NRG 211-1

Installation Instructions 810425-00
Level Probe Type NRG 211-1
Fig. 1
Fig. 2
Fig. 3
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<td>B</td>
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<tr>
<td>C</td>
<td>Stuffing box</td>
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<tr>
<td>D</td>
<td>Groove for gasket</td>
</tr>
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<td>E</td>
<td>Locking screw</td>
</tr>
<tr>
<td>F</td>
<td>Transit protection</td>
</tr>
<tr>
<td>G</td>
<td>Upper part of connector</td>
</tr>
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<td>Retaining clip</td>
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<td>Fixing screw for connector</td>
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<td>L</td>
<td>Expansion bolts</td>
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<td>M</td>
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<td>N</td>
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<tr>
<td>O</td>
<td>Protection tube</td>
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<tr>
<td>P</td>
<td>Cable</td>
</tr>
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<td>Q</td>
<td>Cable gland</td>
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<td>R</td>
<td>Screw for connector insert</td>
</tr>
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Important Notes

Safety Note

Use level probe NRG 211-1 only in combination with GESTRA level switch NRS 2-4/NRS 2-5 to detect and monitor water or condensate levels. The equipment must only be installed by qualified staff. Qualified staff are those persons who – through adequate training in electrical engineering, the use and application of safety equipment in accordance with regulations concerning electrical safety systems, and first aid & accident prevention – have achieved a recognised level of competence appropriate to the installation and commissioning of this device.

Danger

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

Scope of supply

NRG 211-1
1 Level probe NRG 211-1
1 Gasket with serrated faces
1 Installation Instructions

System description

The capacitance level probe NRG 211-1 serves as sensor for the level switch NRS 2-4 (high level) / NRS 2-5 (low level) and can be used as part of a controlled draining system in power stations or for low level detection in tanks.

Function

The electrode is designed as a rod-type capacitor, the capacitance of which is electronically compared with a reference capacitance. The result is a level-proportional measuring voltage. The fluid temperature is measured by an integral resistance thermometer and electronically compared with a fixed limit. When the two values are equal in magnitude the level-proportional measuring voltage will be limited to 4 V.

Design

NRG 211-1
Design with welding standpipe for installation in vertical pipes.
Technical data – level probe

**Weight**
Level probe approx. 5.6 kg
Welding standpipe approx. 4.5 kg

Technical data – preamplifier

**Case**
Terminal box made of aluminium, painted

**Wiring**
Via Harting connector with 6 terminals
Cable gland PG 11

**Supply voltage**
12 V DC, 30 mA

**Output**
1 – 10 V DC, measuring voltage $U_M$

**Protection**
IP 54 (DIN 40050)

**Admissible ambient temperature**
70 °C

**Supply cable for electrode**
Screened three-core cable, conductor size 0.5 mm², max. length 500 m

Technical data – probe

**Connection**
Probe flange PN 320 with welding standpipe for pipes DN $\leq$ 100; with tee piece or for pipes DN > 100 with lateral penetration

**Materials for wetted parts**
- Protection tube up to 500 °C: St 35 (1.0305)
- Protection tube up to 550 °C: 10 CrMo 9 10 (1.7380)
- Strainer: X 6 CrNiMoTi 17-12-2 (1.4571)
- Insulating seal of probe rod: Special ceramics material
- Flange joint ring: X 6 CrNiTi 18-10 (1.4541)/silver

**Max. admissible pH value**
10 (for ceramics insulation)

**Temperature sensor**
Pt 1000

**Pressure/ Temperature ratings**

<table>
<thead>
<tr>
<th>Material for flange/welding standpipe</th>
<th>1.5415</th>
<th>1.7380</th>
<th>1.4922</th>
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</thead>
<tbody>
<tr>
<td>Admiss. service pressure [bar]</td>
<td>320</td>
<td>200</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>[psig]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4642</td>
<td>2901</td>
<td>4642</td>
</tr>
<tr>
<td>Admiss. service temperature [°C]</td>
<td>120</td>
<td>450</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>[°F]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>248</td>
<td>842</td>
<td>248</td>
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</tbody>
</table>
Installation

Welding standpipe

Weld standpipe inclined upwards by at least 5° onto vertical pipe to ensure that the standpipe can completely empty if the level falls. Make sure that the marking TOP is on top. See Fig. 5 on page 21

Note

- We recommend full-penetration butt welding (e.g. type 22 to DIN 2559) for the connection to pipes (tee pieces) DN ≤ 100. With larger pipes the welding standpipe can be introduced through a lateral penetration and then be welded.

