



Level Switch

NRGS 15-1

EN (USA)
English

Original Installation &
Operating Manual
850690-00

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Content of this Manual

Product:

- Level switch NRGs 15-1

First edition:

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Scope of delivery, product package

- 1 x NRGs 15-1 level switch, comprising
 - 1 x level electrode with four tips
 - 1 x terminal box with level switch
- 1 x Installation & Operating Manual

How to use this Manual

This Installation & Operating Manual describes the correct use of the NRGs 15-1 level switch. It applies to persons who integrate this equipment in control systems, install, bring into service, operate, maintain and dispose of this equipment. Anyone carrying out the above-mentioned activities must have read this Installation & Operating Manual and understood its contents.

- Read this Manual in full and follow all instructions.
- Please also read the instructions for use of any accessories.
- The Installation & Operating Manual is part of the product package. Keep it in an easily accessible location.

Availability of this Installation & Operating Manual

- Make sure this Installation & Operating Manual is always available to the operator.
- If you pass on or sell the equipment to a third party, please also hand over the Installation & Operating Manual.

Illustrations and symbols used

1. Action to be taken
- 2.

-
- Lists
 - ◆ Bullet points in lists

A Keys to illustrations



Additional information



Read the relevant Installation & Operating Manual

Hazard symbols in this Manual



Danger zone, dangerous situation

Types of warning

DANGER

Warning of a dangerous situation that results in death or serious injury.

WARNING

Warning of a dangerous situation that may possibly result in death or serious injury.

CAUTION

Warning of a situation that may result in minor or moderate injury.

ATTENTION

Warning of a situation that results in damage to property or the environment.

Specialist terms, abbreviations

Here, we explain some abbreviations, specialist terms, etc., which are used in this Manual.

NRGT .. / NRR.. / NRS.. / URS .. / URB .. / SRL .. / etc.

Equipment and type designations of GESTRA AG.

SELV

Safety Extra Low Voltage

Operating point (of the plant)

The operating point describes the operating parameters within which a plant or boiler is operated in its nominal range. In a steam boiler, for example, these parameters would be output, pressure, and temperature.

The design data may be a lot more stringent, however.

A boiler that is operated at 145 psi (10 bar) and 356 °F (180 °C) may be designed to withstand a pressure of 870 psi (60 bar) and a temperature of 527 °F (275 °C), for example, which is therefore not necessarily its operating point.

Usage for the intended purpose

The NRGs 15-1 level switch indicates when four different water levels have been reached, and acts as a water level controller with MIN and MAX alarm, e.g. in steam boilers and hot water installations and also in condensate and feedwater tanks. The NRGs 15-1 is classified as an operating control in accordance with UL 60730-1.

Applicable directives and standards

The NRGs 15-1 level switch has been tested and approved for use in the scope governed by the following directives and standards:

Standards:

- UL 60730-1 and CAN/CSA E60730-1
General Requirements for Automatic Electrical Controls
- UL 60730-2-15 and CAN/CSA E60730-2-15
Requirements for Automatic Electrical Water Level Sensing Controls

Improper use



There is a danger of death due to explosion if the equipment is used in potentially explosive atmospheres.

Do not use the equipment in potentially explosive atmospheres.



Do not bring any equipment into service that does not have its own specific rating plate.

The rating plate indicates the technical features of the equipment.

Basic safety information



Danger to life from scalding! Do not remove the level electrode under pressure. Steam or hot water can spurt forcefully out of the equipment.

- Only remove the level electrode at **0 psi (0 bar) boiler pressure**.



Risk of severe burns! Do not perform work on a level electrode that is still hot. The level electrode gets very hot during operation.

- Allow the level electrode to cool.
- Always wait for the level electrode to cool before performing any installation and maintenance work.



Danger to life from electric shock during work on electrical systems.

- Always switch off the voltage to the plant before performing connection work.
- Check that the plant is not carrying live voltage before commencing work.



