

Level Electrode

NRG 16-11

NRG 17-11

NRG 19-11

NRG 111-11

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Important Notes

Usage for the intended purpose

Use level electrodes NRG 16-11, NRG 17-11, NRG 19-11 and NRG 111-11 only in conjunction with level switch NRS 1-50 for low-level limiting (low level alarm). The equipment must not be used in explosion risk areas.

Safety note

The level electrode is an item of equipment with safety function (PED) and must only be installed and commissioned by qualified and competent staff.
Retrofitting and maintenance work must only be performed by qualified staff – who through adequate training – have achieved a recognised level of competence.



Danger

When loosening the electrode steam or hot water might escape.
This presents the danger of severe scalds to the whole body.
It is essential not to mount or dismantle the electrode unless the boiler pressure is verified to be 0 bar.

The electrode becomes hot during operation.
Touching the hot equipment presents the risk of severe burns to hands and arms.
All installation and maintenance work must only be performed when the equipment is cold.

If the internal ceramic insulation of the level electrode NRG 111-11 breaks hot steam may escape through the lateral relief vent of the electrode stem.
This presents the danger of severe scalding!
Do not stand close to the electrode during operation.



Attention

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

PED (Pressure Equipment Directive)

The equipment fulfills the requirements of the PED 2014/68/EU. The equipment can be used with fluids of group 1 and 2. With CE marking (except for equipment according to section 3.3 of the PED).

ATEX (Atmosphère Explosible)

The equipment constitutes a simple item of electrical equipment. According to the European Directive ATEX 2014/34/EU the equipment may only be used in potentially explosive atmospheres if it is provided with approved Zener barriers.

Applicable in Ex zones 1, 2. The equipment does not bear an Ex marking. The suitability of the Zener barriers is certified in a separate document.

Explanatory Notes

Scope of supply

NRG 16-11

- 1 Level electrode NRG 16-11, PN 40
- 1 Joint ring 27 x 32, form D, DIN 7603, 2.4068, bright-annealed
- 1 Disk with set screw (measuring surface extension) – optional
- 1 Retaining ring – optional
- 1 Installation manual

NRG 17-11

- 1 Level electrode NRG 17-11, PN 63
- 1 Joint ring 27 x 32, form D, DIN 7603, 2.4068, bright-annealed
- 1 Disk with set screw (measuring surface extension) – optional
- 1 Retaining ring – optional
- 1 Installation manual

NRG 19-11

- 1 Level electrode NRG 19-11, PN 160
- 1 Joint ring 27 x 32, form D, DIN 7603, 2.4068, bright-annealed
- 1 Disk with set screw (measuring surface extension) – optional
- 1 Retaining ring – optional
- 1 Installation manual

NRG 111-11

- 1 Level electrode NRG 111-11, PN 320
- 1 Gasket 33 x 39, DIN 7603, 2.4068
- 1 Sealing plug for M 20 connection
- 1 Surface extension disk with grub screw
- 1 Retaining ring
- 1 Installation manual

Description NRG 16-11, NRG 17-11, NRG 19-11, NRG 111-11

The level electrode NRG 1...-11 detects the min. liquid level (low level alarm) in a steam boiler.

The operation of the electrode is based on the conductivity measuring principle using the electrical conductivity of water.

The NRG 1...-11 is designed for use in conjunction with level switch NRS 1-50 as a self-monitoring low level limiter with periodic self-checking (SMART) feature.

Application in steam and pressurised hot-water plants in accordance with DIN EN 12952 and DIN EN 12953.

Function

The water level limiter comprises a level electrode type NRG 1...-11 and a level switch type NRS 1-50. The level electrode NRG 1...-11 consists of two concentrically arranged electrodes (measuring electrode and compensating electrode) which are isolated from each other by special insulating seals.

The level limiter operation is based on the conductive measuring principle using the electrical conductivity of water for signaling water level. During normal, trouble-free operation the level electrode tip is immersed in boiler water and no low level alarm is given. A low level alarm will only be raised if the electrode tip is exposed for more than 3 seconds. A low level alarm will also be activated if the insulating seals placed between the electrodes and the body are no longer pressure tight, allowing water to penetrate into the body. However in this instance the alarm is caused by a malfunction of the electrode, and confirmation should always be done by checking if there is water in the gauge glass.

Design

NRG 16-11, NRG 17-11, NRG 19-11

Screwed $\frac{3}{4}$ " BSP, DIN EN ISO 228-1

Electrical connection: Four pole connector, terminal box made from aluminium (optional)

NRG 111-11

Screwed 1" BSP, DIN EN ISO 228-1

Electrical connection: Terminal box made from aluminium

Technical Data

NRG 16-11, NRG 17-11, NRG 19-11

Service pressure

NRG 16-11: 32 bar at 238 °C

NRG 17-11: 60 bar at 275 °C

NRG 19-11: 100 bar at 311 °C

Connection

Screwed G ¾ A, to ISO 228

Materials

Screw-in body: 1.4571, X6CrNiMoTi17-12-2

Measuring electrode: 1.4571, X6CrNiMoTi17-12-2

Electrode rod: 1.4401, X5CrNiMo17-12-2

Electrode insulation: Gylon®

Four pole connector: Polyamid (PA)

Terminal box: 3.2161 G AlSi8Cu3 (optional)

