



**FLOWSERVE**

GESTRA

**GESTRA Steam Systems**

**NRG 16-51**

**NRG 17-51**

**NRG 19-51**

**EN**

English

**Installation Instructions 818956-02**

Level Electrodes

NRG 16-51, NRG 17-51, NRG 19-51

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## Application

### Usage for the intended purpose

The level electrodes NRG 16-51, NRG 17-51 and NRG 19-51 are used in conjunction with level switch NRS 1-51 as high water level alarms for steam boiler plants and (pressurized) hot water installations. A high level alarm prevents the water level from exceeding the preset max. water level (HW) and for this purpose switches off e. g. the feedwater supply.

### Function

When the level exceeds the max. water level, the level electrode enters the liquid and an alarm is triggered in the level switch NRS 1-51. The switchpoint "High level (HW) exceeded" is dictated by the length of the electrode rod.

The self-monitoring function ensures that an alarm will also be triggered if the electrode insulation is contaminated or has developed a leak or if there is a malfunction in the electrical connection.

The level electrode is installed inside steam boilers, vessels or inlet lines of hot-water systems. The protective tube mounted on site (see section **Examples of Installation** (pages 18, 19) ensures correct functioning.

One level electrode NRG 1...-51 can be installed together with one GESTRA water level limiting electrode in a single protection tube or external level pot.

If the level electrode is installed in a level pot outside the boiler, make sure that the connecting lines are rinsed regularly. In addition, the logic unit SRL is required to monitor the purging times and the purging sequence.

If the connecting lines for steam  $\geq 40$  mm and water  $\geq 100$  mm, the installation is considered to be internal. In this case the rinsing processes do not have to be monitored.

## Directives and Standards

### Pressure Equipment Directive (PED) 97/23/EC

The level electrode NRG 1...-51 in conjunction with level switch NRS 1-51 is EC type approved according to EN 12952/EN 12953. These Directives state, among other things, the requirements made on limiting systems and equipment for steam boiler plants and (pressurised) hot-water installations.

### Functional Safety acc. to IEC 61508

The level electrode NRG 1...-51 is certified acc. to IEC 61508 only if used in combination with level switch NRS 1-51. This standard describes the functional safety of safety-related electrical/electronic/programmable electronic systems.

The equipment combination NRG 1...-51 + NRS 1-50 corresponds to a type B subsystem with Safety Integrity Level (SIL) 3.

### VdTÜV Bulletin "Wasserstand 100" (= Water Level 100)

The level electrodes NRG 1-51, NRG 1...-12 in conjunction with the level switch NRS 1-51 are type approved according to the VdTÜV Bulletin "Water Level 100".

The VdTÜV Bulletin "Wasserstand (=Water Level) 100" specifies the requirements made on water level control and limiting equipment for boilers.

### ATEX (Atmosphère Explosible)

The level electrodes NRG 1...-51, NRG 1...-12 are simple items of electrical equipment as specified in EN 60079-11 section 5.7. According to the European Directive 94/9/EC the equipment must be equipped with approved Zener barriers if used in potentially explosive areas. Applicable in Ex zones 1, 2 (1999/92/EC). The equipment does not bear an Ex marking. The suitability of the Zener barriers is certified in a separate document.

Note that the requirements of the IEC 61508 are not met if the NRG 1...-51, NRG 1...-12 + Zener barriers + NRS 1-51 are interconnected!

## Technical Data

### NRG 16-51, NRG 17-51, NRG 19-51

#### Service pressure

NRG 16-51: PN 40, 32 bar at 238 °C

NRG 17-51: PN 63, 46 bar at 260 °C

NRG 19-51: PN 160, 100 bar at 311 °C

#### Mechanical connection

Screwed ¾" to EN ISO 228-1

#### Materials

Sheath 1.4301 X5 CrNi18-10

Screw-in body 1.4571, X6CrNiMoTi17-12-2

Measuring electrode 1.4571 X6CrNiMoTi17-12-2

Electrode rod 1.4401 X5CrNiMo17-12-2

Electrode insulation PEEK

NRG 1...-51: Four-pole connector: polyamid (PA)

NRG 1...-51F: Terminal box 3.2161 G AlSi8Cu3

#### Lengths available

500 mm, 1000 mm, 1500 mm

#### Electrical connection

NRG 1...-51: Four-pole connector, cable glands M 16

NRG 1...-50F: Terminal box made from aluminium, cable gland M 20

#### Protection

IP 65 to EN 60529

#### Max. admissible ambient temperature

70 °C

#### Weight

Approx. 1.2 kg (without extension)

(NRG 16-51, NRG 17-51, NRG 19-51)

Approx. 2.1 kg (without extension)

(NRG 16-51F, NRG 17-51F, NRG 19-51F)

#### Approvals

EC Prototype approval PED Pressure Equipment Directive 97/23/EC, EN 12952-11, EN 12953-09:  
Requirements made on limiting equipment for boilers.

