



Level Electrode

NRG 211-1

EN
English

Original Installation Instructions
810425-06

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Important notes

Usage for the intended purpose

The level electrode NRG 211-1 is designed for measuring the water level in condensate lines. In conjunction with level switch NRS 2-4 the electrode can be used as max. limit switch with high level alarm.

Function

The level electrode together with the electronic module NRV 2-30 works according to the capacitance measurement principle, translating the level changes into level-dependent current signals.

The electrode is self-monitoring, i. e. a fault in the insulating seal will cause a malfunction alarm. In addition, a defined switching signal is given when the fluid reaches 395 °C because for physical reasons the level cannot be determined exactly in this temperature range.

The level electrode works with the level switch NRS 2-4 to detect the max. limit and raise a high level alarm. This equipment combination can be used as part of a controlled draining system in power plants.

The electrode with welding standpipe is installed in vertical pipes.

Safety note

The equipment 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 equipment 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.

Directives and standards

PED (Pressure Equipment Directive)

The equipment fulfils the requirements of the Pressure Equipment Directive 2014/68/EU and can be used for fluids of group 2.

The equipment has the CE marking on the name plate.

LV (Low Voltage) Directive and EMC (Electromagnetic Compatibility)

The equipment meets the requirements of the Low Voltage Directive 2014/35/EU and the EMC Directive 2014/30/EU.

ATEX (Atmosphère Explosible)

According to the European Directive 2014/34/EU the equipment must **not** be used in explosion-risk areas.

Note on the Declaration of Conformity / Manufacturer's Declaration CE

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.com or can be requested from us.

Technical data

NRG 211-1

Limiting conditions for level electrode

Material of flange/welding standpipe		1.5415		1.7380		1.4922	
Admissible service pressure	[barg]	320	200	320	200	320	230
	[psig]	4642	2901	4642	2901	4642	3336
Admissible service temperature	[°C]	120	450	120	500	120	550
	[°F]	248	842	248	932	248	1022

Mechanical connection

Special flange PN 320 with welding standpipe for pipes DN ≤ 100 with tee-piece or for pipes DN ≥ 100 with lateral bore

Material of wetted parts

Protection tube up to 500 °C	1.0305
Protection tube up to 550 °C	1.7380
Strainer	1.4571
Insulating seal of electrode	Special ceramic
Flange seal	1.4541/silver

ph value

Max. admissible: 10

Temperature sensor

Pt 1000

Weight

Level electrode approx. 5.6 kg

Welding standpipe approx. 4.5 kg

Electronic module NRV 2-30

Supply voltage

12 V DC

Output

≥ 0 – ≤ 10 V DC

Enclosure

Terminal box: made of aluminium, enamel finish

Electrical connection

Six-pole connector, cable glands Pg 11

Protection

IP 54 to EN 60529

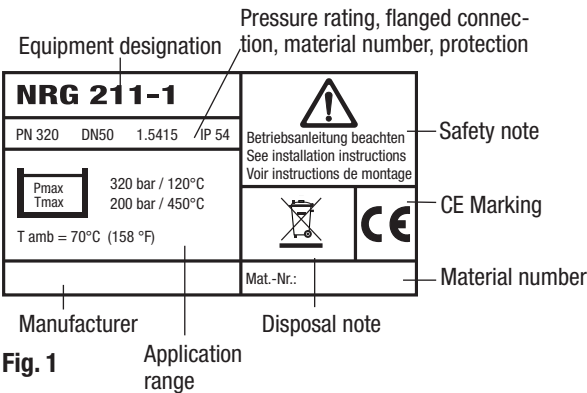
Max. admissible ambient temperature

70 °C

Scope of supply

- NRG 211-1
- 1 Level electrode NRG 211-1
- 1 Gasket with serrated faces
- 1 Installation manual