Lengths available

500 mm, 1000 mm, 1500 mm, 2000 mm, 2500 mm, 3000 mm

Cell constant C

0.13 cm⁻¹ **with** measuring surface extension

0.3 cm⁻¹ **without** measuring surface extension

Response sensitivity

10 µS/cm at 25 °C, cell constant 0.3 cm⁻¹

0.5 µS/cm at 25 °C, cell constant 0.13 cm⁻¹

Electrical connection

Four-pole connector, cable gland M 16,
terminal box made from aluminium, cable glands M 16 (optional)

Protection

IP 65 to EN 60529

Max. admissible ambient temperature

70 °C

Weight

Approx. 1.1 kg

NRG 111-11

Service pressure

NRG 111-11: 180 barg (at 357 °C)

Connection

1" BSP (to DIN EN ISO 228-1)

Materials

Screw-in body: 1.4529, X1NiCrMoCuN25-20-7

Measuring electrode 1.4122, X39CrMo17-1

Electrode rod: 1.4401, X5CrNiMo17-12-2

Electrode insulation: Special ceramic material

Terminal box: 3.2161 G AISi8Cu3

Lengths available

500 mm, 1000 mm, 1500 mm, 2000 mm, 2500 mm, 3000 mm

pH value

Max. admissible: 10

Cell constant C

0.13 cm⁻¹ with measuring surface extension

Response sensitivity

0.5 µS/cm up to 400 µS/cm at 25 °C

Electrical connection

Terminal box made from aluminium, cable glands M 20 (2)

Protection

IP 65 to EN 60529

Max. admissible ambient temperature

70 °C

Weight

Approx. 1.8 kg

Name plate / marking

Equipment designation





NRG 16-11					Betriebsanleitung beachten See installation instructions Voir instructions de montage		
PN 40	G ¾	1.4571	IP 65	C = 0,3 cm ⁻¹	TÜV.SWB.xx-422, WB.xx-354		
 <div>32 bar (464psi) 238°C (460°F) T amb = 70°C (158 °F)</div>						 <div>0525</div>	
GESTRA AG		• Münchener Straße 77				• D-28215 Bremen	

Fig. 1










 	
Betriebsanleitung beachten. See installation instructions. Voir instructions de montage.	
	
NRG 16 - 11	PN 40 <input type="checkbox"/>
NRG 17 - 11	PN 63 <input type="checkbox"/>
NRG 19 - 11	PN160 <input type="checkbox"/>
G 3/4	1.4571 IP65
C = 0,13 cm ⁻¹	<input type="checkbox"/>
C = 0,3 cm ⁻¹	<input type="checkbox"/>
 32 bar (464psi) 238°C (460°F)	<input type="checkbox"/>
 60 bar (870psi) 275°C (527°F)	<input type="checkbox"/>
 100 bar (1450psi) 311°C (592°F)	<input type="checkbox"/>
 Tamb = 70°C (158°F)	
TÜV . WB . xx-354 TÜV . SWB . xx-422	 0525
GESTRA AG Münchener Str. 77 D-28215 Bremen	

Fig. 2








 	
Betriebsanleitung beachten See installation instructions Voir instructions de montage	
	
NRG 111 - 11	
G 1	1.4529 IP65
 180 bar (2611psi) 357°C (675°F)	
 Tamb = 70°C (158 °F)	
C (cm ⁻¹) 0,13	C (cm ⁻¹) 0,3
mit Meßflächenvergrößerung with measuring surface extention agrandissement de la surface de mesure	
TÜV . WB . xx-354 TÜV . SWB . xx-422	 0525
GESTRA AG Münchener Str. 77 D-28215 Bremen	