Functional Safety SIL 3 IEC 61508:  
Functional safety of safety-related electrical/electronic/programmable  
electronic systems

TÜV type approval VdTÜV Bulletin "Wasserstand 100" (= Water Level 100):  
Requirements made on water level limiting & control equipment.  
Type approval no. TÜV · SHWS · XX-423  
(see name plate)

## **Technical Data** – continued –

### **Corrosion resistance**

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

### **Sizing**

The body is not designed for pulsating loads. Welds and flanges are designed to withstand dynamic loading (bending and alternative stress). The dimensional allowances and anti-corrosive additives reflect the latest state of the technical art.

## Name plate/markings

Equipment designation			Safety note		
<b>NRG 16-51</b>				Betriebsanleitung beachten See installation instructions Voir instructions de montage	
PN 40	G 3/4	1.4571	IP 65	TÜV . SWB/SHWS . 09-...	
	32 bar (464psi) 238°C (460°F) T amb = 70°C (158°F)				
GESTRA AG		D-28215 Bremen		0525	
Manufacturer			Serial number		

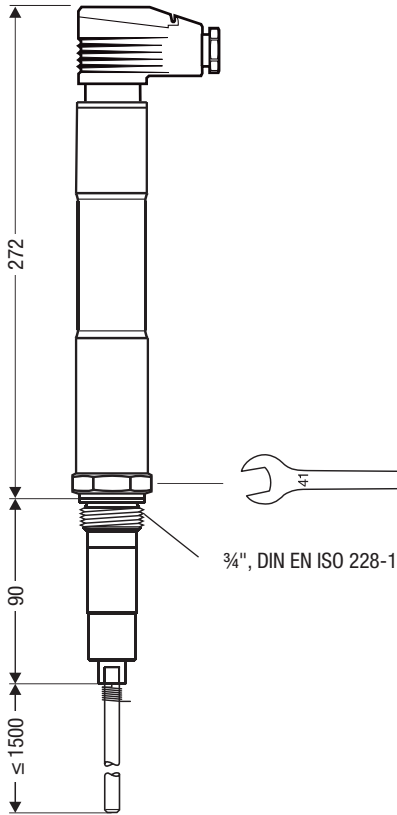
Disposal note  
Pressure rating, thread type, material number, type approval number  
CE marking

Fig. 1

	Betriebsanleitung beachten See installation instructions Voir instructions de montage	Safety note
	Hier öffnen Open here Ouvrir ici	
<b>NRG 16 - 51 F</b>	PN 40 <input type="checkbox"/>	Equipment designation, pressure rating
<b>NRG 17 - 51 F</b>	PN 63 <input type="checkbox"/>	
<b>NRG 19 - 51 F</b>	PN160 <input type="checkbox"/>	
G 3/4	1.4571	IP65
	32 bar (464psi) 238°C (460°F)	<input type="checkbox"/>
	60 bar (870psi) 260°C (500°F)	<input type="checkbox"/>
	100 bar (1450psi) 311°C (592°F)	<input type="checkbox"/>
	Tamb = 70°C (158°F)	
TÜV . SWB/SHWS . 09-...		CE Marking, type approval
	0525	
GESTRA AG Münchener Str. 77 D-28215 Bremen		Disposal note
		Manufacturer
		Serial number