Name plate / marking



Installation

Dimensions NRG 211-1

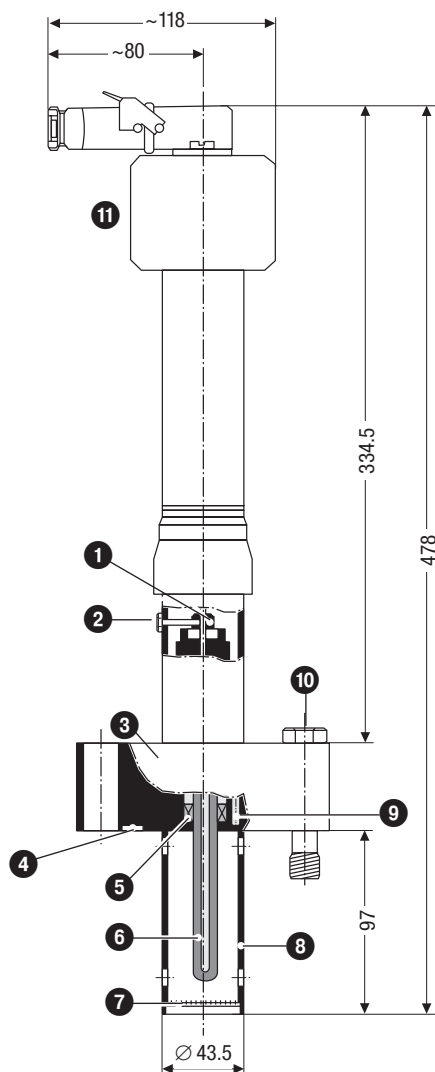


Fig. 2

Key

- | | | | |
|----------------------|-----------------------|----------------------|--------------------------------------|
| 1 Transit protection | 4 Groove for gasket | 7 Strainer | 10 Expansion bolt |
| 2 Fixing screw | 5 Stuffing box | 8 Protection tube | 11 Terminal box in electronic module |
| 3 Flange | 6 Measuring electrode | 9 Temperature sensor | |

Welding standpipe

Weld standpipe inclined upwards by at least 5° - 10° onto vertical pipe to ensure that the standpipe can completely empty if the level falls. Make sure that the marking TOP is on top. **Fig. 3.**



Note

- To connect the equipment to pipes (tee-pieces) with $DN \leq 100$ use full-penetration butt welding 22 DIN 2559.
- For larger pipes the welding standpipe can be introduced through a lateral penetration and then be welded in place.
- The joint ring has serrated faces and silver coated rings at both ends which must not be removed.



Danger

- During the welding process or post weld treatment of the standpipe the temperature of the flange seating surface must not exceed 350 °C (danger of scalding).



Attention

- Handle level electrode with care. Do not let it fall down.
- Do not subject electrode rod to physical shocks..
- Use only the supplied joint ring!
- Use high-temperature lubricant (e. g. Dag 156) for the expansion bolt !
- Do not lag electrode body above the hexagonal section!
- If the the level electrode is removed for inspection work make sure it is stored in a vertical position.

NRG 211-1

1. Check seating surfaces. Clean end flange facings.
2. Insert joint ring into the groove of the welding standpipe.
3. When putting the level electrode in place make sure that the connector at the terminal box points downwards.
4. Tighten expansion bolt ⑩ in diagonally opposite pairs **with a torque of 70 Nm** .
5. Tighten expansion bolt ⑩ in diagonally opposite pairs **with a torque of 130 Nm**.
6. Remove the fixing screw ② of the transit protection ①.