Fig. 3

Dimensions NRG 16-11, NRG 17-11, NRG 19-11

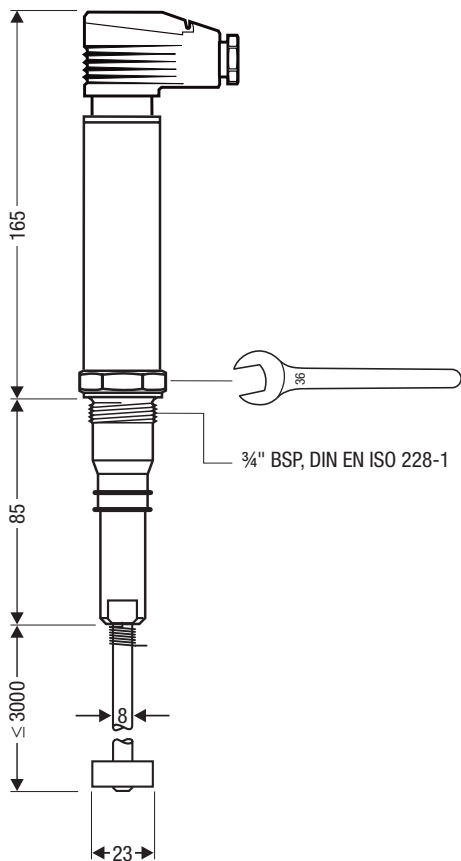


Fig. 4

NRG 16-11 with
measuring surface extension

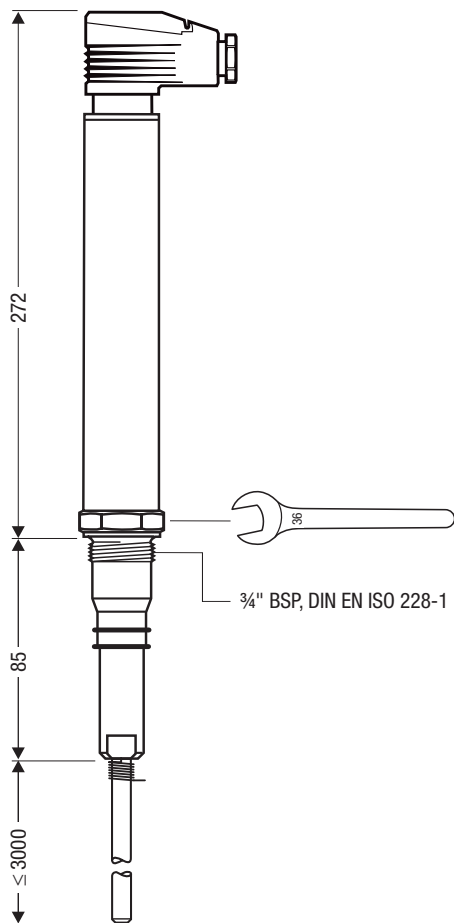


Fig. 5

NRG 17-11, NRG 19-11 without
measuring surface extension

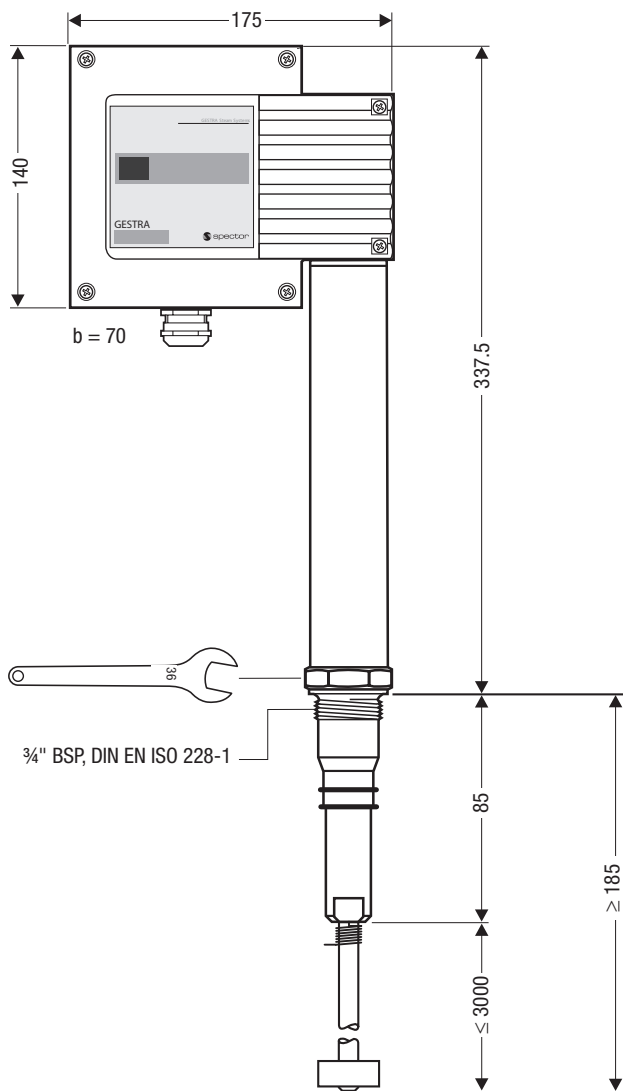


Fig. 6

NRG 17-11, NRG 19-11 with terminal box made from aluminium (optional) and measuring surface extension