Danger

- During the welding process and post weld heat treatment of the standpipe the temperature of the flange seating surface must not exceed 350°C.

Level probe

1. Clean flange seating surfaces.
2. Insert joint ring into the groove of the welding standpipe.
3. Put the probe onto it such that the connector at the terminal box shows to the bottom.
4. Tighten expansion bolts in diagonally opposite pairs with a torque of 170 Nm.
5. Tighten expansion bolts in diagonally opposite pairs with a torque of 130 Nm.
6. Remove the locking screw of the transit protection.

Attention

- Handle level probe with care. Avoid subjecting the probe to mechanical shocks as this might cause damage to the ceramic insulating seal and consequent leakage.
- Do not lag the body of the electrode above the mounting flange.
- When removing the level probe for inspection work store it in a vertical position.
Installation – continued –

Note

- The joint ring has serrated faces and silver coated rings at both ends which must not be removed.

Tools

- Open-end spanner, A. F. 27 mm
- Screwdriver for slotted screws, size 6 mm, completely insulated to VDE 0680
Wiring

Use screened three-core cable, min. conductor size 0.5 mm², max. length 500 m.
1. Lift up the retaining clip 1 and remove the upper part of the connector 6. Fig. 3
2. Remove screw 3 and connector insert 5.
3. Completely unscrew the cable gland 8 and slip it over the cable 9.
4. Strip off cable 9 insulation coating and remove conductor end insulation.
5. Insert cable 9 into the upper part of the connector 6 and effect wiring to connector insert 5 acc. to wiring diagram. Fig. 4
6. Fix connector insert 5 with the aid of screw 3, screw in cable gland 8 and tighten.
7. Insert the upper connector part 6 into the lower connector part 1 and lock by means of the retaining clip 1.

Wiring diagram

Fig. 4
Key to wiring diagram

1. Supply voltage 12 V DC
2. Measuring voltage 1 – 10 V DC
3. Pins
4. For resistance measurement: strip off conductor
5. For resistance measurement: Pt 1000
6. Fixing screws for amplifier board

Attention

- Screen must not make any other electrical contact.
- Connect the screen to the level switch only.
- When switching off inductive loads, voltage spikes are produced that may impair the operation of control and measuring systems. Inductive loads should be provided with commercial arc suppressor RC combinations, e.g. 0.1 µF/100 Ω.
Commissioning

Note

The level probe NRG 211-1 can only be operated and checked in combination with the level switch NRS 2-4 (high level) or NRS 2-5 (low level).

Check wiring

1. Check whether the 19” slide-in unit has been properly installed in the magazine.
2. Check whether the mains supply corresponds to the wiring carried out on the level probe.

Apply mains voltage

1. Switch on the mains supply and check whether the mains voltage is applied across the level switch. See installation instructions NRS 2-4 or NRS 2-5.

Check switching function

1. With level switch NRS 2-4
   Check the switching function “high level”. To assist with this objective raise the water level in the tank above the preset high level. The LED high level located at the level switch NRS 2-4 must light up and the corresponding function in the secondary circuit must be operated.
   With level switch NRS 2-5
   Check the switching function “low level”. To assist with this objective lower the water level in the tank below the preset low level. The LED low level located at the level switch NRS 2-5 must light up and the corresponding function in the secondary circuit must be operated.
2. Raise (NRS 2-5) or lower (NRS 2-4) the water level in the tank. The level electrode NRG 211-1 must switch back to normal operation.