Tools

- Open-end spanner A. F. 27, DIN 3110, ISO 3318

Examples of installation

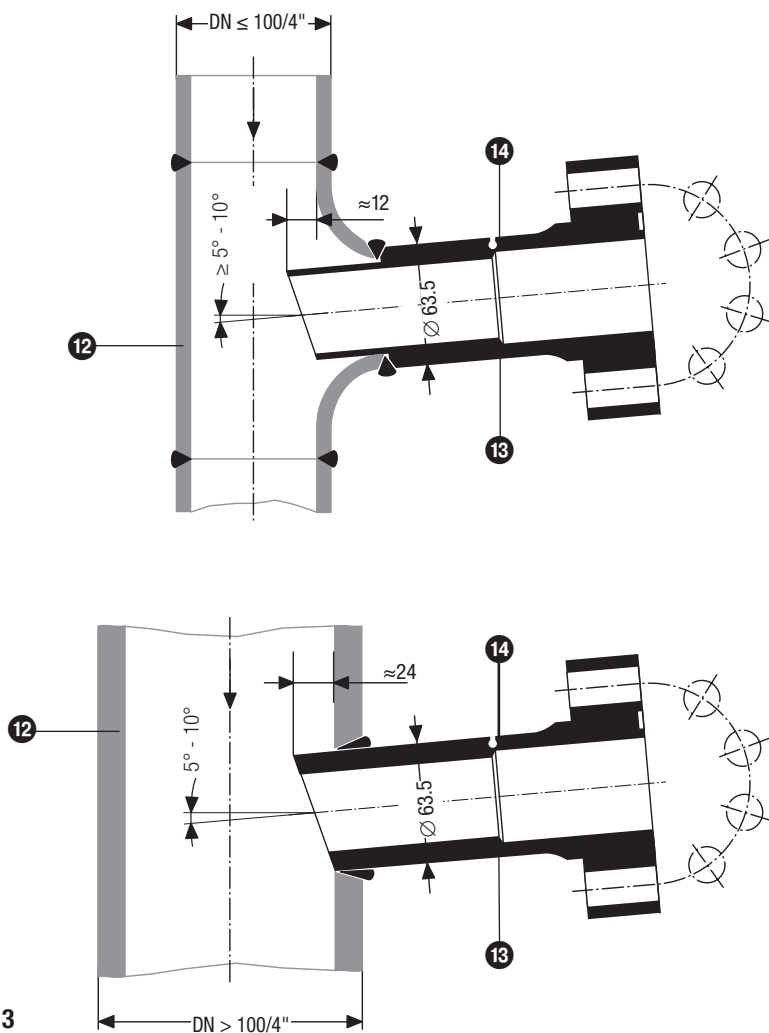


Fig. 3

Key

- 12 Provided by customer
- 13 Welding standpipe (GESTRA)
- 14 Marking TOP

Electrical connection

Connection of level electrode

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm², e. g. LiYCY 4 x 0.5 mm², max. length 500 m.

Connect only one screen to the NRS 2-4. Wire terminal strip in accordance with the wiring diagram.

Fig. 5

The screen must not make any other electrical contact.



Attention

- Please follow the instructions given in the installation manual for NRS 2-4!
- Make sure that connecting cables leading to the level electrode are segregated and run separately from power cables.

