover screws M4 x 16 mm
- D** M12 CAN bus socket, 5-pole, A-coded
- E** M12 CAN bus connector, 5-pole, A-coded
- F** Protective sleeve, on NRG 111-61 only *
- G** Sheath
 - For NRG 16-61 and NRG 17-61 with a simplified view of the different designs.
- H** Seal seat for sealing ring
- I** Sealing ring D 27 x 32, form D, DIN 7603-2.4068, bright annealed for NRG 16-61, NRG 17-61, NRG 19-61
Sealing ring D 33 x 39, form D, DIN 7603-2.4068, bright annealed for NRG 111-61
- J** Electrode thread
- K** Electrode tip
- L** Retaining spring
- M** Electrode extension
- N** Measuring surface extension
- O** Lock washer
- P** Insulator

* Description of protective sleeve **F** for the NRG 111-61 level electrode

Mistakes during transport or installation can cause the ceramic in the NRG 111-61 level electrode to break, so that hot steam or hot water escapes through the pressure relief hole. The protective sleeve **F** diverts escaping hot steam or hot water downwards.

Dimensions of the NRG 16-61, NRG 17-61

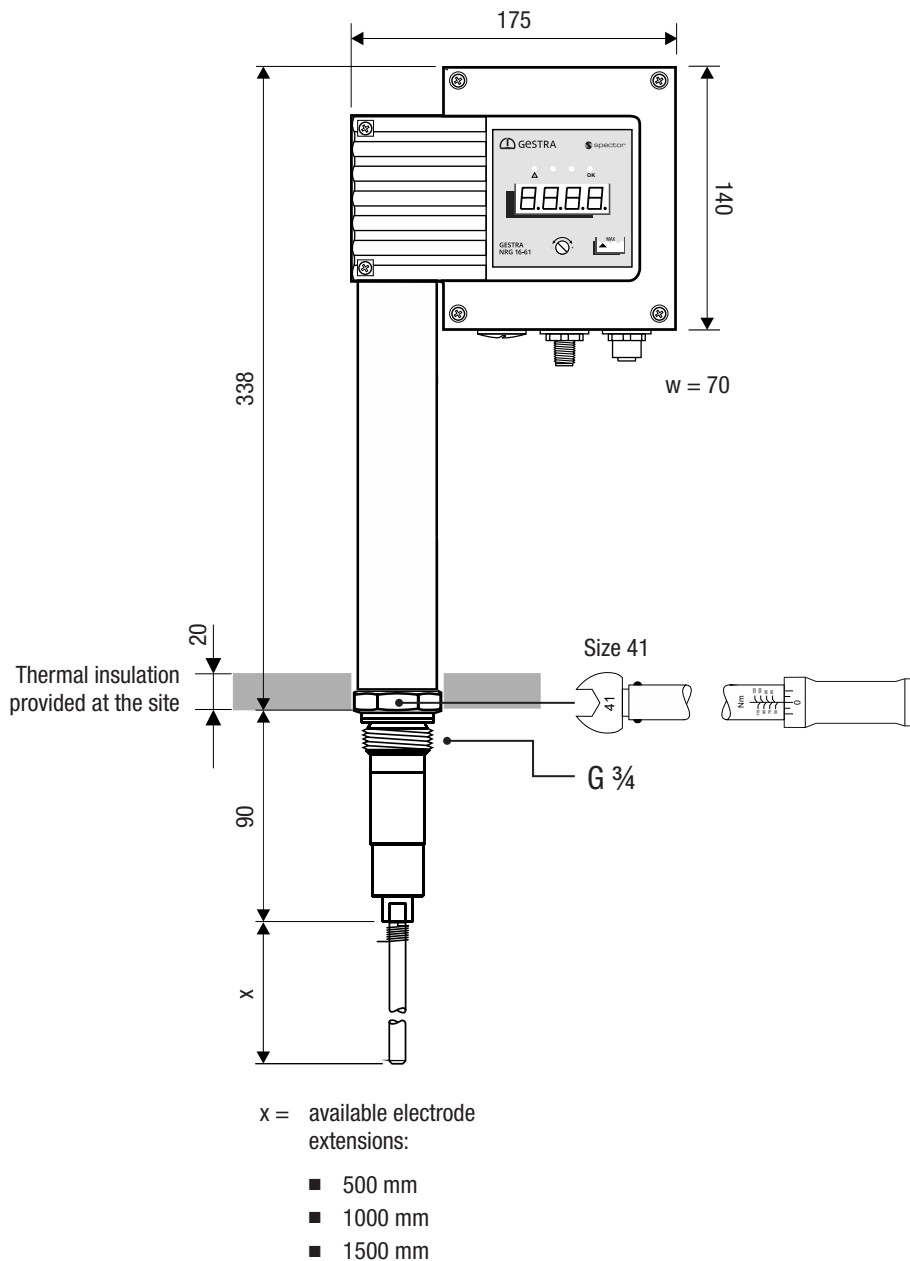


Fig. 8 All lengths in mm