Check voltage

1. Check the supply and measuring voltage of the level electrode. The voltages can be measured at the electrode or level switch. **Fig. 4**
   
   **Table: Supply voltage**: 12 V DC
   **Table: Measuring voltage**: see table 1 – measuring voltages on page 16
   
   In order to check the measuring voltage for probe exposed refer to “Check Resistance Thermometer”
### Table 1 Measuring voltages

<table>
<thead>
<tr>
<th>Measuring voltage $U_m$</th>
<th>Decoding NRS 2-4</th>
<th>Decoding NRS 2-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0 V – 1 V</td>
<td>Malfunction in probe supply line (short circuit or interruption)</td>
<td>Malfunction in probe supply line (short circuit or interruption)</td>
</tr>
<tr>
<td>= 1 V – 4 V</td>
<td>Probe exposed / fluid temperature ≥ 395 °C</td>
<td>Probe submerged</td>
</tr>
<tr>
<td>= 4 V – 7 V</td>
<td>Probe submerged, HIGH level</td>
<td>Probe exposed, LOW level</td>
</tr>
<tr>
<td>≥ 9 V</td>
<td>Malfunction in probe (defective insulating seal, leaky stuffing box)</td>
<td>Malfunction in probe (defective insulating seal, leaky stuffing box)</td>
</tr>
</tbody>
</table>

### Check resistance thermometer

1. Check the built-in resistance thermometer Pt 1000 and the measuring voltage for ELECTRODE EXPOSED. Lift the retaining clip and remove the upper part of the connector. **Fig. 3**

2. Remove screw and connector insert.

3. Completely unscrew cable gland and slip it over the cable.

4. Pull out the sensor supply cable for the thermometer and connect the ohmmeter. **Fig. 4**

5. The setpoint to be measured depends on the plant temperature, see table 2 RESISTANCE VALUES.

6. Check measuring voltage: it must be within 1 – 4 V DC (electrode exposed)

7. Reconnect the sensor supply cable.

8. Fix connector insert with screw, screw in cable gland and tighten.

9. Put upper part of the connector into lower part of the connector and lock by means of retaining clip.

### Table 2 Resistance values

<table>
<thead>
<tr>
<th>°C</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>Ω/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000.0</td>
<td>1039.0</td>
<td>1077.9</td>
<td>1116.7</td>
<td>1155.4</td>
<td>1194.0</td>
<td>1232.4</td>
<td>1270.7</td>
<td>1308.9</td>
<td>1347.0</td>
<td>1385.0</td>
<td>3.85</td>
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<td>100</td>
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<td>1460.6</td>
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<td>1535.7</td>
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<td>1610.1</td>
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<td>2.95</td>
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</tbody>
</table>

Mean values of 100 °C ranges
**Maintenance**

**Note**
- Store probe only in vertical position.

**Replace amplifier board**

1. Unscrew fixing screw ④ and remove terminal box cover. **Fig. 2**
2. Withdraw all terminals from pins.
3. Unscrew fixing screw ⑥ and remove board. **Fig. 4**
4. Insert new board and screw in fixing screws ⑥.
5. Connect terminals to pins.
6. Re-install terminal box cover, screw in fixing screw ④ and tighten.
Annex

Warning

The terminal strip of the NRS 2-4/NRS 2-5 is live during operation. This presents the danger of electric shock. Cut off power supply before inserting or removing the 19" slide-in unit and before undertaking any installation or maintenance work.

Fault finding list

Green LED OPERATION at level switch NRS 2-4/NRS 2-5 is not illuminated

Fault: The supply voltage has failed.
Remedy: Measure the voltage across A/C28 and A/C30 of the NRS 2-4/NRS 2-5. Check power supply and wiring.

No function when level falls or rises – LED MALFUNCTION IN PROBE and HIGH LEVEL on level switch NRS 2-4 or LOW LEVEL on level switch NRS 2-5 are illuminated

Fault: The locking screw has not been removed from the level probe NRG 211-1.
Remedy: Remove locking screw.

Fault: Defective level probe (defective insulating seal, untight stuffing box)
Remedy: Measure voltage across C18/A18 of NRS 2-4/NRS 2-5. Measure voltage across terminals 2 and 3 of the NRG 211-1. If voltage $\geq 9$ V check probe supply cable and wiring.