Dimensions NRG 111-11

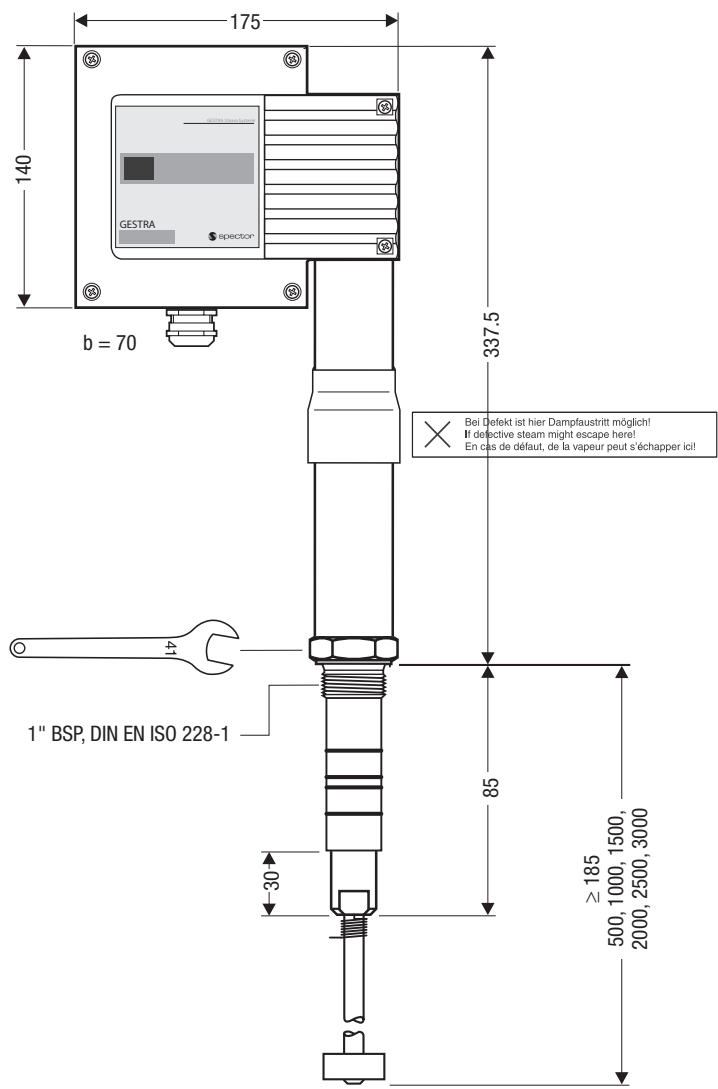


Fig. 7
NRG 111-11 with measuring surface extension

Design

NRG 16-11, NRG 17-11, NRG 19-11, NRG 111-11

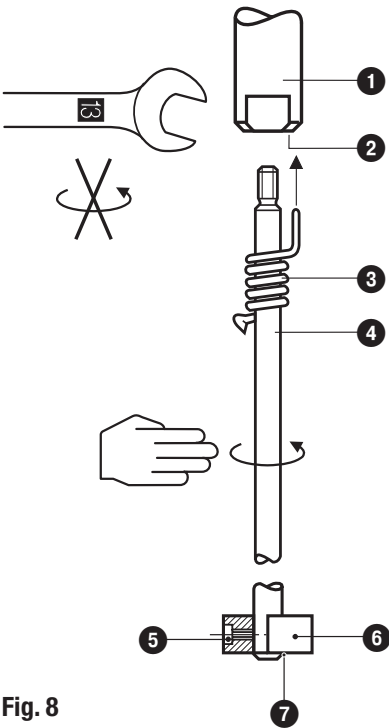


Fig. 8

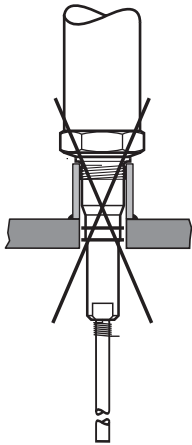


Fig. 9

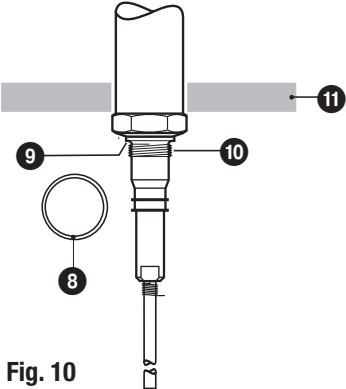


Fig. 10

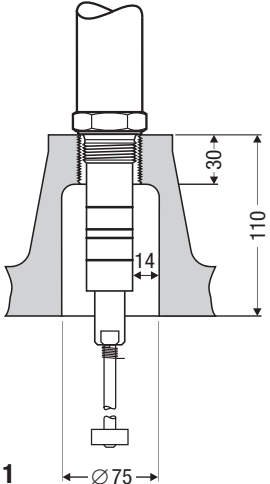


Fig. 11

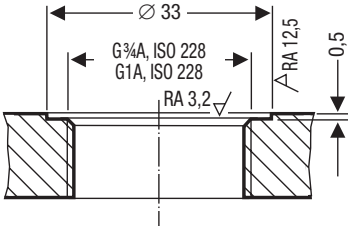


Fig. 12

Functional Elements

NRG 16-11, NRG 17-11, NRG 19-11

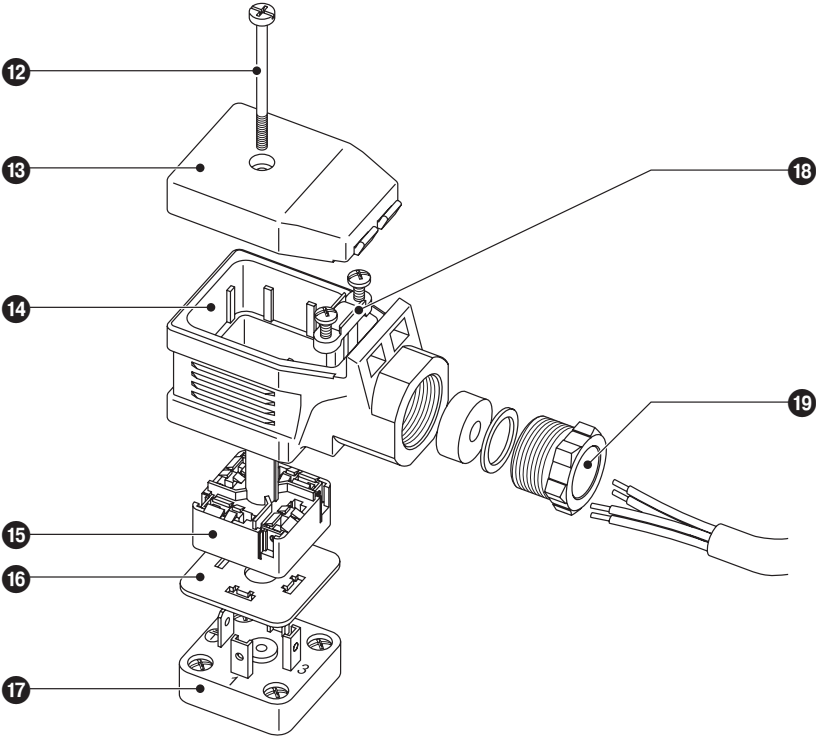


Fig. 13

NRG 111-11, optional for NRG 16-11, NRG 17-11, NRG 19-11

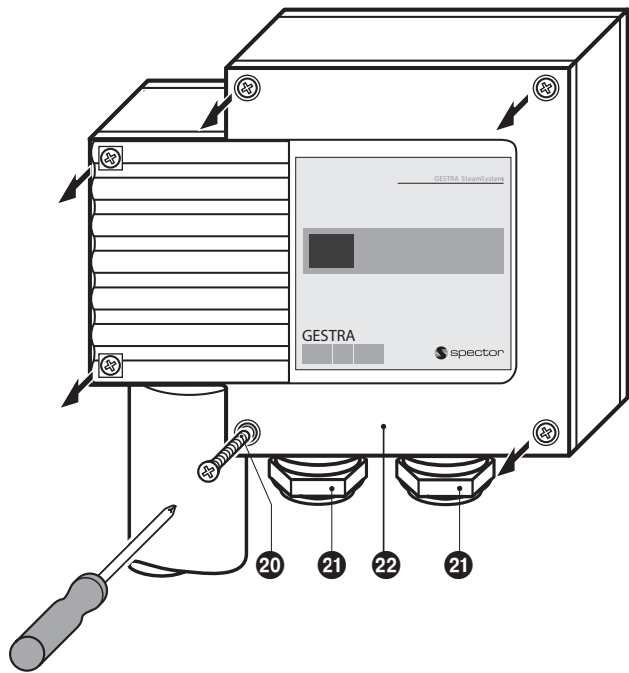


Fig. 14

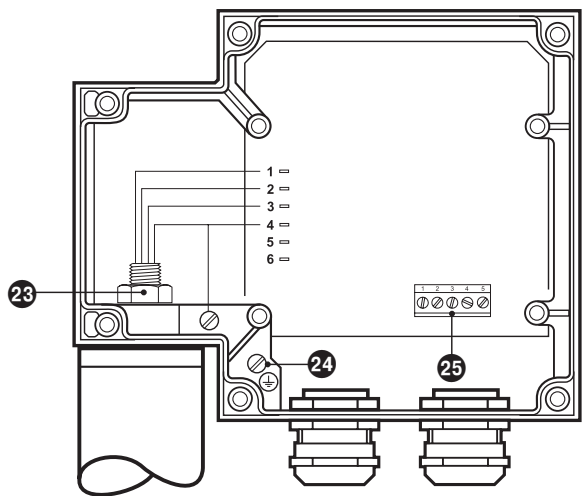


Fig. 15

Key

- ➊ Measuring electrode
- ➋ Bore
- ➌ Spring
- ➍ Electrode tip
- ➎ Grub screw
- ➏ Disk (Measuring surface extension)
- ➐ Retaining ring
- ➑ Gasket 27 x 32, form D, DIN 7603, 2.4068 bright annealed
- ➒ Seating surface
- ➓ Electrode thread
- ➔ Thermal insulation, provided on site, $d = 20\text{ mm}$
(outside of thermal insulation of steam generating unit)
- ➕ Screw M 4
- ➖ Lid
- ➗ Upper part of terminal box
- ➘ Connecting plate
- ➙ Sealing element
- ➚ Contact plate for level electrode
- ➛ Cable clamp
- ➜ Cable gland M 16 (PG 9)
- ➝ Housing screws M 4
- ➞ Cable entry M 20 x 1.5