Tools

- Screwdriver, size 6 mm, completely insulated according to VDE 0680

NRV 2-30

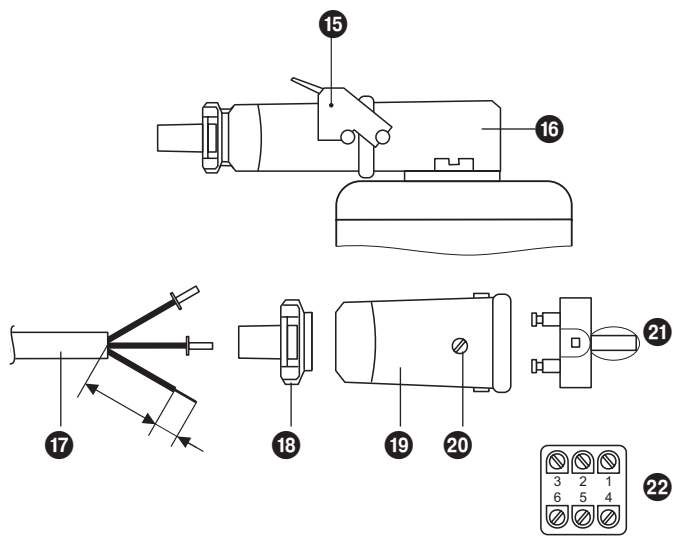


Fig. 4

Wiring diagram

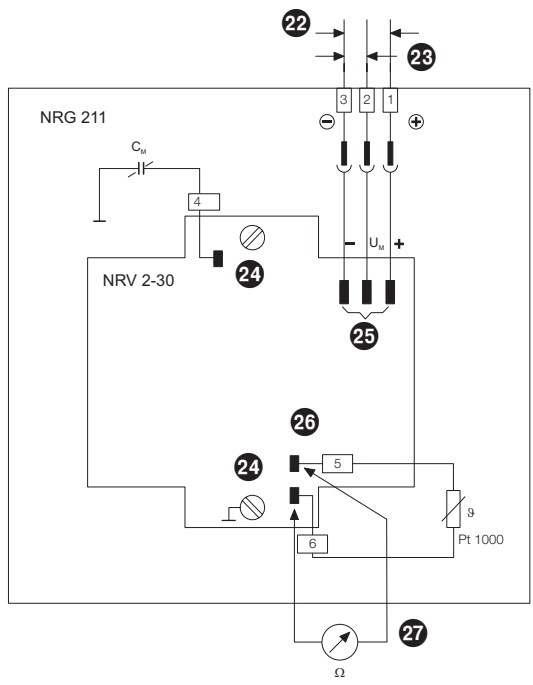


Fig. 5

NRV 2-30, wiring connecting terminals

1. Turn up the retaining bracket **15** and detach the upper part of the connector **19** from the level electrode.
2. Unscrew screw **20** and press the contact block **21** out of the upper part of the connector **19**.
3. Loosen cable gland **18**.
4. Pull cable **17** through cable gland **18**, ring, joint ring and upper part of connector **19**.
5. Wire connecting terminals in the contact block **21** according to **Fig. 5**.
6. Press the contact block **22** into the upper part of the connector **19**.
7. Re-insert screw **20** in the hole and tighten it. In doing so the contact block **21** is fixed to the upper part of the connector **19**.
8. Fasten the cable gland **18**.
9. Plug the upper part of the connector **19** into the lower part **16** and secure it in place by turning down the retaining bracket **15**.

Commissioning procedure



Note

The level electrode NRG 211-1 and the level switch NRS 2-4 (MAX) form a functional unit and must only be operated and checked together.

For additional information on commissioning procedures and troubleshooting refer to the installation manual of the level switch NRS 2-4.

Applying supply voltage

Please check that the level electrode is wired in accordance with the wiring diagram (**Fig. 5**) and switch on the supply voltage of the level switch NRS 2-4.

Checking switching functions

Check the switching function "High level" (MAX). For this purpose raise the water level in the tank above the preset high level. The LED of the level switch NRS 2-4 that indicates "High level" (MAX) must light up and the corresponding function in the secondary circuit must be triggered.

Key

15 Retaining bracket	21 Contact block	27 For resistance measurement Temperature sensor (for measurement remove conductors)
16 Lower part of connector	22 Supply voltage 12 V DC	
17 Cable	23 Measuring voltage 1 – 10 V DC	
18 Cable gland	24 Fixing screws for electronic module	
19 Upper part of the connector	25 Terminal lugs	
20 Screw	26 Connection for temperature sensor	

Troubleshooting



Danger

The terminal strip of the level switch is live during operation.

This presents the danger of electric shock!

Always cut off power supply to the equipment before mounting, removing or connecting the terminal strip and before unplugging the 19" slide-in unit!



Attention

Before carrying out the fault diagnosis please check:

Supply voltage:

Is the level electrode supplied with the voltage specified on the name plate?

Wiring:

Is the wiring in accordance with the wiring diagram?

Indication, diagnosis and remedy

Malfunctions indicated by level switch NRS 2-4		
Display	Error	Diagnosis and remedy
LED Power ON not illuminated.	No supply voltage.	Switch on supply voltage. Check all electrical connections.
LED Level electrode defective and LED High Level (MAX) illuminated	The fixing screw of the level electrode has not been removed.,	Remove the fixing screw.
	Level electrode defective (insulating seal, stuffing box)	Measure the voltage of the NRS 2-4 across C18/A18. Measure the voltage of the NRG 211-1 across terminals 2 and 3. If the voltage ≥ 9 V replace level electrode.
LED Malfunction in cable - illuminated	Connecting cable to level electrode defective (short circuit, interruption)	Measure the voltage of the NRS 2-4 across C18/A18. Measure the voltage of the NRG 211-1 across terminals 2 and 3. If the voltage ≤ 1 V check the connecting cables and the wiring.

Checking voltage

Check the supply and measuring voltages of the level electrode. You can measure the voltages on the level electrode or the level switch. **Fig. 5**

Voltages	Diagnosis
12 V DC	Supply voltage
≤ 0 V – 1 V DC	Connecting cable to level electrode defective (short circuit, interruption)
$= 1$ V – 4 V DC	Level electrode exposed, fluid temperature ≥ 395 °C
$= 4$ V – 7 V DC	Level electrode submerged, HIGH level
≥ 9 V DC	Level electrode defective (insulating seal, stuffing box)

Indication, diagnosis and remedy - continued -

HIGH level exceeded, equipment does not work		
Display	Error	Remedy
Only LED Power ON illuminated	Level electrode not submerged.	Measure the voltage of the NRS 2-4 across C18/A18. Check installation and measure the voltage of the NRG 211-1 across terminals 2 and 3. Check installation of level electrode and, if necessary, change it.
	Level switch defective.	Measure the voltage of the NRS 2-4 across C16/A18 (supply voltage of level electrode). If no voltage can be measured replace the level switch.
	Electronic module defective.	Measure the voltage of the NRS 2-4 across C18/A18. Measure the supply voltage of the NRG 211-1 across terminals 1 and 3 and the measuring voltage across terminals 2 and 3. Replace electronic module if supply voltage is 12 V DC but no measuring voltage can be measured.
	Temperature sensor defective.	Measure the measuring voltage of the NRG 211-1 across terminals 2 and 3. If you measure a voltage of 1 - 4V check the temperature sensor. If the temperature sensor is defective replace the level electrode.