Dimensions of the NRG 19-61

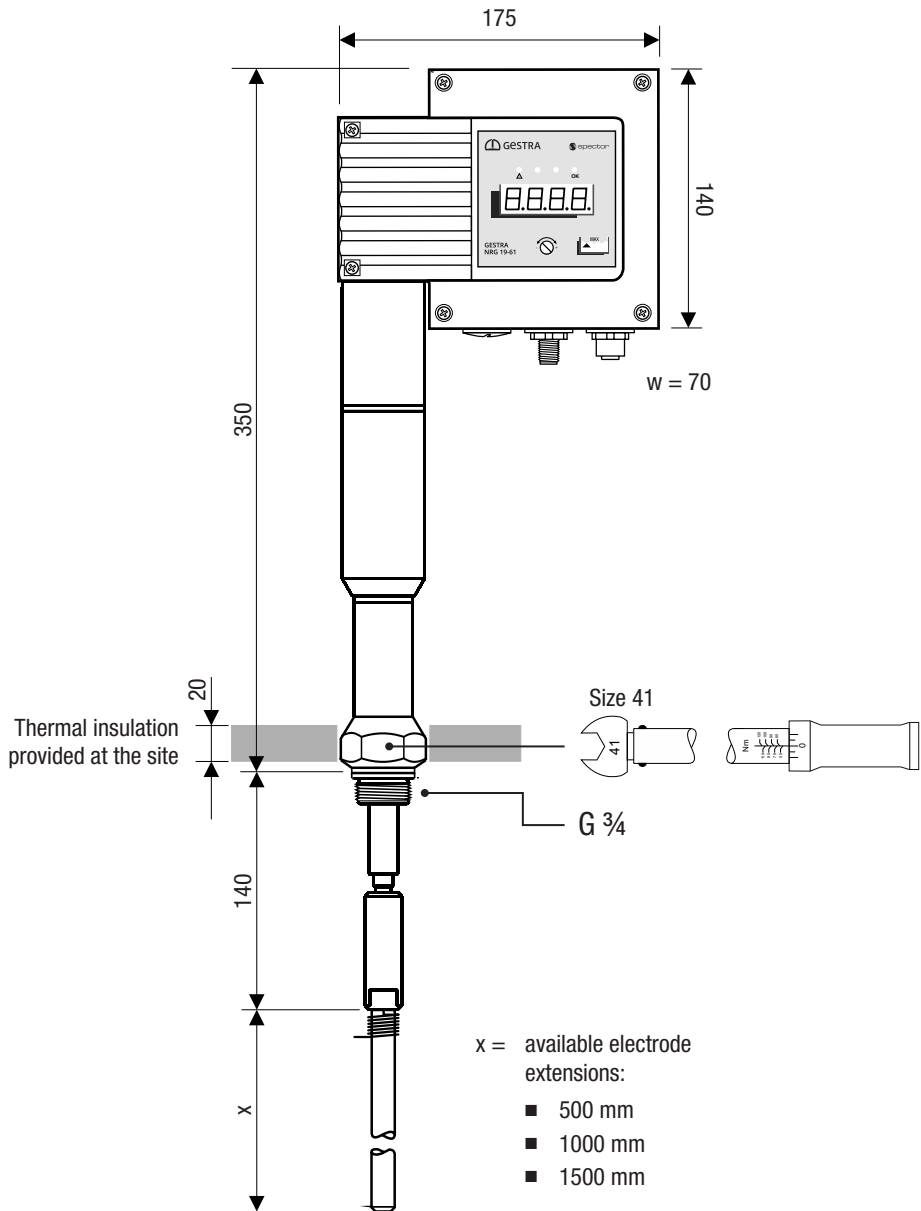


Fig. 9 All lengths in mm

Dimensions of the NRG 111-61

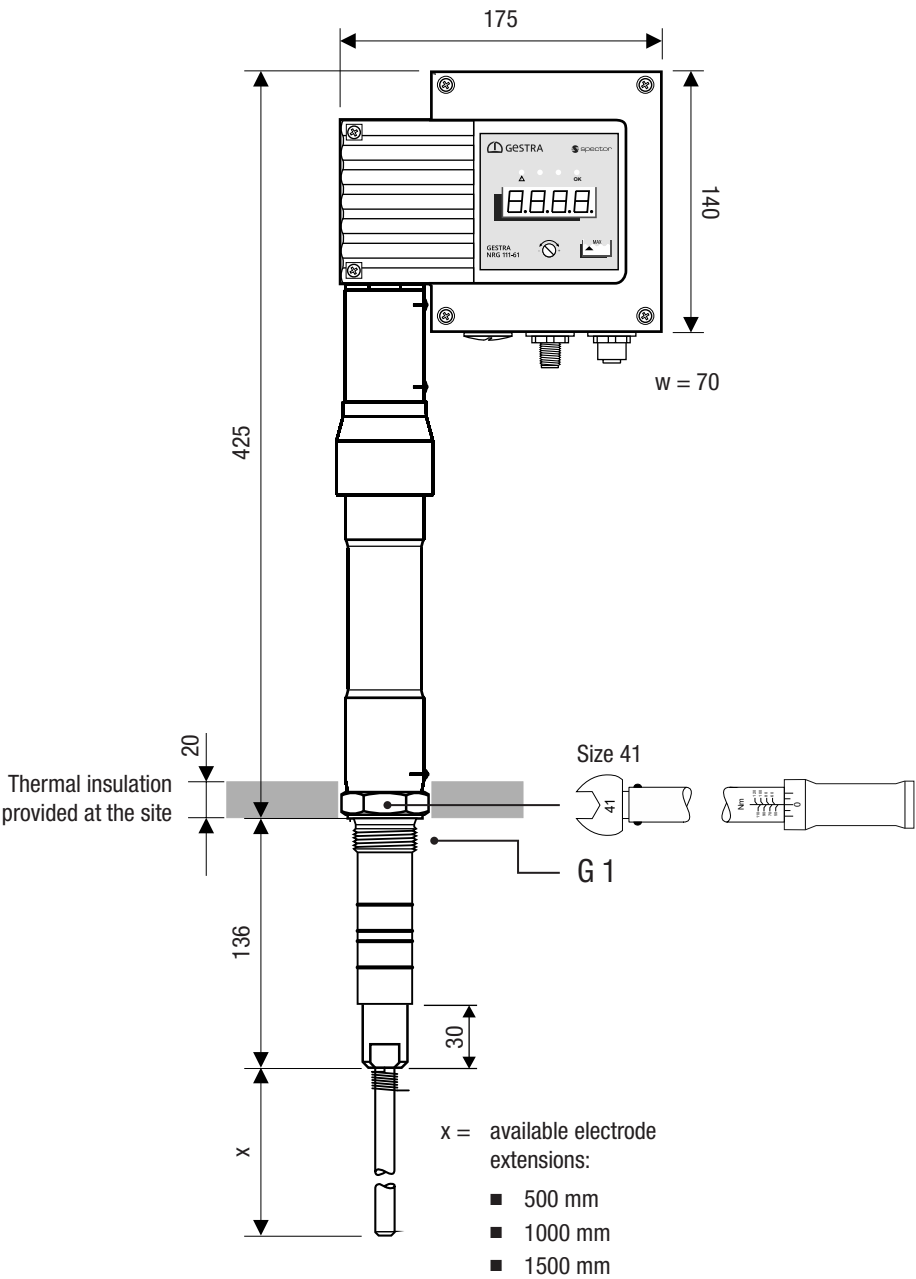


Fig. 10 All lengths in mm

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 plant parts to a central earthing point to prevent equalisation currents.
- Use a cover to protect the equipment from direct sunlight, condensation and heavy rain.
- Use UV-resistant cable ducts for routing the connecting cable.
- Take further measures to protect the equipment from harmful environmental influences such as lightning, insects and animals, and salty air.

You will need the following tools:

- Size 13, 19 and 41 open-ended spanners
- Torque wrench (with size 41 open-ended spanner attachment)
- Scriber or pen
- Hacksaw
- Hieb 2 flat file
- Allen key (size 3)

Preparing for installation

Establishing the measuring length of the level electrode

ATTENTION



Incorrectly shortened electrodes will not be able to detect high water.

Electrodes must not be shorter than the permitted high water switchpoint.