Danger to life! Hot steam or hot water can suddenly escape from a faulty NRGs 15-1 level switch.

Shocks and impacts during transport or installation can result in damage to or leaks in the level electrode, causing pressurized hot steam or hot water to escape through the pressure relief hole.

- To prevent damage during transport and installation, do not expose the electrode rod to major shocks or impacts.
- Before and after installation, check that the level electrode is completely undamaged.
- Check that the level electrode is not leaking when bringing into service.



Attempts to repair the equipment will cause the plant to become unsafe.

- The NRGs 15-1 level switch may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

Required personnel qualifications

Activity	Personnel	
Integration in control system	Specialist staff	Plant designer
Installation/electrical connection/ bringing into service	Specialist staff	The equipment may only be installed, wired and brought into service by qualified and competent staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and refits may only be performed by authorized staff who have undergone specific training.
Refits	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Notes on product liability

The manufacturer cannot accept any liability for damages resulting from improper use of the equipment.

Function

The NRGs 15-1 level switch is a compact system consisting of a level electrode with four tips and an integrated level switch. The equipment only functions if used in water with a minimum electrical conductivity of > 0.25 ppm ($0.5 \mu\text{S}/\text{cm}$) at 77°F (25°C).

In the level switch, a time-delayed switching channel, an output relay and a signal LED are assigned to each of the four electrode tips.

The function of switching channels 1 and 4 is fixed, while switching channels 2 and 3 are defined via the code switch. The switchpoints of each switching channel depend on the level and are determined by shortening the relevant electrode tips.

The following functions are possible:

- Electrode rod 1 exposed / switching channel 1 energizes relay 1 = low water 1
- Electrode rod 2 exposed / switching channel 2 energizes relay 2 = low water 2
- Electrode rod 3 exposed or immersed / switching channel 3 energizes relay 3 (time-dependent) = timed pump control (fill/discharge control)
- Electrode rods 2 and 3 exposed or immersed / switching channel 3 energizes relay 3 = on/off pump control (fill/discharge control)
- Electrode rod 4 immersed / switching channel 4 energizes relay 4 = high water

Technical data

Service pressure

363 psi at 435 °F (25 bar at 224 °C)

Mechanical connection

Thread 1" - 11.5 NPT

Materials

Screw-in body:	1.4404 / F316L
Electrode rods:	1.4571, CrNiMoTi17-12-2
Electrode rod insulation:	PTFE
Spacer:	PTFE
Terminal box:	Polycarbonate

Electrode rods

Length supplied:	39.37 in (1000 mm)
Diameter:	0.2 in (5 mm)

Supply voltage

NRGS 15-1 / 240 VAC: 240 V +10/-15 %, 50/60 Hz

NRGS 15-1 / 120 VAC: 120 V +10/-15 %, 50/60 Hz

Power consumption

3 VA

Fuse

External 63 mA, slow blow, at 240 V

External 125 mA, slow blow, at 120 V

Response sensitivity [electrical conductivity of water at 77 °F (25 °C)]

> 5 ... < 5000 ppm (> 10 ... < 10000 µS/cm) (switch-selectable)

Electrode voltage

20 V_{ss}

Output

4 volt-free relay contacts,

8 A 250 V AC / 30 V DC $\cos \varphi = 1$ (IEC 61810)

Ensure interference suppression (RC combination) for contactor.

Energizing/de-energizing delay

Relays 1 and 2: 1s, fixed

Relay 3: 0-30s, set via potentiometer

Relay 4: 3s, fixed

Indicators and controls

3 red LEDs to indicate "Low level alarm 1 + 2 / High level".

1 yellow LED to indicate "Pump on".

1 green LED to indicate "Mains supply on".

1 10-pole code switch to select the sensitivity and define the functions.

1 potentiometer for setting the time delay (0 to 30 s)

Technical data

Cable entry/electrical connection

3 cable glands with integrated cable clamp (M 16).