- ➟ Housing lid
- ➠ Nut
- ➡ PE connection
- Terminal strip

Installation

NRG 16-11, NRG 17-11, NRG 19-11, NRG 111-11, step 1

1. Screw electrode tip ④ into measuring electrode ①, **Fig. 8**
2. Carefully determine required measuring length, taking minimum length into account.
3. Mark length of electrode tip ④.
4. Unscrew electrode tip ④ from measuring electrode ① and cut tip.
5. Screw electrode tip ④ into measuring electrode ① and tighten. Slide spring ③ along electrode tip ④, so that its bent end completely enters into small bore ②.
6. If a measuring surface extension is required slip disk ⑥ onto electrode tip ④ ensuring that the electrode tip protrudes 2 mm from disk. Fasten disk with grub screw ⑤. Push retaining ring ⑦ over electrode tip against disk ⑥.

NRG 16-11, NRG 17-11, NRG 19-11, NRG 111-11, step 2

1. Check seating surfaces, **Fig. 12**
2. Place supplied gasket ⑧ onto seating surface of the threaded standpipe or flange. **Fig. 10**
3. Apply a light smear of silicone grease (e. g. WINIX® 2150) to electrode thread ⑩.
4. Screw level electrode into threads of flange provided on vessel and tighten with a 36/41 mm ring spanner. The torque required is **160 Nm when cold** (NRG 16-11, NRG 17-11, NRG 19-11) or **350 Nm** (NRG 111-11).



