FLOWSERVE GESTRA

## GESTRA Steam Systems

# NRG 26-21

GB

## Installation Instructions 818774-00

Level Electrode
NRG 26-21

# Contents

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# Important Notes

## Usage for the intended purpose

Use level electrode NRG 26-21 only in conjunction with level switches NRR 2..., NRS 2... or NRT 2... for indicating liquid levels.

Note that the equipment must **not** be used in explosion risk areas.

## Safety note

The equipment must only be installed and commissioned by qualified and adequately trained personnel.

Maintenance and retrofitting must only be performed by entrusted personnel who – through adequate training – have achieved a recognised level of competence.

### Danger

When loosening the electrode live steam or hot water might escape.
This presents the danger of sever scalding.
It is therefore essential not to dismantle the electrode unless the boiler pressure is verified to be zero.

The electrode is hot during operation.
This presents the risk of severe burns to hands and arms.

Installation and maintenance work should only be carried out when the system is cold.

### 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.

## ATEX (Atmosphère Explosible)

The equipment constitutes a simple item of electrical equipment as defined in DIN EN 50020 section 5.4. According to the European Directive ATEX 94/9/EC the equipment may only be used in potentially explosive atmospheres if it is provided with approved Zener barriers.
Application in Ex zones 1, 2 (1999/92/EC). The equipment does not bear an Ex marking.
The suitability of the Zener barrier is certified in a separate document.

# Explanatory Notes

## Scope of supply

**NRG 26-21**
1 Level electrode NRG 26-21 with joint ring D 27 x 32 DIN 7603, 1.4301 bright annealed
1 Installation manual

## System description

The level electrode NRG 26-21 works according to the capacitance measurement principle. The NRG 26-21 is used for signalling different levels in electrically conductive and non-conductive liquids:

- Levels maintained within the control band defined by two preset limits

The preamplifier NRV 2-29 is integrated in the terminal box of the level electrode.

## Function

The principle of capacitance measurement is applied to determine the level. The electrode rod and the vessel wall form a capacitor. If the level of the dielectric located between the two capacitor plates changes, the current which flows through the plates changes proportionally to the level.
A dielectric is defined as an insulating substance, which excludes many liquids such as water. In order to receive a useful measuring result the measuring rod, which is submerged to varying depths in the liquid, must be completely insulated. After the calibration of the zero point / measuring range (0 % / 100 %), the level can be read off from a remote display unit. The level measuring range can be changed during operation.

## Design

**NRG 26-21**
Screwed design ¾", DIN ISO 228-1, **Fig. 2**

# Technical Data

## NRG 26-21

**Type approval no.**
TÜV · WR · 01-320

**Service pressure**
32 bar g at 238 °C

**Connections**
Screwed ¾", DIN ISO 228-1

**Materials**
Terminal box: PPO (Noryl®)
Stem: 1 .4571 CrNiMoTi17-12-2
Measuring electrode: 1 .4571 CrNiMoTi17-12-2
Electrode insulation: PTFE

**Supply voltage**
12 V

**Length supplied / measuring range**
⓮ Max. installation length at 238 °C
⓯ Measuring range

| ⓮ | ⓯ |
|---|---|
| 373 | 300 |
| 477 | 400 |
| 583 | 500 |
| 688 | 600 |
| 794 | 700 |
| 899 | 800 |
| 1004 | 900 |
| 1110 | 1000 |
| 1214 | 1100 |
| 1319 | 1200 |
| 1423 | 1300 |
| 1528 | 1400 |
| 1636 | 1500 |
| 2156 | 2000 |

# Technical Data – continued –

## NRG 26-21 – continued –

**Sensitivity**
Range 1: Water ≥ 0.5 µS/cm
Range 2: Water ≥ 20 µS/cm
Range 3: Fuel oil EL $\varepsilon_r$ 2.3

**Cable entry**
Cable gland with integral cable clamp M 16

**Protection**
IP 65 to DIN EN 60529

**Max. admissible ambient temperature**
70 °C

**Weight**
approx. 1.8 kg

## Corrosion resistance

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

## Sizing

The body must not be subjected to sharp increases in pressure. Welds and flanges of the electrode are designed to withstand dynamic loading (bending and alternating stress). The dimensional allowances and additives for corrosion reflect the latest state of technology.