NRG 16-61, NRG 17-61, NRG 19-61, NRG 111-61

1. Manually screw the electrode extension **M** into the electrode tip **K**.
2. Determine the required measuring length of the level electrode and mark this on the electrode extension **M**.
3. Unscrew the electrode extension **M** from the electrode tip **K** once more.
4. Shorten the electrode extension **M** as far as the mark and file the cut edge.

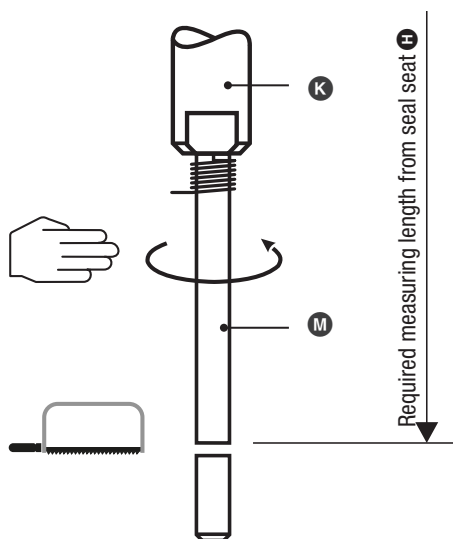


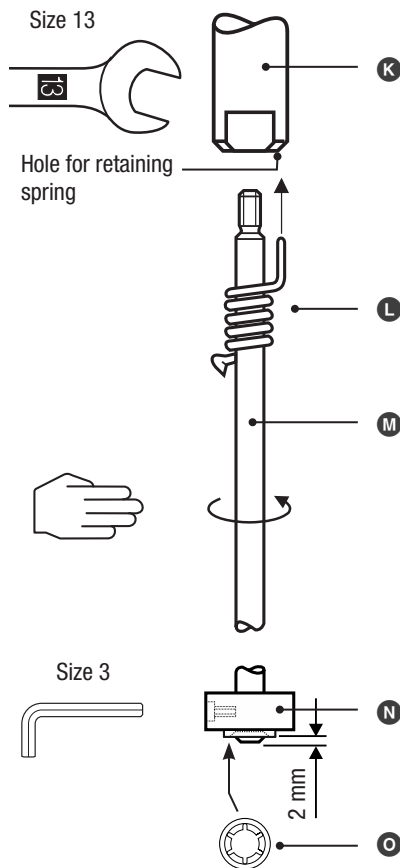
Fig. 11

Preparing for installation

Screwing the level electrode and electrode extension together

NRG 16-61, NRG 17-61, NRG 19-61, NRG 111-61

- Following a visual inspection, firmly screw the electrode extension into the electrode tip **K**.
- While doing this, push the retaining spring **L** onto the electrode extension **M** until it is securely held in the hole provided.
Use an open-ended spanner (size 13) to firmly hold the electrode during this work.



If necessary (e.g. for low conductivity of around 0.5 $\mu\text{S}/\text{cm}$), you can fit the optional measuring surface extension **N.**

- Push the measuring surface extension **N** onto the electrode extension **M**.



Make sure the electrode extension **M** protrudes from the underside by at least 2 mm.

- Using an Allen key, screw the measuring surface extension firmly in place.
- Push the supplied lock washer **O** over the electrode extension **M** from below and press it against the measuring surface extension.

Fig. 12

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 boiler pressure before you unscrew the level electrodes.
- Only remove the level electrodes at a boiler pressure of 0 bar.

WARNING



Hot level electrodes can cause severe burns.

Level electrodes are extremely hot during operation.

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

ATTENTION



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

- Inspect the sealing surfaces of the tank standpipe and flange cover to ensure they are perfectly machined, see Fig. 13 and Fig. 14.
- Take care not to bend the level electrode during installation!
- The angle of inclination of the level electrode must not exceed 45°, and the length of the electrode rod is limited to 1000 mm maximum.
- Do **not** install the terminal box **A** or upper part of the sheath **G** 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. 17 to Fig. 19.
- To prevent current leaks, maintain a minimum distance of 14 mm between the electrode and earth (flange or tank wall).
- Check the boiler standpipe and flange during the preliminary boiler inspection.

Installation

1. Inspect the sealing surfaces of the tank stand-pipe or flange cover.

Sealing surfaces must be perfectly machined as shown in Fig. 13 and Fig. 14.

Sealing surface dimensions for NRG 16-61, NRG 17-61, NRG 19-61

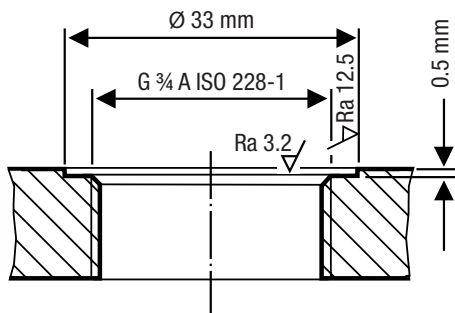


Fig. 13

Sealing surface dimensions for NRG 111-61

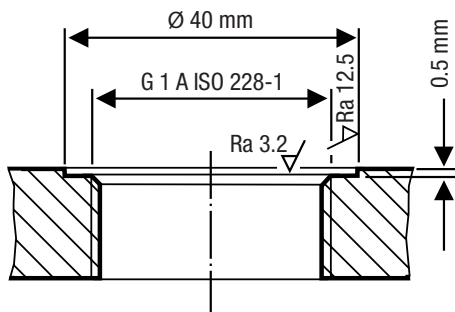


Fig. 14

Installation

2. Push the supplied sealing ring ❶ onto the seal seat ❷ 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 ❶.
 - ◆ **Sealing ring D 27 x 32**
DIN 7603-2.4068, bright annealed for NRG 16-61, NRG 17-61, NRG 19-61
 - ◆ **Sealing ring D 33 x 39**
DIN 7603-2.4068, bright annealed for NRG 111-61

Prohibited seal materials:

- Hemp, PTFE tape
- Conductive paste or grease

Example

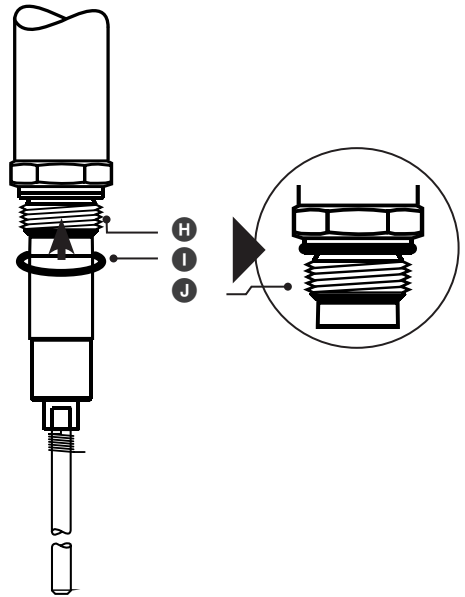


Fig. 15

3. If necessary, apply a small quantity of silicone grease (e.g. Molykote® P40) to the electrode thread ❷.
4. Screw the level electrode into the threaded coupling 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 16-61, NRG 17-61, NRG 19-61 = 160 Nm
- NRG 111-61 = 350 Nm

Installation example with dimensions, see Fig. 17, page 33

Installation

Installing two level electrodes in a flange by detaching a terminal box

When installing or removing the level electrode (e.g. when installing for the first time, during annual cleaning/maintenance or when taking out of service), you may need to detach the terminal box from the electrode because of space issues.