Attention

- The seating surfaces and threads on the vessel and mounting flange must be accurately machined, **Fig. 12**
- Do not bend the electrode tip when cutting.
- Use only the supplied gasket:
NRG 16-11, NRG 17-11, NRG 19-11: 27 x 32, form D, DIN 7603, 2.4068
NRG 111-11: D 33 x 39, DIN 7603, 2.4068
- Do not lag the electrode body.
- Do not insulate the threads with hemp or PTFE tape.
- Do not apply conductive paste or grease to the electrode thread.
- Provide a min. spacing of 14 mm between electrode and earth (flange, boiler wall), **Fig. 11, Fig. 17**
- Observe the minimum distances for the installation of the electrode.
- If the level electrode **NRG 111-11** is to be installed in a flanged standpipe DN 50 use only the GESTRA hat flange! **Fig. 11**
- When using the level electrode **NRG 111-11** take the pH limit value (10) and the max. admissible electrical conductivity (100 µS/cm at 25 °C) into consideration.



Important notes

- One level electrode NRG 1...-11 can be installed together with one GESTRA level electrode, one level switch or transmitter for water level control and high level alarm in one single protection tube or level pot (inside diameter 100 mm). **Fig. 16.** If the NRG 1...-11 is installed inside the vessel, it must be at least 40 mm away from the upper vent hole.
- The installation of two level-limiting electrodes NRG 1...-11 in one standpipe is **not** allowed!
- For the approval of the boiler standpipe observe the relevant regulations.
- For typical installation examples refer to pages 19 – 20.
- When mounting the electrode laterally make sure that the inclination angle does not exceed 45° and that the length of the electrode rod is limited to 1000 mm. **Fig. 17**
- If the electrode is installed outdoor, it **must** be provided with a weather-proof cover supplied by GESTRA. As an alternative the level electrode can be equipped with a terminal box made from aluminium.

Tools

- Open-end spanner A. F. 13, DIN 3110, ISO 3318
- Open-end spanner A. F. 36, DIN 3110, ISO 3318
- Open-end spanner A. F. 41, DIN 3110, ISO 3318
- Scriber
- Hacksaw
- Flat file, cut 2, DIN 7261, form A