## Name plate / marking

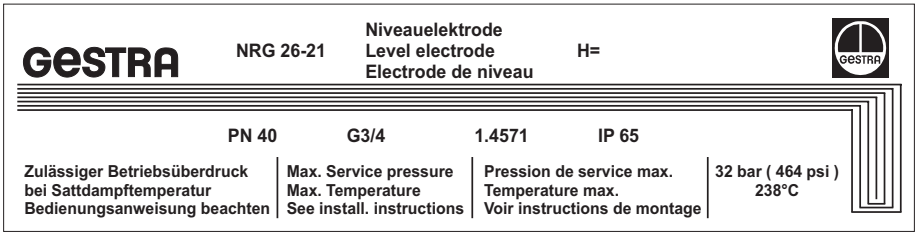


**Fig. 1**

## Technical Data – continued –

### Dimensions

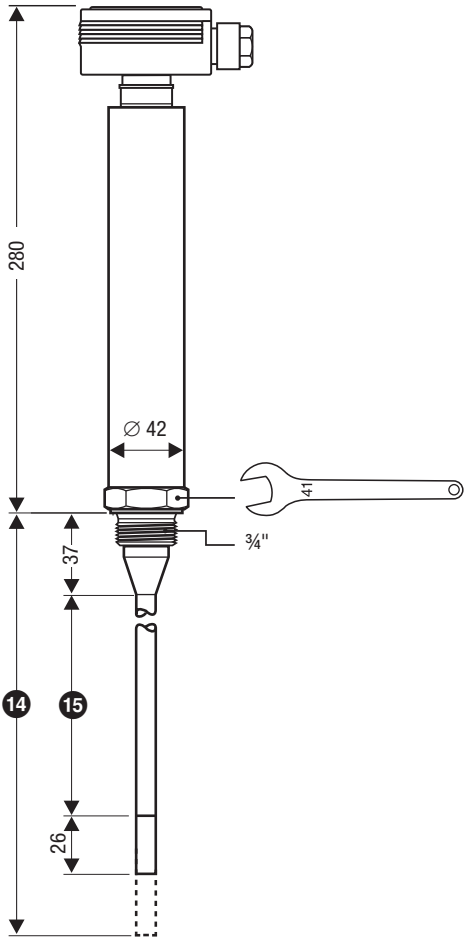


**Fig. 2**

⓯ Constant length (no elongation)