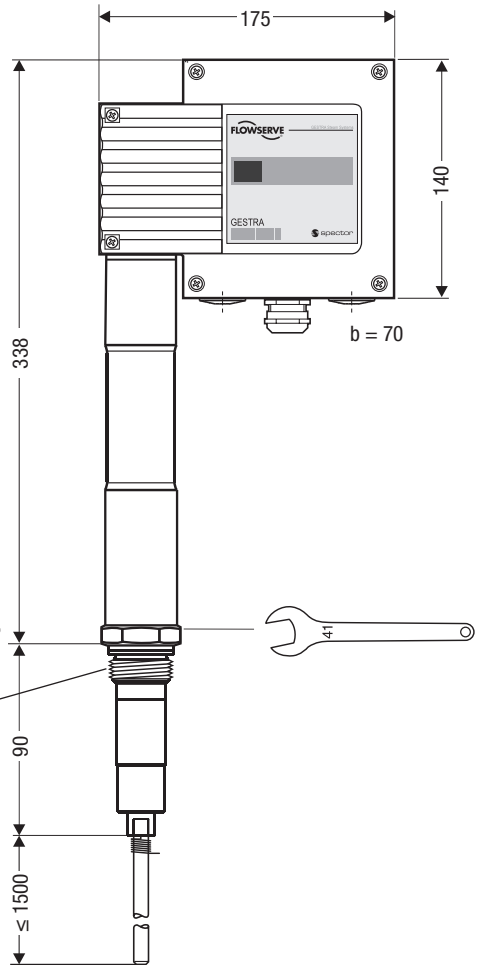
Fig. 2

Dimensions NRG 16-51, NRG 17-51



**Fig. 3**

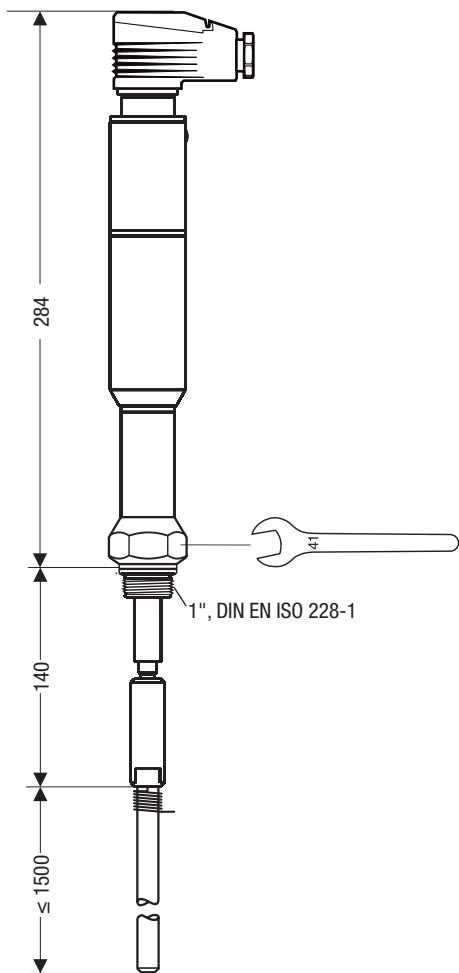
NRG 16-51, NRG 17-51  
with four-pole connector