A self-locking nut connects the terminal box to the electrode. Therefore, before establishing the electrical connection, you can rotate the terminal box max. $\pm 180^\circ$ (a half turn) in the desired direction. This is often sufficient for alignment.

If, and only if, this option is not sufficient, detach the terminal box from the electrode and fit it again later on (see steps below).



ATTENTION



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

The steps below must be carried out exclusively by the manufacturer's service personnel or a specialist expressly authorised by the manufacturer to perform this work.



Avoid open circuits, damaging terminals and subsequent short circuits

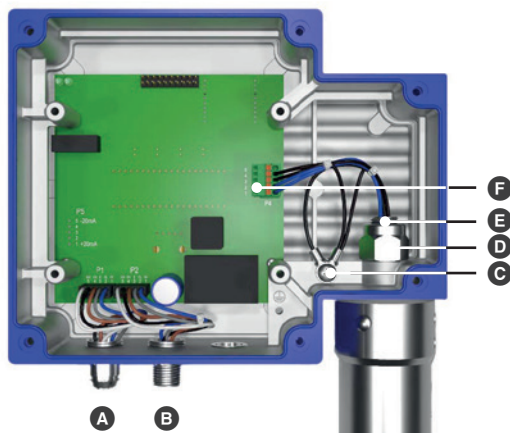
- When screwing the level electrode into or out of the standpipe, take care not to twist or trap the connecting cables from the electrode to the terminal box!
- Therefore, detach all connecting cables from the electrode to the terminal box before unscrewing the level electrode from the standpipe.

Installation

Installing two level electrodes in a flange by detaching a terminal box

1. Fit the first electrode as described above.
2. Undo and remove the rear panel of the **second electrode** terminal box opposite the operating unit.

Interior view of terminal box:



Do not twist or damage the connecting cables of the electrode.

Fig. 16

Key:

- Ⓐ M12 socket
- Ⓑ M12 connector
- Ⓒ Ring cable lug (earth connection)
- Ⓓ Self-locking nut (size 19)
- Ⓔ Cable gland for the connecting cable to the electrode
- Ⓕ Terminal block with connector (detachable)

3. Unplug the connector from the terminal block Ⓕ.
4. Detach the ring cable lug Ⓒ from the terminal box.
5. Undo the nut Ⓓ in the terminal box of the **second electrode** using a size 19 open-ended spanner.
You can now rotate the terminal box freely on the electrode.
6. Install the **second electrode** in the flange.

Installation

Installing two level electrodes in a flange by detaching a terminal box

7. Rotate the terminal box so that it is correctly orientated.



Ensure the terminal box is correctly orientated/aligned – position it correctly in advance.

8. Tighten the nut in the terminal box to a torque of 25 Nm.

9. Re-insert the connector in the terminal block **F** until you hear it click into place.

The connector cannot be inserted the wrong way round. If necessary, use cable ties to tie the connecting cables together in the terminal box.

10. Screw the ring cable lug **C** (earth connection) back onto the terminal box.

11. Finally, check the wiring one more time.

12. Close the rear panel of the second electrode terminal box and screw back on.

Installation example with dimensions, see Fig. 18, page 34

Installation examples with dimensions

Use as an internal safety high-level limiter with protective tube provided on site.

Illustration not to scale.

Dimensions marked * apply to the NRG 111-61

Key, see page 36

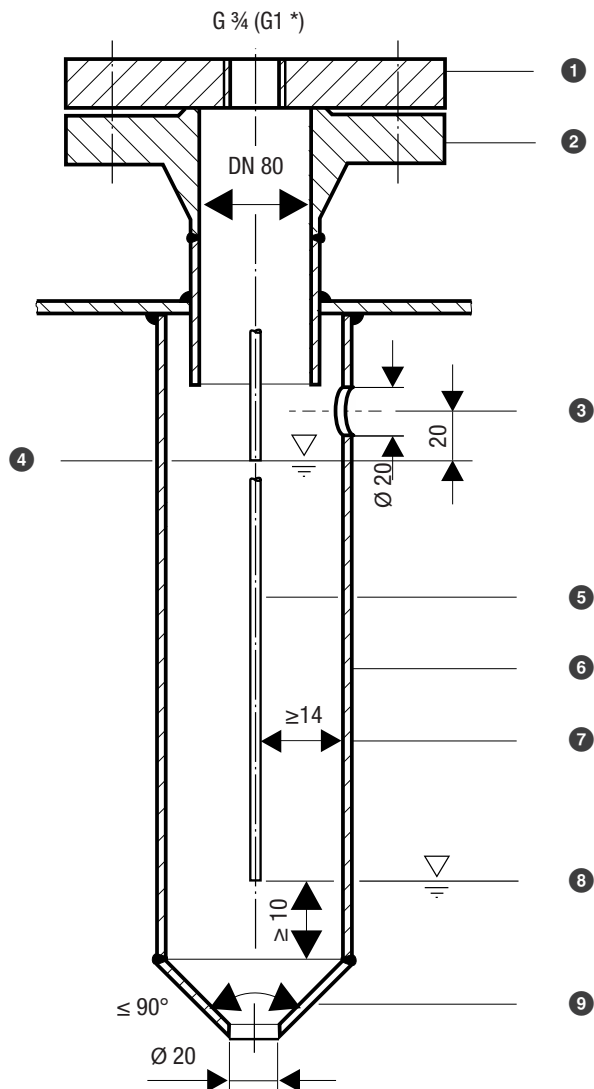


Fig. 17

All lengths and diameters in mm

Installation examples with dimensions

Use as an internal safety high-level limiter with protective tube provided on site, combined with water level control or water level limiter.

Illustration not to scale.