No function when level falls or rises – LED MALFUNCTION IN CABLE on level switch NRS 2-4 / NRS 2-5 is illuminated

Fault: Malfunction in probe supply cable (short circuit, interruption).
Remedy: Measure voltage across C18/A18 of NRS 2-4/NRS 2-5. Measure voltage across terminals 2 and 3 of level probe NRG 211-1. If voltage $\leq 1$ V check probe supply cable and wiring.

Level switch NRS 2-4: No function when level falls or rises or when high level is exceeded – only the green LED OPERATION of the level switch NRS 2-4 is illuminated

Fault: Level probe does not enter the liquid.
Remedy: Measure voltage across C18/A18 of NRS 2-4. Check installation of NRG 211-1 and measure voltage across terminals 2 and 3. If necessary change position of installation of the level probe.

Fault: Defective level switch.
Remedy: Measure voltage across C16/A18 (supply voltage for level probe) on NRS 2-4. Replace level switch if no voltage can be measured.

Fault: Defective preamplifier.
Remedy: Measure voltage across C18/A18 of NRS 2-4. Measure supply voltage across terminals 1 and 3 of NRG 211-1 and measuring voltage across terminals 2 and 3. If supply voltage = 12 V and no measuring voltage can be measured, replace preamplifier.
Fault: Defective temperature sensor.
Remedy: Check the measuring voltage across terminals 2 and 3 of NRG 211-1. If the supply voltage 1 – 4 V check temperature sensor. If temperature sensor is defective replace level probe.

Level switch NRS 2-5: No function when level falls or rises or when level is below min. level – only the green LED operation of the level switch NRS 2-5 is illuminated

Fault: Level probe does not enter the liquid.
Remedy: Measure voltage across C18/A18 of NRS 2-5. Check installation of NRG 211-1 and measure voltage across terminals 2 and 3. If necessary change position of installation of the level probe.

Fault: Defective level switch.
Remedy: Measure voltage across C16/A18 (supply voltage for level probe) on NRS 2-5. Replace level switch if no voltage can be measured.

Fault: Defective preamplifier.
Remedy: Measure voltage across C18/A18 of NRS 2-5. Measure supply voltage across terminals 1 and 3 of NRG 211-1 and measuring voltage across terminals 2 and 3. If supply voltage = 12 V and no measuring voltage can be measured, replace preamplifier.

Fault: Defective temperature sensor.
Remedy: Check the measuring voltage across terminals 2 and 3 of NRG 211-1. If supply voltage = 1 – 4 V check temperature sensor. If temperature sensor is defective replace level probe.

The temperature measured by means of the resistance thermometer does not correspond to the actual installation temperature

Fault: Defective Pt 1000.
Remedy: Replace level probe.

Spare parts

<table>
<thead>
<tr>
<th>Designation</th>
<th>Reference no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplifier board NRV 2-30</td>
<td>391 241</td>
</tr>
</tbody>
</table>
Declaration of conformity

We hereby declare that the equipment **NRG 211-1** conforms to the following European guidelines:
- LV guideline 73/23/EWG version 93/68/EWG
- EMC guideline 89/336/EWG version 93/68/EWG

which are based on the following harmonised standards:
- LV standard EN 60947-5-1: 1991
- EMC standard EN 50 081-2, EN 50 082-2

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

Bremen, 28th April 1997
GESTRA GmbH

Dr. Anno Krautwald  
Dr. Christian Politt
Examples of Installation

Key

A  By customer

B  Welding standpipe (GESTRA)
España

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Luis Cabrera, 86-88
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Tel. 00 34 91 / 5 152 032
Fax 00 34 91 / 4 136 747; 5 152 036
E-mail: gestra@gestra.es

Polska

GESTRA POLONIA Spolka z o. o.
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PL-80-172 Gdansk
Tel. 00 48 58 / 306 10 02 oder 306 10 10
Fax 00 48 58 / 306 10 03 oder 306 33 00
E-mail: gestra@gestra.pl

France

Flowserve Flow Control S. A. S.
10 Avenue du Centaure, BP 8263
F-95801 CERGY PONTOISE CEDEX
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Fax 0 03 31 / 34 43 26 87
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