## Design

### NRG 26-21

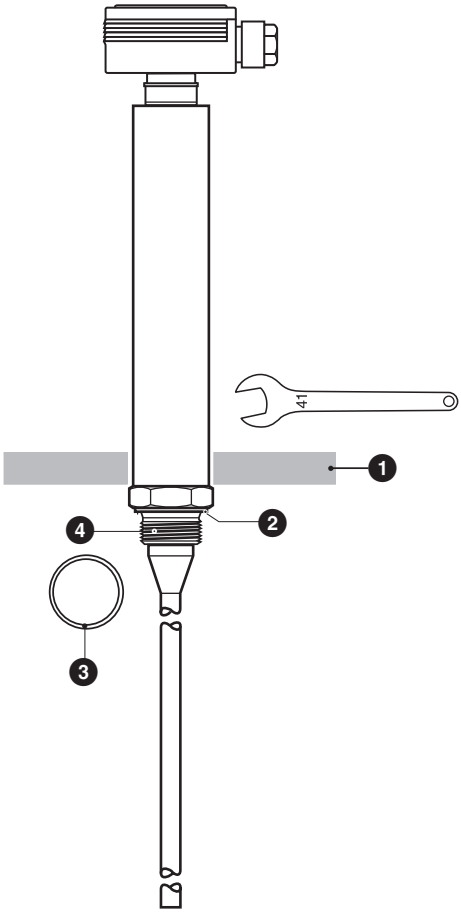


Fig. 3

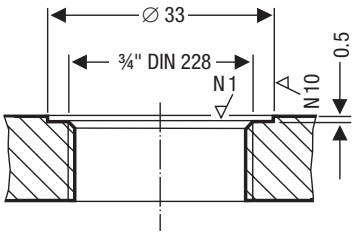


Fig. 4

## Functional Elements

### NRG 26-21

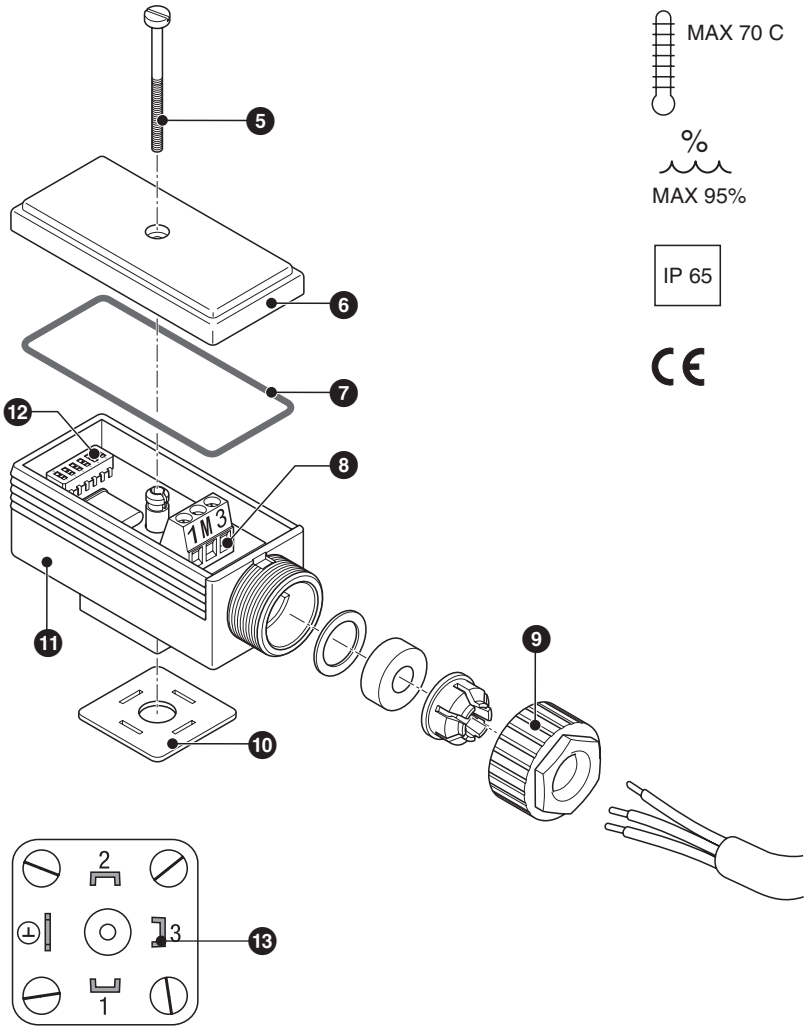


**Fig. 5**

Preamplifier NRV 2-29 integrated in the terminal box

## Design / Functional Elements

### Key

1. Thermal insulation provided on site, d = 20 mm (without thermal insulation of steam boiler)
2. Seating surface
3. Joint ring D 27 x 32, DIN 7603 – 1.4301
4. Electrode thread ¾", DIN ISO 228-1
5. Screw M4
6. Cover
7. Seal
8. Terminal strip
9. Cable entry M16 (PG 9)
10. Sealing plate
11. Terminal box (with preamplifier NRV 2-29)
12. Code switch
13. Contact plate
14. Max. installation length at 238 °C
15. Measuring range

# Installation

## NRG 26-21

1. Check seating surfaces of threads or flange provided on vessel or boiler standpipe, **Fig. 4**.
2. Place joint ring ❸ onto seating surface ❷ of the electrode, **Fig. 3**.
   Use only joint ring (of stainless steel 1.4301) D 27 x 32 to DIN 7603 supplied with electrode.
3. Apply a light smear of silicone grease (e. g. DOW Corning 111 Compound) to electrode thread ❹.
4. Screw level electrode into threads or flange provided on vessel or boiler standpipe and tighten with a 41 mm open-end spanner. The torque required for tightening is **160 Nm** when cold.

### Attention

- The seating surface of the threads and flanges provided on the vessel or boiler standpipe must be accurately machined, **Fig. 4**.
- Do not bend electrode rod when mounting.
- Do not lag electrode body.
- Do not insulate electrode thread with hemp or PTFE tape.

### Note

- For the approval of the boiler standpipe with connecting flange the relevant local or national regulations must be considered.
- See four examples of installation of page 13.