Key, see page 36

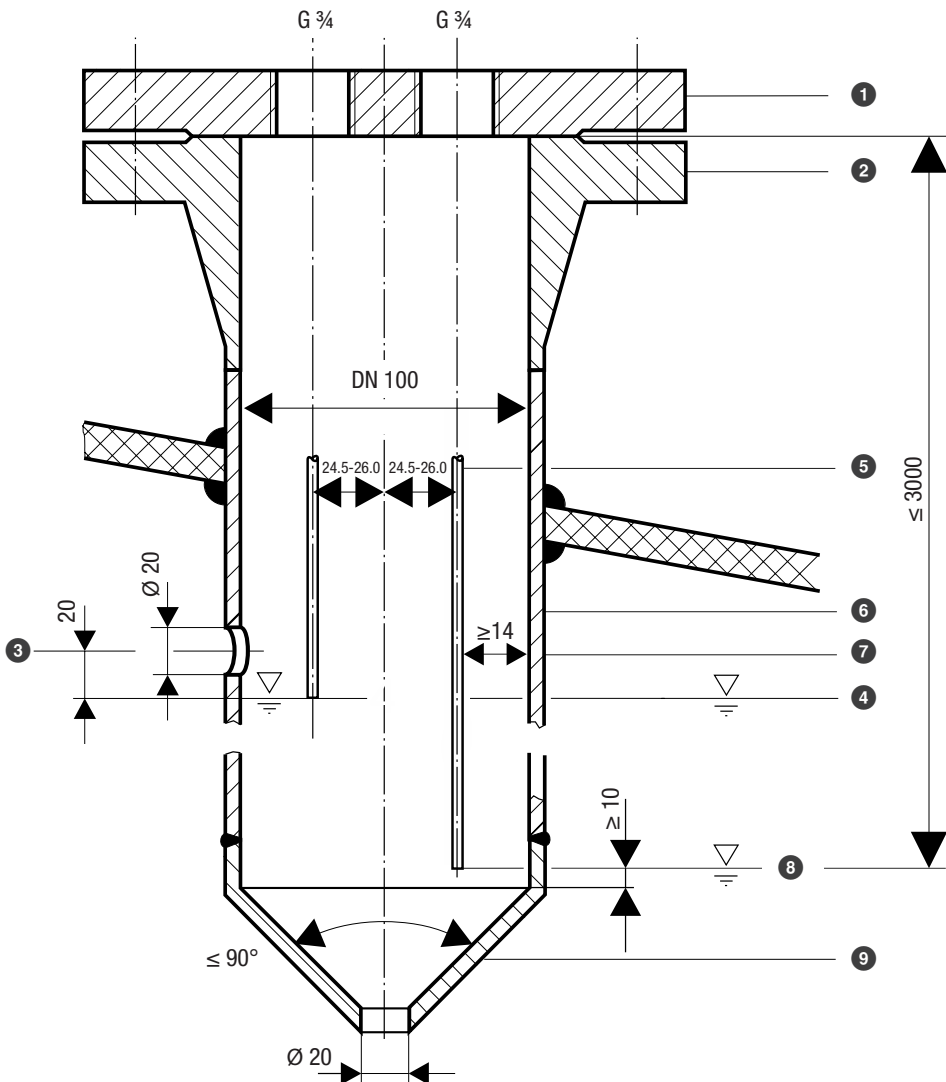


Fig. 18

All lengths and diameters in mm

Installation examples with dimensions

Level pot \geq DN 80 as an external safety high-level limiter

Illustration not to scale.

Dimensions marked * apply to the NRG 111-61

Key, see page 36

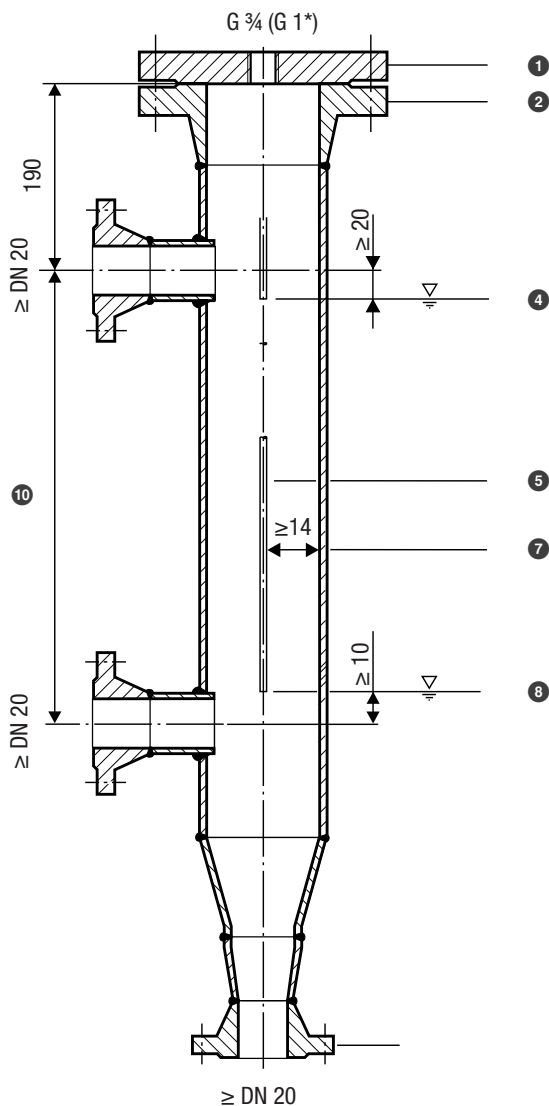


Fig. 19

All lengths and diameters in mm

Installation examples with dimensions

Key Fig. 17 to Fig. 19

- ❶ Fig. 17: Flange (PN 40, 63, 160, 320) EN 1092-1
- Fig. 18: Flange (PN 40, 63, 160) EN 1092-1
- Fig. 19: Flange (PN 40, 63, 60, 320) EN 1092-1
- ❷ Standpipe
- ❸ Pressure relief hole (locate as close to the boiler wall as possible!)
- ❹ High water (HW)
- ❺ Electrode rod, $d = 8 \text{ mm}$
- ❻ Fig. 17 (single electrode): Protective tube DN 80
- Fig. 18 (two electrodes): Protective tube DN 100
- ❼ Electrode spacing $\geq 14 \text{ mm}$ (air gaps and creepage paths)
- ❽ Low water (LW)
- ❾ Fig. 17 (single electrode): Reducer DIN 2616-2
- Fig. 18 (two electrodes): Reducer DIN 2616-2
- ❿ Fig. 19: Centre distance of standpipe

Positioning the terminal box

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

ATTENTION



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

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



If the terminal box needs to be rotated by **$>180^\circ$** , proceed as described on pages 30 to 32.