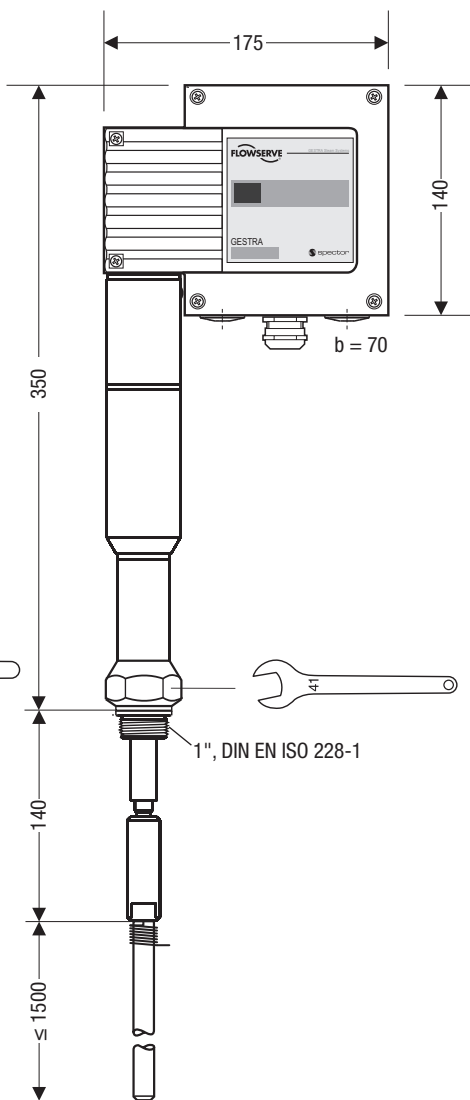
**Fig. 4**

NRG 16-51F, NRG 17-51F  
with aluminium terminal box

Dimensions NRG 19-51



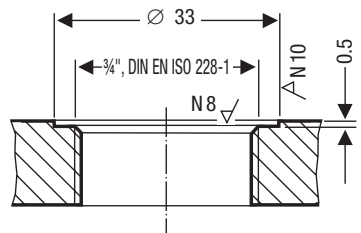
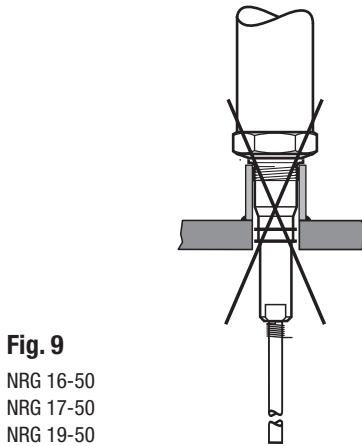
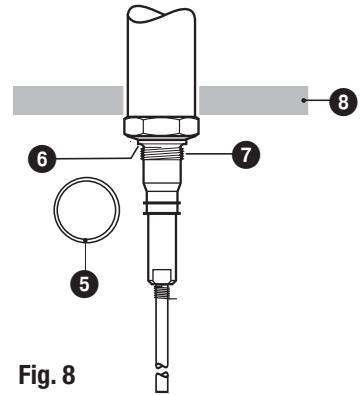
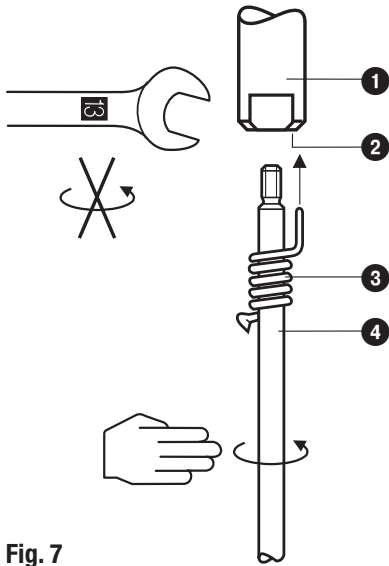
**Fig. 5**  
NRG 19-51