## Tools

- Open-end spanner 41 mm A. F.

# Installation – continued –

## Examples of installation

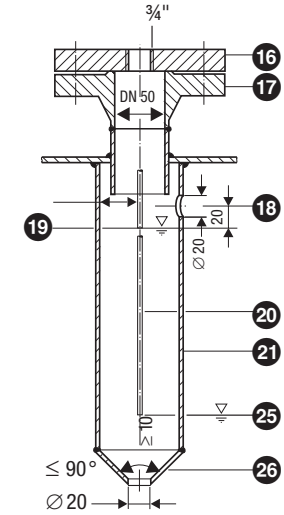


Fig. 6

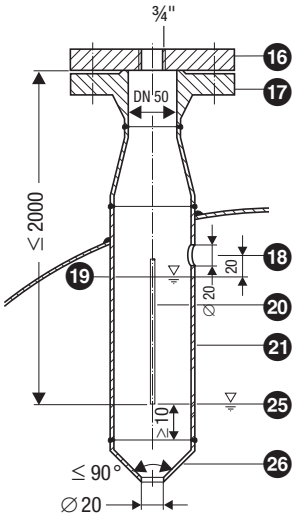


Fig. 7

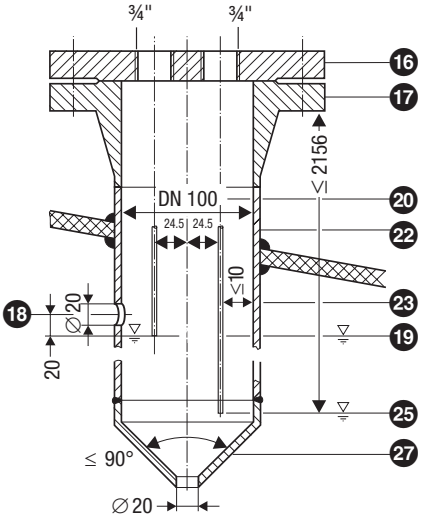


Fig. 8

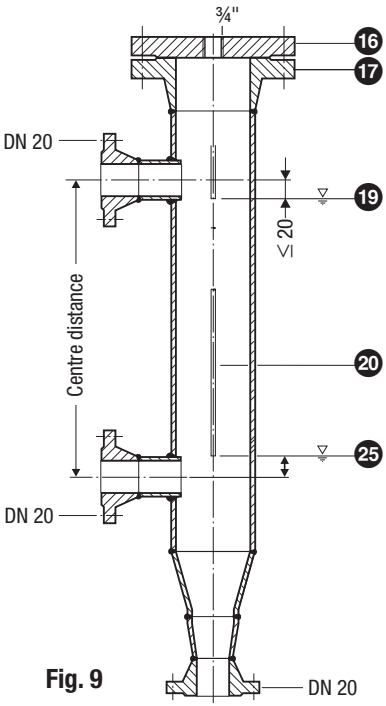


Fig. 9

## Key

16 Flange PN 40, DN 50, DIN 2527
Flange PN 40, DN 100, DIN 2527

17 For the approval of the boiler standpipe with connecting flange the relevant regulations must be considered.

18 Vent hole

19 High water (HW)

20 Electrode rod d = 15 mm

21 Protection tube DN 80

22 Protection tube DN 100

23 Electrode distance ≥ 14 mm (LW)

24 Electrode distance ≥ 40 mm (LW)

25 Low water (LW)

26 Reducer DIN 2616-2, part 2 K-88.9 x 3.2 - 42.4 x 2.6 W

27 Reducer DIN 2616-2, part 2 K-114.3 x 3.6 - 48.3 x 2.9 W

## Electrical Connection

### NRG 26-21

Electrical connection via four pole connector.

Note that screened four core cable, e. g. I-Y(St)Y 2 x 2 x 0.8 or LICYC 4 x 0.5 $mm^2$ is required for wiring the electrode.

Max. length 100 m with conductivities from 10 µS/cm.
Max. length 30 m with conductivities from 0.5 µS/cm.

1. Undo screw ❺, **Fig. 5**.
2. Take the terminal box off the level electrode, leaving the sealing plate ⓾ on the contact plate ⓭.
3. Remove cover ❻ with seal ❼.
4. Detach cable gland ❾ from terminal box ⓫.
5. Run cable through cable gland ❾ of the terminal box ⓫ and connect the terminals of the terminal strip ❽ according to the wiring diagram.
6. Replace cover ❻ and insert screw ❺.
7. Put terminal box onto the level electrode and fix it firmly by tighten screw ❺.