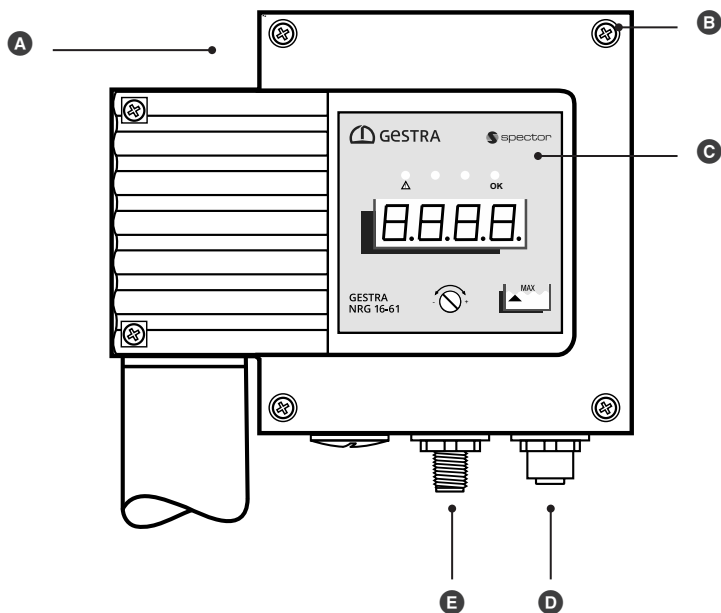


Fig. 20

- A** Terminal box
- B** Cover screws M4 x 16 mm
- C** Operating panel with 4-digit LED display/alarm LEDs and rotary knob, see page 47
- D** M12 CAN bus socket, 5-pole, A-coded
- E** M12 CAN bus connector, 5-pole, A-coded

Connecting the CAN bus system

Bus line, cable length and cross-section

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

Example

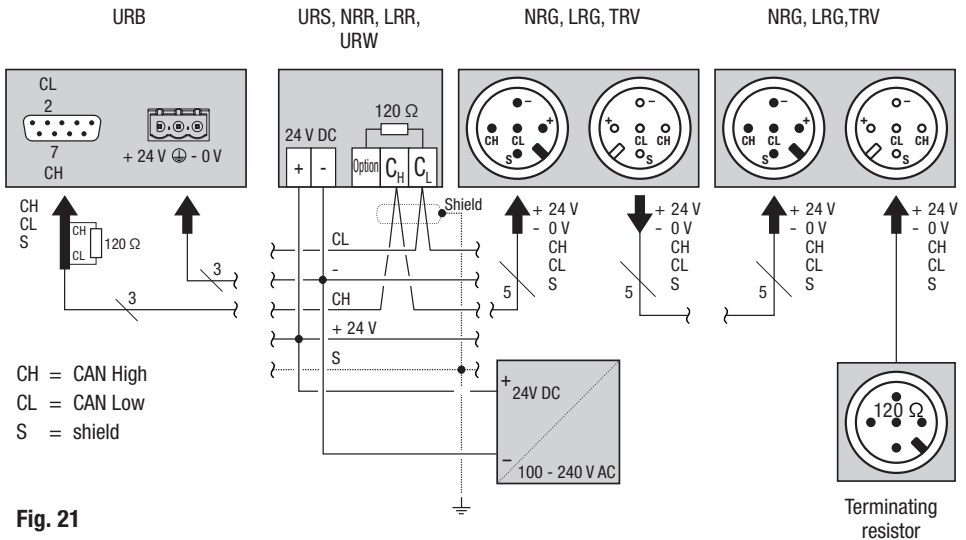


Fig. 21

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!
- Use a central earth to prevent differences in potential between plant parts.
 - ◆ Connect the bus line shields to one another all the way along, and connect them to the central earthing point (CEP).
- If two or more system components are connected in a CAN bus network, a 120 Ω terminating resistor must be connected to the **first** and **last** devices between terminals C_L/C_H.
- Use the CAN bus connector with terminating resistor if you are using the level electrode as the first or last device.
- Only **one** URS 60 and **one** URS 61 safety control unit may be used in the CAN bus network.
- The CAN bus network must not be interrupted during operation!
If it is, an alarm is triggered.

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

If non pre-wired control cables are used, you must wire the CAN bus connector and couplings as shown in the wiring diagram **Fig. 22**.

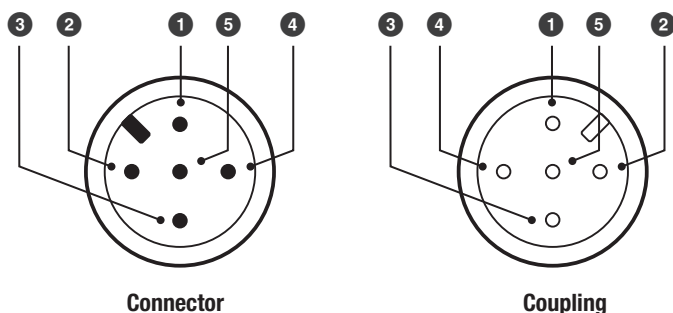


Fig. 22

- | | |
|----------|--------------------|
| ① S | Shield |
| 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 each terminal device of the CAN bus line?

Next, switch on the supply voltage.

Changing the factory settings if necessary

You will need the following tools

- Size 2.5 slotted screwdriver

Changing parameters with password protection enabled



When password protection is enabled, you must enter the password before changing parameters, see page 41. Password protection applies only to the menu items with parameters that the user can actually change.



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

Password protection after restarting the equipment




Parameters are also password-protected when the equipment has been restarted, if password protection was previously enabled, see page 45.

Default ex-works password

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

Bringing into service

Selecting and setting a parameter:

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

The display alternates between the set parameter and its current value, e.g. bd.rt → "value" → bd.rt.


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

o.P.E.r. → Id → bd.rt → °C.in → r1.r2 → diSP → InFo → PW → o.P.E.r.

Key to parameters, see page 42.



If you do not enter anything for 30 seconds, the display automatically returns to "o.P.E.r."

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


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


or (password protection disabled)


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


With password entry:

3. Release the rotary knob.

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


5.  Enter the password "1902". You can skip to the next flashing digit by briefly pressing the rotary knob.
- / + reduce/increase the value.

6.  After the final digit, press and hold the rotary knob until "donE" is displayed. The display then alternates between the selected parameter and its current value.

7.  Press and hold the rotary knob until the current parameter value flashes on the display. Move on to step 8.

Bringing into service

Without password entry:


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

Each parameter has an individual, admissible value range.

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



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

9.  Save your settings by pressing the rotary knob for approx. 1 second.
The message “**done**” is shown and the parameter appears on the display once more.