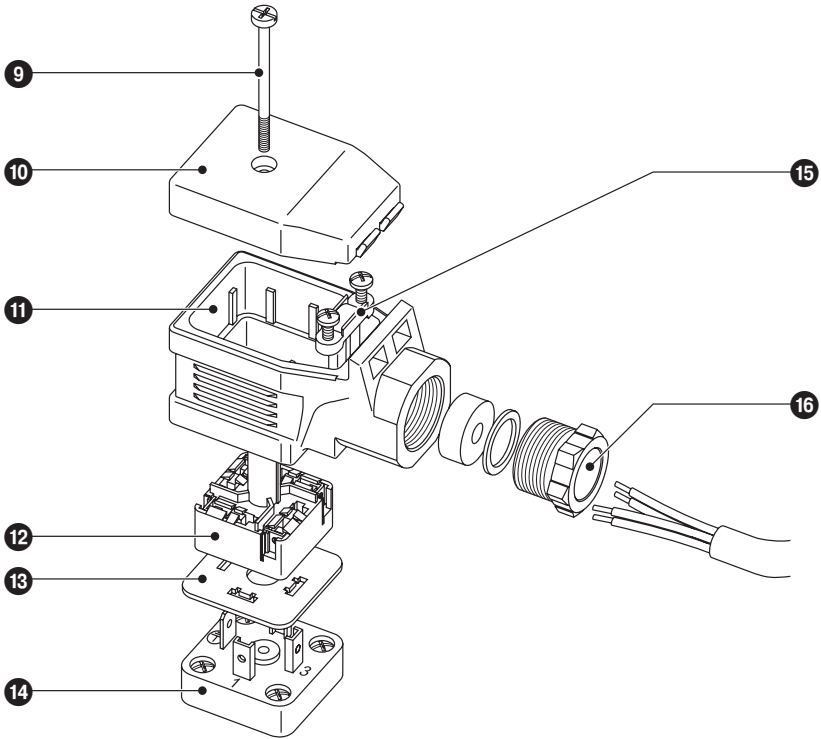



**Fig. 6**  
NRG 19-51F

# Functional Elements

NRG 16-51, NRG 17-51, NRG 19-51





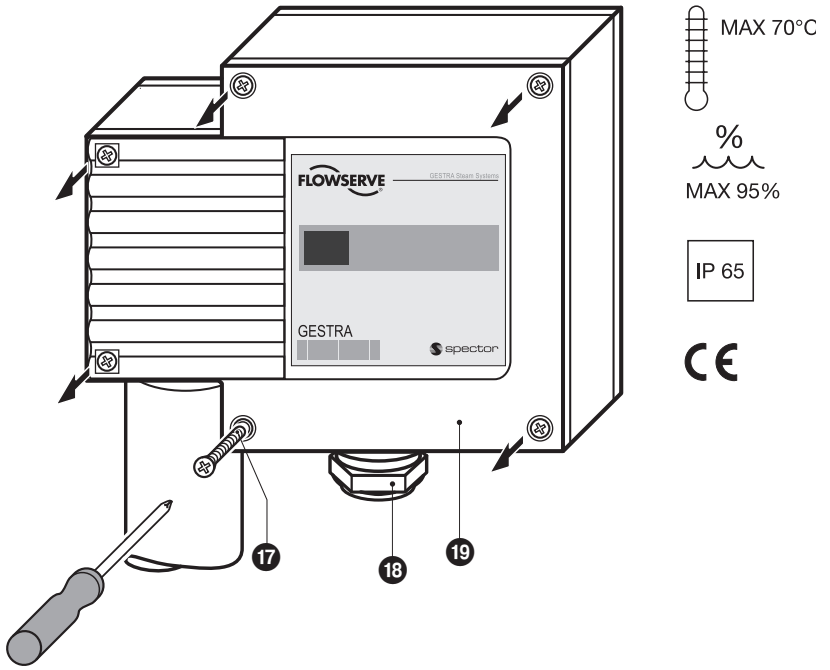
 MAX 70°C

  
%  
MAX 95%

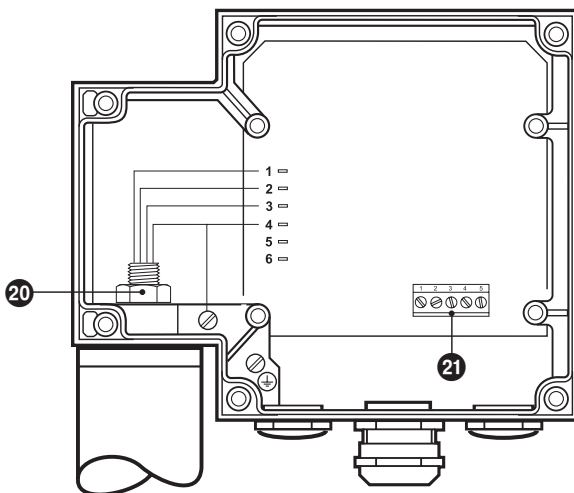
IP 65

Fig. 11





**Fig. 12**



**Fig. 13**

### Key

- 1 Measuring electrode
- 2 Bore
- 3 Spring
- 4 Electrode tip
- 5 NRG 1...-51: Joint ring 27 x 32, form D, DIN 7603, 1.4301, bright annealed
- 6 Seating surface
- 7 Electrode thread
- 8 Thermal insulation, provided on site, d = 20 mm (outside of thermal insulation of steam boiler)
- 9 Screw M 4
- 10 Cover
- 11 Upper part of the terminal box
- 12 Connecting plate
- 13 Insulating plate
- 14 Contact plate of level electrode
- 15 Cable strain relief
- 16 Cable gland M 16 (PG 9)
- 17 Housing screws M 4
- 18 Cable gland M 20 x 1.5
- 19 Housing cover
- 20 Nut
- 21 Terminal strip

## Important Notes

### Safety note

High water level alarms are safety devices and must only be installed, wired 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 risk of severe scalding all over the body!

It is therefore essential not to dismantle the electrode unless the boiler pressure is verified to be 0 bar.

The electrode becomes hot during operation.

Risk of severe burns to hands and arms.

Before carrying out installation and maintenance work make sure that the steam trap is cold.