## Electrical Connection – continued –

### Wiring diagram

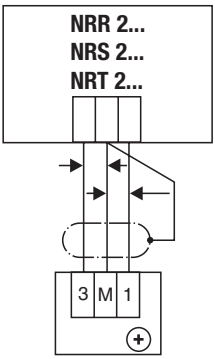


**Fig. 10**

### Setting measuring range

Adjust the preamplifier NRV 2-26 integrated in the terminal box ⓫ to the operating conditions prevailing in your installation before putting the level electrode into operation. Make sure that the measuring range setting is correct for your application and check whether the fluid to be controlled is electrically conductive or not before commissioning the electrode.

### Tools

- Screwdriver for cross-recess head screws, size 1
- Screwdriver for slotted screws, size 2.5, completely insulated to VDE 0680
- Open-end spanner 17 mm A. F.

# Basic Settings

## Factory setting

The default setting of the code switch ⑫ is the max. measuring range for water (conductivity ≥ 20 µS/cm. The max. measuring range is the length ⑮ (distance between lower and upper measuring point) plus 26 mm, see **Fig. 11**.

The level electrode features the following factory set default values:

- Measuring range up to 350 mm: Code switch ⑫ position 4, 5 ON, 1, 2, 3, 6 OFF
- Measuring range 350 mm to 750 mm: Code switch ⑫ position 4 ON, 1, 2, 3, 5, 6 OFF
- Measuring range 750 mm to 1500 mm: Code switch ⑫ position 3 ON, 1, 2, 3, 4, 6 OFF
- Measuring range 1500 mm to 2500 mm: Code switch ⑫ position 2 ON, 1, 3, 4, 5, 6 OFF

## Establishing active measuring range

A control range may be established within the measuring range of the electrode.
Establish the length of the control range using the code switch ⑫, see **Fig. 5, Fig. 11**

Ⓧ Selected control range (= active measuring range) in [mm]

⑮ Max. measuring range at 25 °C

㉘ Diagram for water, conductivity ≥ 20 µS/cm

㉙ Diagram for water, conductivity ≥ 5 µS/cm

㉚ Diagram for fuel oil EL, dielectric constant $\varepsilon_r$ 2.3

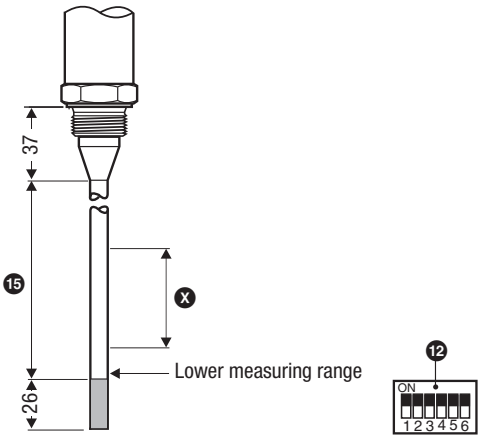


**Fig. 11**

## Attention

- If Ⓧ is clearly smaller than ⑮ change the code switch according to the diagrams ㉘, ㉙ and ㉚ to adapt the setting to the fluid used in the installation.

### Establishing active measuring range – continued –

Ascertain the type of fluid to be monitored. Establish the active measuring range [mm] for your application. Use diagrams ㉘, ㉙ or ㉚ to determine the required code switch settings for water and fuel oil EL.

Example: Max. measuring range at 25 °C: 1500 mm, active measuring range: 1000 mm, switch 3 of the code switch must be set to ON and all other switches to OFF.

If the fluid to be monitored is not water or fuel oil EL, the voltage must be measured in order to determine the switch position. For this purpose switch on the mains switch of the associated level switch NRR 2..., NRS 2... or NRT 2... .