Checking temperature sensor

1. Turn up the retaining bracket **15** and detach the upper part of the connector **19** from the level electrode. **Fig. 4**
2. Unscrew the four cover screws and detach cover from terminal box.
3. Detach the connecting lines of the temperature sensor **26** and connect an ohmmeter **27**. **Fig. 5**
4. Measure the resistance value and compare the result with the water temperature in table 1. If necessary, interpolate intermediate values.
5. If the values deviate replace the level electrode with a new one.
6. If the resistance value corresponds to the temperature, re-attach the connecting line to the temperature sensor **26**.
7. Fit the cover of the terminal box in place and tighten the four cover screws.
8. Plug the upper part of the connector **19** into the lower part **16** and secure it in place by turning down the retaining bracket **15**.

Resistance values

°C	0	10	20	30	40	50	60	70	80	90	100	Ω/°C ¹⁾
0	1000.0	1039.0	1077.9	1116.7	1155.4	1194.0	1232.4	1270.7	1308.9	1347.0	1385.0	3.85
100	1385.0	1422.8	1460.6	1498.2	1535.7	1573.2	1610.1	1647.6	1684.7	1721.6	1758.4	3.73
200	1758.4	1795.1	1831.7	1868.2	1904.6	1940.8	1977.0	2013.0	2048.8	2084.6	2120.3	3.61
300	2120.3	2155.8	2191.3	2226.6	2261.8	2296.9	2331.9	2366.7	2401.5	2436.1	2470.6	3.50
400	2470.6	2505.0	2539.3	2573.4	2607.5	2641.4	2675.2	2708.9	2742.5	2776.0	2809.3	3.38
500	2809.3	2842.6	2875.7	2908.7	2941.6	2974.3	3007.0	3039.5	3072.0	3104.3	3136.5	3.27
600	3136.5	3168.6	3200.5	3232.4	3264.1	3295.7	3327.2	3358.6	3389.9	3421.0	3452.1	3.15
700	3452.1	3483.0	3513.8	3544.5	3575.1	3605.5	3635.9	3666.1	3696.2	3726.2	3756.1	3.04
800	3756.1	3815.5	3815.5	3845.0	3874.5	3903.8	—	—	—	—	—	2.95

¹⁾ Mean values of 100 °C range

Table 1

Replacing electronic module

1. Turn up the retaining bracket **15** and detach the upper part of the connector **19** from the level electrode. **Fig. 4**
2. Unscrew the four cover screws and detach cover from terminal box.
3. Detach all wires from the terminal lugs.
4. Unscrew fixing screws **24** and remove electronic module. **Fig. 5**
5. Insert new electronic module and screw in fixing screws **24**.
6. Re-attach all wires to the terminal lugs.
7. Fit the cover of the terminal box in place and tighten the four cover screws.
8. Plug the upper part of the connector **19** into the lower part **16** and secure it in place by turning down the retaining bracket **15**.

Maintenance

Safety note

The equipment 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 level 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 level electrode becomes hot during operation.
Risk of severe burns to hands and arms.
Before carrying out installation and maintenance work make sure that the equipment is cold.



Note

- If the level electrode is removed for inspection work make sure it is stored in a vertical position.

Checking ceramic insulator

After two years at the latest check the ceramic insulator of the measuring electrode ⑦ for cracks. To do so you have to remove the electrode. The equipment may only be installed and removed by qualified personnel.

Loosen the retaining ring for the strainer ⑦ **Fig. 2** and remove the strainer. If there are visible signs of cracks in the insulator replace the level electrode with a new one.

If you cannot detect any cracks put the strainer ⑦ back in place and secure it by means of the retaining ring. Re-install the electrode. Observe the note in chapter "Installation" on page 9.

Removing and disposing of the level electrode

Removing and disposing of level electrode NRG 211

1. Switch off supply voltage.
2. Turn up the retaining bracket ⑮ and detach the upper part of the connector ⑰ from the level electrode. **Fig. 4**
2. Before removing the equipment make sure that it is neither hot nor under pressure.

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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