#### Attention

The name plate specifies the technical features of the equipment. Do not commission or operate any item of equipment that does not bear its specific name plate.



#### Note

For outdoor installations please use level electrode NRG 1...-51 F. Level electrodes with this suffix (F) feature a terminal box made from aluminium.

### Scope of supply

#### NRG 16-51

- 1 Level electrode NRG 16-50, PN 40
- 1 Joint ring 27 x 32, Form D,  
DIN 7603, 1.4301, bright annealed
- 1 Installation manual

#### NRG 17-51

- 1 Level electrode NRG 17-50, PN 63
- 1 Joint ring 27 x 32, Form D,  
DIN 7603, 1.4301, bright annealed
- 1 Installation manual

#### NRG 19-51

- 1 Level electrode NRG 19-50, PN 160
- 1 Joint ring 27 x 32, Form D,  
DIN 7603, 1.4301, bright annealed
- 1 Installation manual

## Installation

### NRG 16-51, NRG 17-51, NRG 19-51, step 1

1. Screw electrode tip ④ into measuring electrode ①. **Fig. 7**
2. Carefully determine required measuring length of electrode.
3. Mark length of electrode tip ④.
4. Unscrew electrode tip ④ from measuring electrode ① and cut tip.
5. After visual inspection screw electrode tip ④ into measuring electrode ①. Slide spring ③ along electrode tip ④ so that its end completely enters the small hole ②.

### NRG 16-51, NRG 17-51, NRG 19-51, step 2

6. Check seating surfaces. **Fig. 10**
7. Place joint ring ⑤ onto seating surface ⑥ of the electrode. **Fig. 8**
8. Apply a light smear of silicone grease (e. g. WINIX® 2150) to electrode thread ⑦.
9. Screw level electrode into threads or flange provided on vessel and tighten with a 41 mm open-end spanner.  
The torque required **when cold is 160 Nm.**



#### Note

- **One level electrode NRG 1...-51 can be installed together with one GESTRA water level limiting electrode in a single protection tube or external level pot (inside diameter 100 mm). Fig. 16.**

### NRG 16-50F, NRG 17-50F, NRG 19-50, additional information

One level electrode NRG 1...-51 F can be installed together with one GESTRA level electrode (with aluminium terminal box) in a single protection tube or external level pot.  
Please proceed as follows:

1. Mount level electrode NRG 1...-51F as first device as described in items 6 – 9.

When installing level electrode NRG 1...-51 F, please observe the following instructions:

1. Unscrew screws ⑱ and remove housing cover ⑲. **Fig. 12.** The arrow on the name plate points towards this cover.
2. Loosen nut ⑳ with a 19 mm spanner, but do not remove! **Fig. 13**
3. Turn terminal box into desired position (+/- 180°).

**The terminal box can now be turned through +/- 180° .**

4. Tighten nut ⑳ with a torque of **25 Nm.**
5. Mount housing cover ⑲ and tighten screws ⑱.



### Note

- For the approval of the boiler standpipe the relevant regulations must be considered.
- Refer to pages 18 for typical installation examples.
- The angle of inclination of the electrode must not exceed 45°, with the length of the electrode rod being limited to 1000 mm. **Fig. 15**
- For outdoor installations please use level electrode NRG 1...-51 F. Level electrodes with this suffix (F) feature a terminal box made from aluminium.



### Attention

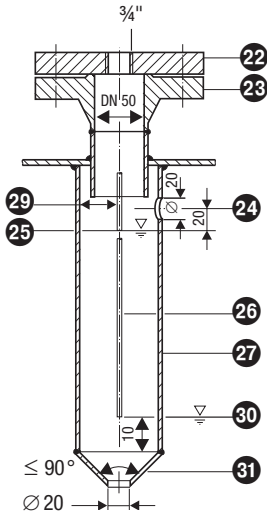
- The seating surfaces of the standpipe or the flange provided on the vessel must be accurately machined, see **Fig. 10**
- Do not bend electrode tip when mounting.
- Use only the joint rings supplied with the electrode.  
NRG 16-51, NRG 17-51, NRG 19-51: 27 x 32, form D, DIN 7603, 1.4301
- Do not lag electrode body above the hexagonal section.
- Do not insulate electrode thread with hemp or PTFE tape!
- Do not apply conductive paste or grease to the electrode thread!
- Make sure that the air distance between the electrode rod and earth (flange, vessel wall) is not less than 14 mm. **Fig. 14 – 17**
- Observe the minimum distances for the installation of the electrode!