1. Open the cover ❻ of the terminal box ⓫.
2. Fill vessel until its max. liquid level is reached and then connect a voltmeter between the terminals "1" (+) and "M" (–). Before starting the measurement set all switches of the code switch to OFF.
3. Now operate each individual switch in turn: first only 1 to ON, then only 2 to ON, then only 3 to ON, then only 4 to ON, then 4 +5 to ON and then 4 + 5 + 6 to ON. As soon as with one of the switch positions the value measured by the voltmeter exceeds 7 V, select the preceding switch position.
4. After having set the code switch, put cover ❻ onto the terminal box ⓫ and fix it by fastening the screw ❺.

**㉘ Diagram for water, conductivity ≥ 20 µS/cm**

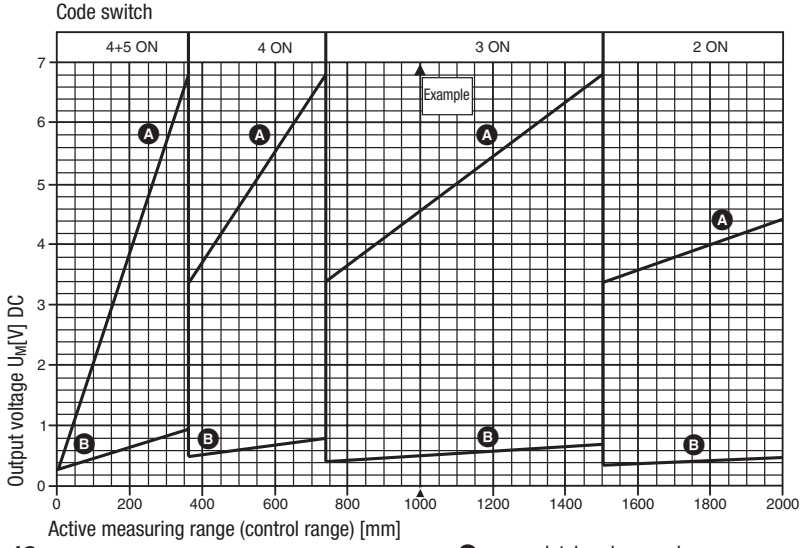


**Fig. 12**

Ⓐ = completely submerged
Ⓑ = completely exposed

### Establishing active measuring range – continued –

**29 Diagram for water, conductivity ≥ 25 µS/cm**

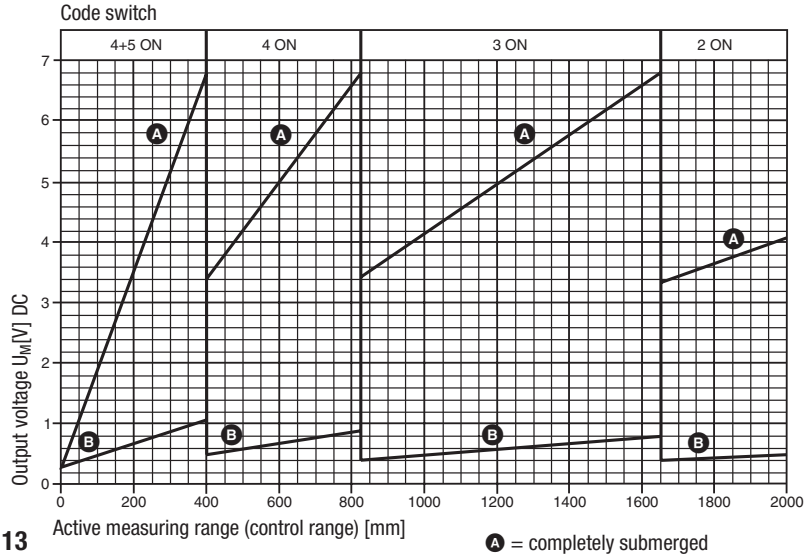


**Fig. 13**

**30 Diagram for fuel oil EL, dielectric constant $\varepsilon_r$ 2.3**

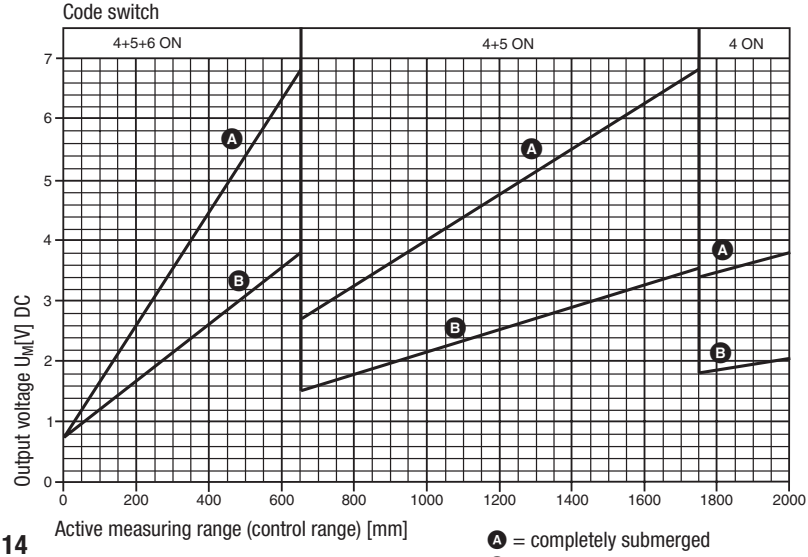


**Fig. 14**

## Basic Settings – continued –

**Note**

- When the measuring points of the electrode are established when the equipment is **cold**, the measuring points will shift as the temperature increases due to the thermal expansion of the electrode rod. The setting must then be corrected.

## Commissioning

### Checking electrical connection

1. Make sure that the system NRG 26-21 is wired according to the wiring diagram, **Fig. 10**.
2. Make sure that the mains voltage of the associated level switch agrees with the ratings on the name plate.

### Checking measuring voltages

The supply voltage of the electrode can be measured between terminals “3” and “M” in the terminal box ⓫. The voltage should be 12 V d. c. If this voltage is not measured, the electrode has to be checked at our works or by a works official.

The level-proportional voltage $U_M$ can be measured between terminals “1” (+) and “M” (–).
Raise the liquid level in the vessel to the max. point of the control range (completely submerged), e. g. 1000 mm, and measure the voltage.

Compare the value measured with the value of the corresponding diagram (in chart ㉘, $U_M$ for 1000 mm is 4.6 V). The following values must be obtained in any case:
Level electrode completely exposed: $U_M \geq 0$ V, level electrode completely submerged: $U_M \leq 7$ V.

If the level electrode is submerged and $U_M = 0$ V or $U_M > 7$ V is measured, the level electrode has to be checked in our service department.