Examples of Installation

NRG 16-11, NRG 17-11, NRG 19-11

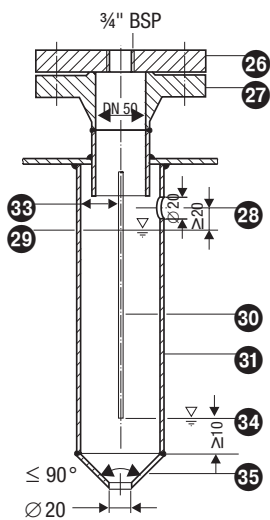


Fig. 16

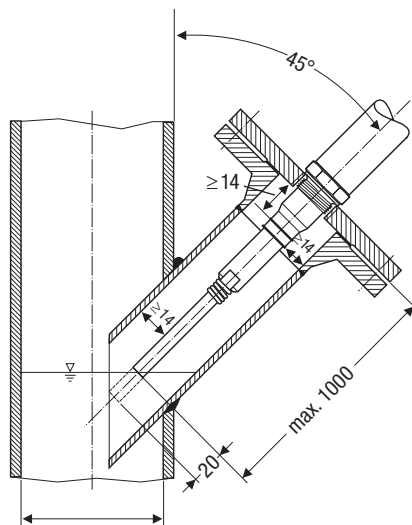


Fig. 17

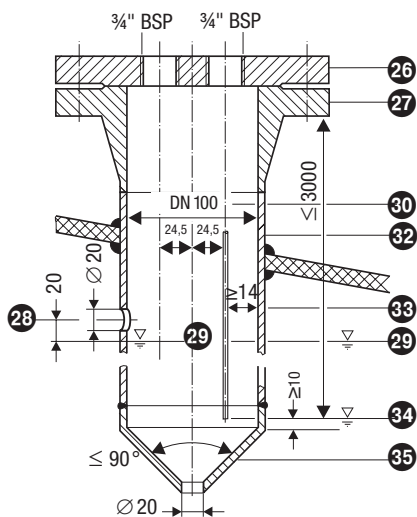


Fig. 18

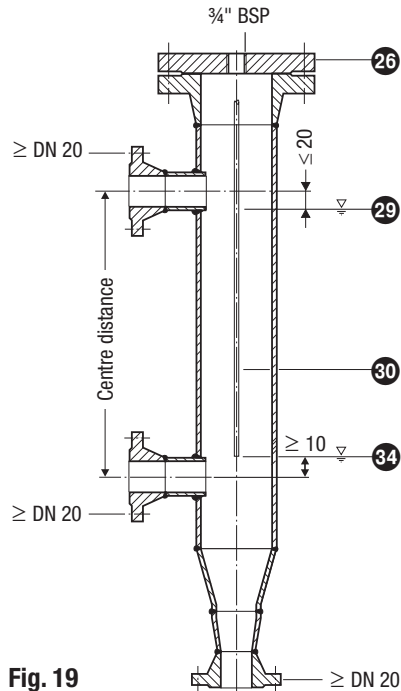


Fig. 19

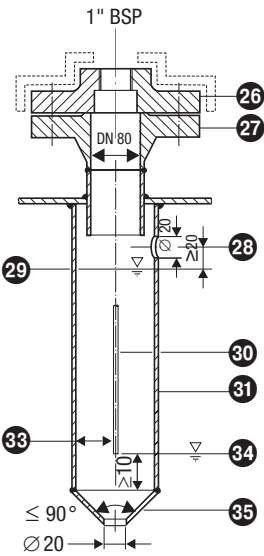


Fig. 20

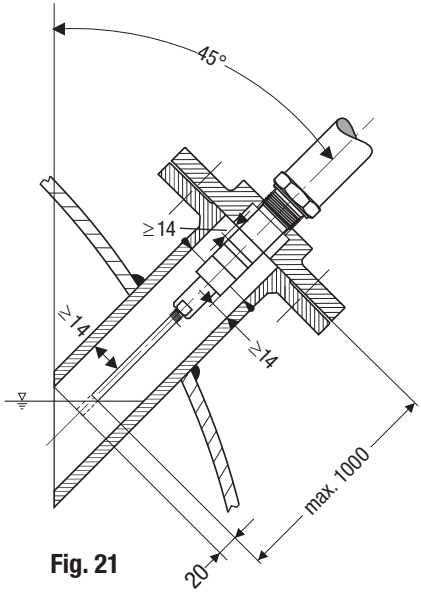


Fig. 21

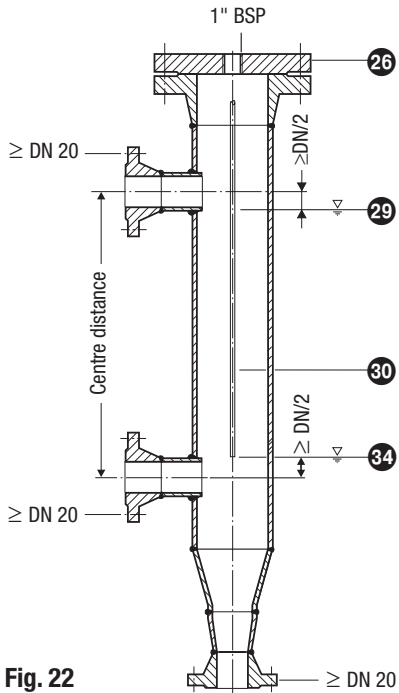


Fig. 22

Examples of Installation – continued –

Key

- 26 Flange PN 40, PN 63, PN 160, DN 50, DIN EN 1092-01 (single electrode)
Flange PN 40, PN 63, PN 160, DN 100, DIN EN 1092-01 (electrode combination)
GESTRA hat flange PN 320, DN 50, DIN EN 1092-01 (NRG 111-11)
- 27 For the approval of the boiler standpipe the relevant regulations must be considered.
- 28 Vent hole Provide bore as close as possible to the boiler wall!
- 29 High water HW
- 30 Electrode rod $d = 8 \text{ mm}$
- 31 Protection tube $\geq \text{DN } 80 / \geq \text{DN } 100$ (NRG111-1), (in France according to AFAQ $\geq \text{DN } 100$)
- 32 Protection tube DN 100
- 33 Electrode distance $\geq 14 \text{ mm}$ (creepage distances and clearances)
- 34 Low water LW
- 35 Reducer DIN 2616-2, K-88.9 x 3.2 – 42.4 x 2.6 W

Electrical Connection

NRG 16-11, NRG 17-11, NRG 19-11

Electrical connection via four pole connector.

To connect the level electrode please use:

- For level switch NRS 1-50 with response sensitivity 10 μ S: Screened multi-core control cable, min. conductor size 0.5 mm², e.g. LiYCY 4 x 0.5 mm², max. length 100 m.
- For level switch NRS 1-50 with response sensitivity 0.5 μ S: Double-screened multi-core low-capacitance data cable, min. conductor size 0.5 mm², Li2YCY PiMF 2 x 2 x 0.5 mm², max. length 30 m.

1. Unscrew screw 12, Fig. 13
2. Take the terminal box off the level electrode, leaving the sealing element 16 on the contact plate 17.
3. Remove lid 13.
4. Press connecting plate 15 out of the upper part of the terminal box 14.

The upper part of the terminal box can be turned in steps of 90°.

5. Detach cable gland 19 and cable clamp 18 from the upper part of the terminal box 14.
6. Run cable through cable gland 19 and upper terminal box 14 and connect the terminals of the connecting plate 15 according to the wiring diagram.
7. Press connecting plate 15 into the upper part of the terminal box and align the cable.
8. Hold cable with cable clamp 18 and cable gland 19 in position.
9. Mount lid 13 and insert screw 12.
10. Put upper part of the terminal box onto the level electrode and fix it firmly with screw 12.

NRG 111-11, optional for NRG 16-11, NRG 17-11, NRG 19-11

Electrical connection via terminal box made from aluminium

To connect the level electrode please use:

- For level switch NRS 1-50 with response sensitivity 10 μ S: Screened multi-core control cable, min. conductor size 0.5 mm², e.g. LiYCY 4 x 0.5 mm², max. length 100 m.
- For level switch NRS 1-50 with response sensitivity 0.5 μ S: Double-screened multi-core low-capacitance data cable, min. conductor size 0.5 mm², Li2YCY PiMF 2 x 2 x 0.5 mm², max. length 30 m.

1. Undo screws 20 and remove housing cover 22. Fig. 14
2. Unscrew union nuts of cable entry 21.
3. Slacken nut 23 with 18 mm open-end spanner but do not remove, Fig. 15

The electrode terminal box can now be turned through +/– 180°.

4. Turn electrode terminal box into desired position (+/– 180°).
5. Tighten nut 23 slightly.
6. Remove terminal strip 25 from board.
7. Connect terminal strip according to wiring diagram.
8. Affix terminal strip.
9. Re-attach housing cover 22 and fix it with screws 20.