### Tools

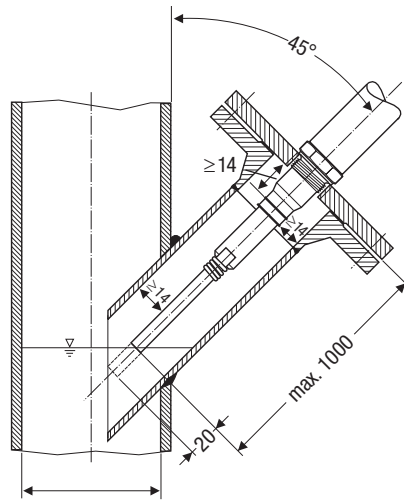
- Open-end spanner A. F. 13, DIN 3110, ISO 3318
- Open-end spanner A. F. 19, DIN 3110, ISO 3318
- Open-end spanner A. F. 41, DIN 3110, ISO 3318
- Scriber
- Hacksaw
- Flat file, medium cut, DIN 7261, form A

# Examples of Installation

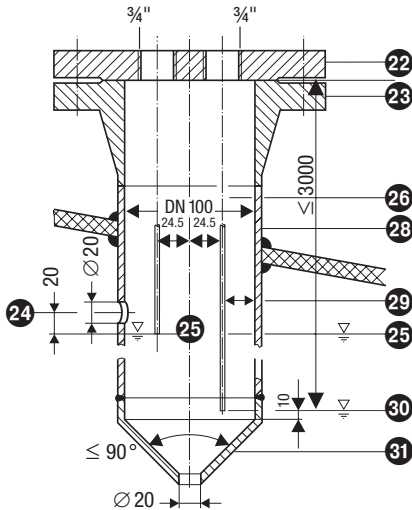
NRG 16-51, NRG 17-51, NRG 19-51



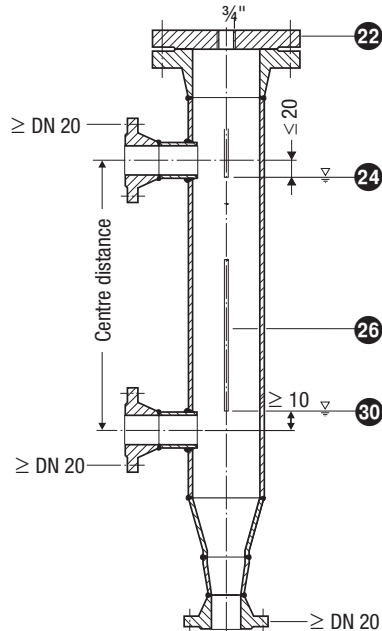
**Fig. 14** Protection tube (provided on site) if electrode is used as internal high level alarm.



**Fig. 15** Inclined installation, e. g. in ascending inlet lines of hot-water installations or vessels



**Fig. 16** Protection tube (provided on site) if electrode is used as internal water level-limiter combined with water level control or high water level alarm



**Fig. 17** Level pot if electrode is used as external high level alarm.

## Examples of Installation – continued –

### Key

- 22 Flange PN 40, PN 63, PN 160, DN 50, DIN 2501-1 (for one electrode)  
Flange PN 40, PN 63, PN 160, DN 100, DIN 2501-1 (for two electrodes)
- 23 For the approval of the boiler standpipe with connecting flange the relevant regulations must be considered.
- 24 Vent hole                      Provide vent hole as close to the boiler wall as possible!
- 25 High water HW
- 26 Electrode rod  $d = 8$  mm
- 27 Protection tube DN 80 (in France according to AFAQ  $\geq$  DN 100)
- 28 Protection tube DN 100
- 29 Electrode distance  $\geq 14$  mm (air gap and creepage distance)
- 30 Low water LW
- 31 Reducer DIN 2616-2, K-88.9 x 3.2- 42.4 x 2.6 W

## Electrical Connection

### Connection of level electrode

To connect the level electrode use screened multi-core control cable with a min. conductor size 0.5 mm<sup>2</sup>, e.g. LiYCY 4 x 0.5 mm<sup>2</sup>.

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

Max. length 30 m with an electrical conductivity of the boiler water < 10 µS/cm at 25 °C.