## Operation

### NRG 26-21

Operation in steam and (pressurised) hot water plants in accordance with TRD 401, TRD 602, TRD 604, EN 12952; EN 12953 or other national regulations or according to the guidelines of classification societies.

**Note**

- Should malfunctions occur during the commissioning procedure refer to chapter “Operational Malfunctions” on page 21 in order to analyse and correct them.

## Operational Malfunctions

**Fault-finding list for troubleshooting**

**The equipment fails to work**

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

***Fault:*** The electrode housing does not have earth connection to the boiler.
***Remedy:*** Clean seating surfaces and insert metal joint ring D 27 x 32 DIN 7603 – 1.4301.
Do **not** insulate the electrode with hemp or PTFE tape.

**The equipment does not work properly**

***Fault:*** The electrode has been installed without a protection tube.
The protection tube serves as reference electrode.
***Remedy:*** Install a protection.

***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 (optional) are closed.
***Remedy:*** Open the isolating valves.

***Fault:*** The desired zero point does not lie within the measuring range of the electrode.
The electrode is too short.
***Remedy:*** Replace the electrode. Choose correct electrode length.

***Fault:*** The adjustment of the measuring range is incorrect.
***Remedy:*** Correct the code switch ⓬ setting, see section “Basic Settings”.

***Fault:*** Dirt deposits have accumulated on the electrode rod.
***Remedy:*** Remove the electrode and clean its rod with a wet cloth.

If faults occur that are not listed above, please contact our subsidiary or 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 (circuit boards) must be disposed of separately.
For the disposal of the level electrode observe the pertinent legal regulations concerning waste disposal.

# Annex

## Declaration of Conformity CE

We hereby declare that the equipment **NRG 26-21** conforms to the following European guidelines:

- Low Voltage Directive (LVD) 73/23/EC version 93/68/EC
- Directive of Electromagnetic Compatibility (EMC) 89/336/EC version 93/68/EC
- Low voltage standard EN 50178
- Electromagnetic compatibility standard EN 50081-2, EN 50082-2

This declaration is no longer valid if modifications are made to the equipment without consultation with us.

Bremen, 3rd January 2005
GESTRA AG

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