Wiring diagram

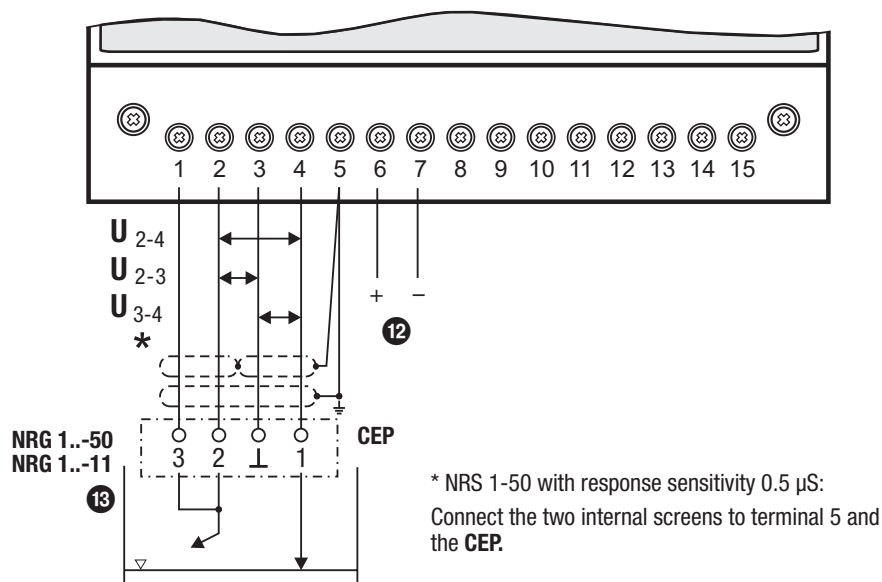


Fig. 23

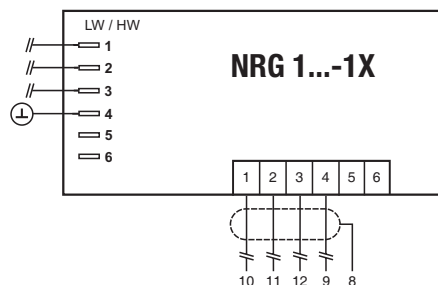


Fig. 24 Terminal box made from aluminium

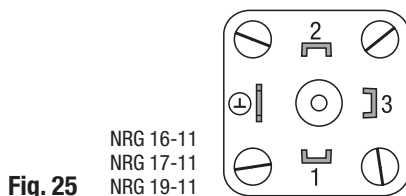


Fig. 25

Voltage table

Use this voltage table as a reference when checking whether the level electrode is submerged or if there is a malfunction. Please take the wiring diagram of the electrode NRS 1-50 into account.

Fig. 23

U_{2-4}	U_{3-4}		U_{2-3}
	submerged	exposed	malfunction (submerged/alarm)
$\approx 0.7\text{ V}$ 85 Hz !	$< \frac{U_{2-4}}{2}$	$\geq \frac{U_{2-4}}{2}$	$\leq U_{3-4}$



Note

- The self-checking routine of the level switch NRS 1-50 reduces U_{2-4} to 0 Volt, if executed cyclically.

Tools

- Screwdriver for cross-recess head screws, size 1
- Screwdriver for slotted screws, size 2.5, completely insulated according to DIN VDE 0680-1
- Open-end spanner A. F. 18 (19)

Commissioning

Check wiring

Check whether the NRG 1...-11 and the associated controller NRS 1-50 are wired in accordance with the wiring diagram. **Fig. 23 – 25**

Apply mains voltage

Apply mains voltage to level switch NRS 1-50.

Operation

Low-level limiter

Operation in combination with controller NRS 1-50 in steam and pressurised hot water plants to EN 12952, EN 12953 or other national regulations.



Note

- Should malfunctions occur during the commissioning procedure refer to chapter “Operational Malfunctions” on page 25 in order to analyse and correct them.

Operational Malfunctions

Fault-finding list for troubleshooting

Level electrode submerged – low-level alarm

Fault: The electrode housing does not have earth connection to the boiler.
Remedy: Clean seating surfaces and insert metal joint ring D27 x 32 (D33 x 39) to DIN 7603, 1.4301. Do **not** insulate level electrode with hemp or PTFE tape.

Fault: The internal insulation of the electrode rod is damaged.
Remedy: Replace level electrode.

Fault: Mains voltage is not applied to level switch.
Remedy: Apply mains voltage. Wire electrode according to wiring diagram.

Water level below low level limit – no function

Fault: The vent hole in the protection tube does not exist, is obstructed or flooded.
Remedy: Check protection tube and, if necessary, provide vent hole.

Fault: The isolating valves of the external measuring pot are closed.
Remedy: Open isolating valves.

Fault: The electrode rods have earth contact.
Remedy: Check and change position of installation.

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

Decommissioning



Danger

Risk of severe burns and scalds to the whole body!
Before removing the level electrode make sure that the vessel or measuring pot are depressurised (0 bar) and cooled down to room temperature (20 °C).

Disposal

Remove the level electrode and separate the waste materials in accordance with the material specification. Electronic components (boards) must be disposed of separately.
For the disposal of the level electrode observe the pertinent legal regulations concerning waste disposal.

Annex

Note on the Declaration of Conformity / Declaration by the Manufacturer C€

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

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

For your notes



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