Wire terminal strip in accordance with the wiring diagram. **Fig. 18**

Connect screens **only** to terminal 5 of the level switch NRS 1-51.

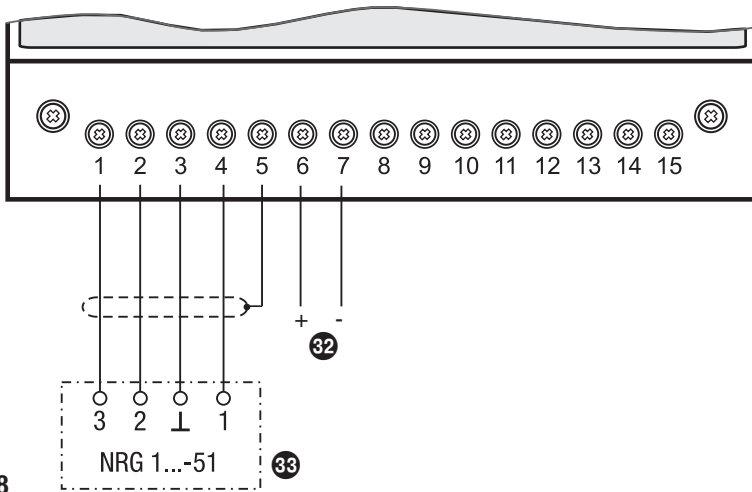
### NRG 16-51, NRG 17-51, NRG 19-51 with four-pole connector

1. Undo screw **9**. **Fig. 12**
2. Remove upper part **11** of the terminal box from the level electrode but leave insulating plate **13** on contact plate **14**.
3. Remove cover **10**.
4. Press connecting plate **12** out of upper part of the terminal box **11**.  
**The upper part of the terminal box can be turned in steps of 90°.**
5. Detach cable gland **16** and cable clamp **15** from upper part of the terminal box **11**.
6. Run cable through cable gland **16** and upper part of the terminal box **11** and wire terminals of the connecting plate **12** in accordance with wiring diagram. **Fig. 19**
7. Press connecting plate **12** into the upper part of the terminal box and align cable.
8. Fix cable with cable clamp **15** and cable gland **16**.
9. Re-attach cover **10** and insert screw **9**.
10. Put upper part of the terminal box onto the level electrode and fix it with screw **9**.

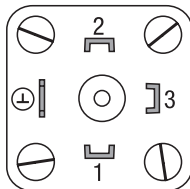
### NRG 16-51F, NRG 17-51F, NRG 19-51F with aluminium terminal box

1. Unscrew screws **17** and remove housing cover **19**. **Fig. 12**
2. Undo cable gland **18**. Pull cable through cable entry.
3. Remove terminal strip **21** from circuit board.
4. Connect terminal strip according to the wiring diagram. **Fig. 20**
5. Attach terminal strip.
6. Tighten the cable gland in order to seal the cable entry.
7. Mount housing cover **19** and tighten screws **17**.

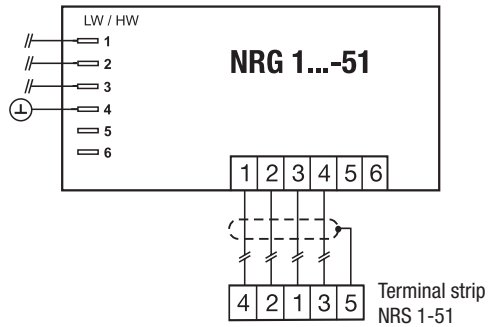
**Wiring diagram**



**Fig. 18**



**Fig. 19** Wiring of level electrode with four-pole connector



**Fig. 20** Wiring of level electrode with aluminium terminal box

## Electrical Connection – continued –

### Key

- 32 Stand-by input 1, 24 V DC, for connecting the logic unit SRL
- 33 Level electrode NRG 1...-51, NRG 1...-12

### Tools

- Screwdriver for cross 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) mm

## Commissioning, Fault Indication and Remedy

For additional information on commissioning procedures and troubleshooting refer to the installation manual of the level switch NRS 1-51.

## Decommissioning



### Danger

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

### Disposal

Dismantle the level electrode and separate the waste materials, using the specifications in the table “Materials” as a reference.

For the disposal of the equipment observe the pertinent legal regulations concerning waste disposal.

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





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