Pay attention to the time limit for password entry



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

Key to parameters:

- o.P.E.r. = operational (normal operating state)
- Id = limiter ID
- bd.rt = baud rate
- °C.in = ambient temperature of terminal box
- r1.r2 = ratio of RM:RK (measuring electrode: compensation electrode)
>1 means ALARM = immersed.
- diSP = initiate a display test
- InFo = show software version and equipment type
- PW = enable/disable password protection

Bringing into service

Notes on changing communication parameters “bd.rt, Id”



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

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

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



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

Changing the baud rate



Set the same baud rate for all bus nodes.

Pay attention to the setting instructions on page 41 ff. 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 setting by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the baud rate, restart the entire system.

Changing the limiter ID



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

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

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

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

Bringing into service

Pay attention to the setting instructions on page 41 ff. and proceed as follows:

1. Select the parameter “**Id**”.
2. Press and hold the rotary knob until the current limiter ID flashes on the display.
3. Set the desired ID (0001 to 0008).
4. Save your setting by pressing the rotary knob for approx. 1 second.
5. After you have successfully changed the limiter ID, restart the entire system.

Manually initiating a display test

Pay attention to the setting instructions on page 41 ff. and proceed as follows:

1. Select the parameter “**diSP**”.
2. Press and hold the rotary knob until the display test starts and shows “....”.
3. The following numbers run across the display from right to left:
“...., 1, 2, 3, 4, 5, 6, 7, 8, 9,”
4. Check that all numbers are displayed correctly.
The display test runs automatically until it has finished, and cannot be interrupted.
5. The display test ends automatically with the message “**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 electrode with an identical one from GESTRA AG.
-

Viewing the software version and equipment type “InFo”

Pay attention to the setting instructions on page 41 ff. and proceed as follows:

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

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

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

Bringing into service

Enabling/disabling password protection

The default ex-works password cannot be changed

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

Pay attention to the setting instructions on page 41 ff. and proceed as follows:

1. Select the parameter “**PW**”.
“**PW**” alternates with the current status, e.g. “**oFF** or **on**”, on the display.
2. Press and hold the rotary knob until “**PASS**” is displayed.
3. Release the rotary knob.
4. Next, press the rotary knob until “**0000**” appears and the right-hand digit flashes.
5. Enter the password “**1902**”. You can skip to the next flashing digit by briefly pressing the rotary knob.
6. After the final digit, press and hold the rotary knob until “**donE**” is displayed.

The following may appear on the display:

- **donE** The correct password was entered
 - **FAiL** The wrong password was entered
 - **quit** Timeout. Password entry has been aborted.
7. Release the rotary knob.
“**PW**” alternates with the current status, e.g. “**oFF** or **on**”, on the display.
 8. Press the rotary knob again until “**oFF** or **on**” flashes on the display.
 9. Turn the rotary knob and set the desired status.
 - **on** = password protection is enabled
 - **oFF** = password protection is disabled
 10. Press and hold the rotary knob until “**donE**” is displayed.
 11. Release the rotary knob.
“**PW**” alternates with the set status, e.g. “**oFF** or **on**”, on the display.
 12. You can quit the menu by waiting (message “**quit**”) or by turning the rotary knob to the actual value.

Bringing into service

Checking the high water switchpoint by raising the level

ATTENTION



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

- Check the high water switchpoint when bringing into service and every time the NRG 1x-61 level electrode is replaced.
- Never start up any plant that has not passed the high water switchpoint check.
- NRG 1x-61 level electrodes may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

Checking the limiter switchpoints by initiating a test function

Check the high water (HW) switchpoint by allowing the water to rise above the set limit. In this case, the equipment must behave as if there were an alarm, see page 49, “Test” table.

Lockout function



If the installation requires a lockout function, this must be implemented in the downstream (safety) circuit. This circuit must conform to the requirements of EN 50156.

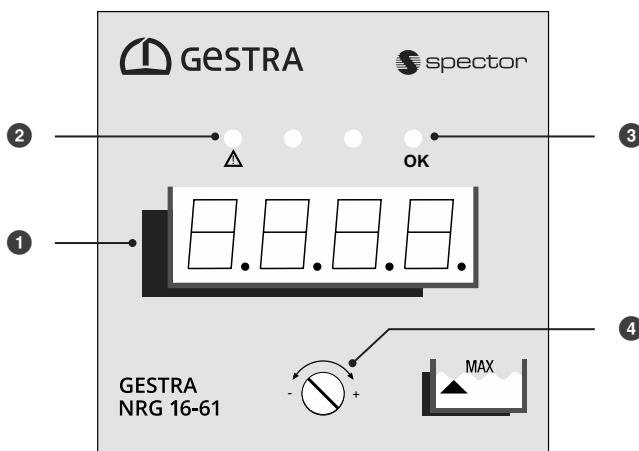


Fig. 23

The operating panel:

- ① Actual value display/error code/limit value, green, 4 digits
- ② LED 1, alarm/fault, red
- ③ LED 2, function OK, green/flashing during self-test
- ④ Rotary knob/pushbutton for operation and settings

Notes on the priority of the various indications



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

Priority 1 = fault indications as per error code table, see page 51 ff.

Priority 2 = high-level (HW) alarm

Priority of error code display

Higher priority error codes overwrite lower ones on the display!

Starting, operation and testing

Relationship between equipment status, display and alarm LEDs:

Starting		
Switch on supply voltage	LED test, all LEDs light up Indication: S-xx = software version t-02 = equipment type NRG 1x-61	The system is started and tested. The LEDs and display are tested.

Operation		
Level electrode no longer immersed	Indication: o.P.E.r. LED 2: Operating LED lights up green	Abbreviation of "operational"
Level electrode immersed	Indication: HI.LE LED 1: Alarm LED lights up red	Indication HI.LE (HIGH LEVEL) and triggering of alarm. After the time delay has elapsed, the URS 60/URS 61 safety control unit opens the output contacts.
	LED 2: Operating LED is OFF	Alarm is triggered

Behaviour in the event of a fault indication (error code display)		
On the occurrence of a fault	Indication: e.g. E.008	An error code is continuously displayed, error codes see page 51
	LED 1: Alarm 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"> ■ The fault or error state is transferred to the URS 60/URS 61 safety control unit via CAN data telegram. ■ The fault triggers an immediate safety shutdown there. ■ The affected signal output is activated. ■ The URS 60/URS 61 safety control unit does not automatically lock the safety contacts. 		



Electrode alarms and fault indications cannot be acknowledged.

When the alarm or fault indication is cancelled the display also goes blank, and the URS 60/URS 61 safety control unit closes the safety contacts and deactivates the relevant signal outputs once more.

See the following page for more information and tables.

Starting, operation and testing



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

Testing		
Checking the safety function by simulating the alarm state		
In operating mode: Press the rotary knob on the NRG 1x-61 and hold until the end of the test or press button 1, 2, 3 or 4 of the URS 60/URS 61 safety control unit and hold until the end of the test or open the relevant menu on the URB 60 and initiate the test function.	Indication: HI.LE	The system simulates immersion of the level electrode.
	LED 1: Alarm LED lights up red	High-level alarm
	LED 2: Operating LED is OFF	Alarm is triggered
	<ul style="list-style-type: none"> ■ The switch-off delay is running, the signal output closes with/without a delay. ■ The delay time has elapsed, the output contacts are open and the signal outputs are closed. ■ The test ends. 	



Faulty equipment jeopardises plant safety.

- If the level electrode does not behave as described above, it may be faulty.
- Perform failure analysis.
- NRG 1x-61 level electrodes 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, 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 each terminal device of the CAN bus line?

Configuration of level electrodes:

- Are the level electrodes set to the correct limiter ID 1,2,3,4,5,6,7,8?
- Limiter IDs cannot be assigned more than once.

Baud rate:

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

ATTENTION



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

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

System malfunctions

Indication of system malfunctions using error codes

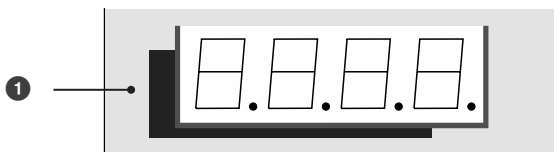


Fig. 24

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

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.008	Ch1Ch2DiffErr	EMC or internal error	Check the installation location Replace the level electrode
E.009	CH2RM:RKErr	Contamination or loss of insulation	Remove, check and clean the level electrode
E.010	CH2RM+RKErr	EMC or measuring voltage error	Reduce conductivity in hot water installations
E.011	CH2RangeErr	Ch2 Out of Range	Check the wiring Replace the level electrode
E.012	CH1RM:RKErr	Contamination or loss of insulation	Remove, check and clean the level electrode
E.013	CH1RM+RKErr	EMC or measuring voltage error	Reduce conductivity in hot water installations
E.014	Ch1RangeErr	Ch1 Out of Range	Check the wiring Replace the level electrode
E.015	DutyErr	EMC error or measurement frequency problem	Check the installation location Replace the level electrode
E.016	FreqErr	EMC error or measurement frequency problem	Check the installation location Replace the level electrode
E.017	MWChErr	Reading test failed	Check the wiring Replace the level electrode
E.018	PWMErr	EMC error or external voltages	Check the installation location Replace the level electrode

System malfunctions

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.019	V6Err	EMC or voltage error 6.0 V	Check the installation location Replace the level electrode
E.020	V5Err	EMC or voltage error 5.0 V	Check the installation location Replace the level electrode
E.021	V3Err	EMC or voltage error 3.3 V	Check the installation location Replace the level electrode
E.022	V1Err	EMC or voltage error 1.2 V	Check the installation location Replace the level electrode
E.023	V12Err	EMC or voltage error 12 V	Check the installation location Replace the level electrode
E.024	CANErr	Incorrect baud rate or wiring	Check the baud rate, wiring and terminating resistors
E.025	ESMG1Err	EMC error or internal process error	Check the installation location Replace the level electrode
E.026	BISTErr	EMC or internal error	Check the installation location Replace the level electrode
E.027	OvertempErr	Ambient temperature > 75 °C	Check the installation location Lower the ambient temperature of the terminal box

All error codes from E.001 to E.007 not listed here are available as reserves



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

System malfunctions

Common application and usage errors

Non-immersion of the level electrode is not detected ("o.P.E.r." is not displayed)	
Possible causes if no error codes are shown	Remedy
Possible supply voltage failure.	<ul style="list-style-type: none"> ■ Switch on the supply voltage. ■ Check that the wiring conforms to the wiring diagrams.
The electrode extension has a short circuit to earth due to a build-up of deposits on the insulator.	<ul style="list-style-type: none"> ■ Check and clean the insulator. ■ Always use the supplied metal sealing ring, see page 4. ■ Do not use conductive paste or grease on the thread when screwing in the measuring electrode.
The inner seal of electrode rod is damaged.	Replace the level electrode.
The ambient temperature may be too high, > 75 °C.	<ul style="list-style-type: none"> ■ Check the installation location ■ Lower the ambient temperature of the terminal box

Immersion of the level electrode is not detected ("H.I.LE" is not displayed)	
Possible causes if no error codes are shown	Remedy
The pressure relief hole in the protective tube is missing, clogged or flooded.	<ul style="list-style-type: none"> ■ Check the protective tube. ■ Drill a pressure relief hole in the protective tube.
The stop valves of the external measuring cylinder may be closed (optional).	Open the stop valves.
There are insulating deposits on the electrode extension.	Clean the electrode extension.
The electrode terminal box has no earth connection to the tank.	<ul style="list-style-type: none"> ■ Check and clean the sealing surfaces. ■ Always use the supplied metal sealing ring, see page 4. ■ Make sure the thread of the measuring electrode does not have insulating material wound around it, e.g. hemp or PTFE tape.

System malfunctions

Checking installation and function

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

- Check the high water (HW) switchpoint by allowing the water to rise above the set limit. In this case, the equipment must behave as if there were an alarm.
- Check the switchpoint when bringing into service and every time the NRG 1x-61 level electrode is replaced.



System malfunctions in the NRG 1x-61 level electrode also trigger a system malfunction in the URS 60/URS 61 safety control unit. The output contacts open without a delay and the relevant signal output is activated.

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



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

Taking out of service/Disassembly

DANGER



Danger to life from scalding caused by escaping hot steam.

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

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

WARNING



Hot level electrodes can cause severe burns.

Level electrodes are extremely hot during operation.

- Perform installation and maintenance work only on level electrodes that have 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.



If the terminal box needs to be rotated by **>180°** in relation to the electrode, proceed as described on pages 30 to 32.

Disposal

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

Returning decontaminated equipment

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

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

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



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

Please proceed as follows:

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

Declaration of Conformity; Standards and Directives

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

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

GESTRA AG

Münchener Straße 77

28215 Bremen

Germany

Tel. +49 421 3503 0

Fax +49 421 3503 393

e-mail info@de.gestra.com

Website www.gestra.com

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



You can find our authorised agents around the world at:

www.gestra.com

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

UK Importer: GESTRA UK Ltd

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West Portway Business Park, Andover,
Hampshire SP10 3TS
United Kingdom