1 2-pole terminal strip for power supply.

1 12-pole terminal strip for connecting the control cables.

Terminal strips are detachable screw-type models with conductor size \geq AWG 16 (\leq 1.5 mm).

Protection

NEMA type 4 according to NEMA 250

IP 65 according to EN 60529

Protection class

Class II with functional ground via boiler wall

Installation class

3

Overvoltage category

CAT III

Admissible ambient temperature

at power-on 32 ° ... 158 °F (0 ° ... 70 °C)

during operation 14 ° ... 158 °F (-10 ° ... 70 °C)

Transport temperature

-4 ° ... +176 °F (-20 ° ... +80 °C) (< 100 hours), only switch on after a defrosting period of 24 hours.

Storage temperature

-4 ° ... 158 °F (-20 ° ... +70 °C), only switch on after a defrosting period of 24 hours.

Relative humidity

Max. 95%, no moisture condensation

Weight







Approx. 3.08 lb (1.4 kg)




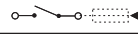


Other information

Independently mounted Type 1.B action operating control

Pollution degree 2, impulse voltage 4000 V

Rating plate, identification

 		
<p>Vor Öffnen des Deckels, Gerät freischalten! Betriebsanleitung beachten!</p> <p>Before removing cover, isolate from power supplies. See installation instructions!</p> <p>Avant d'ouvrir le couvercle déconnecter complètement l'appareil. Voir instructions de montage.</p>		
NRGS 15-1 / 120VAC		
<p>Niveauschalter Level switch Commutateur de niveau</p>		
1-11,5 NPT 1.4404/F316L		
 <p>P_{max} 363psi (25 bar) T_{max} 435°F (224°C)</p> <p>Tamb = 158°F (70°C)</p>	<p>IP65</p>	
120VAC 50/60Hz 3VA		
0-30s 0,5/10µS/cm		
 250V ~ T2,5A		
<p>GESTRA AG Münchener Str. 77 28215 Bremen Made in Germany</p>		 
Mat.-Nr.: XXXXXX		

 		
<p>Vor Öffnen des Deckels, Gerät freischalten! Betriebsanleitung beachten!</p> <p>Before removing cover, isolate from power supplies. See installation instructions!</p> <p>Avant d'ouvrir le couvercle déconnecter complètement l'appareil. Voir instructions de montage.</p>		
NRGS 15-1 / 240VAC		
<p>Niveauschalter Level switch Commutateur de niveau</p>		
1-11,5 NPT 1.4404/F316L		
 <p>P_{max} 363psi (25 bar) T_{max} 435°F (224°C)</p> <p>Tamb = 158°F (70°C)</p>	<p>IP65</p>	
240VAC 50/60Hz 3VA		
0-30s 0,5/10µS/cm		
 250V ~ T2,5A		
<p>GESTRA AG Münchener Str. 77 28215 Bremen Made in Germany</p>		 
Mat.-Nr.: XXXXXX		

— Safety information —

— Equipment designation —

— Pressure rating, thread type, material number —

— Protection Service pressure/temperature —

— Admissible ambient temperature —

— Electrical connection data De-energizing delay / Response sensitivity —

— Fuse Output contact —

— Disposal information —

— Manufacturer —



 <p>UL LISTED OPERATING CONTROL E513189</p>	Input rating: 240VAC
	Frequency: 50/60Hz
	Output rating: Pilot Duty C300 / R300
	Ambient temperature: 158°F (70°C)
	Environmental rating: NEMA 4
	Wiring: AWG 16-20, Cu only
 <p>UL LISTED OPERATING CONTROL E513189</p>	Input rating: 120VAC
	Frequency: 50/60Hz
	Output rating: Pilot Duty C300 / R300
	Ambient temperature: 158°F (70°C)
	Environmental rating: NEMA 4
	Wiring: AWG 16-20, Cu only

Fig. 1

Overall view of the NRG5 15-1

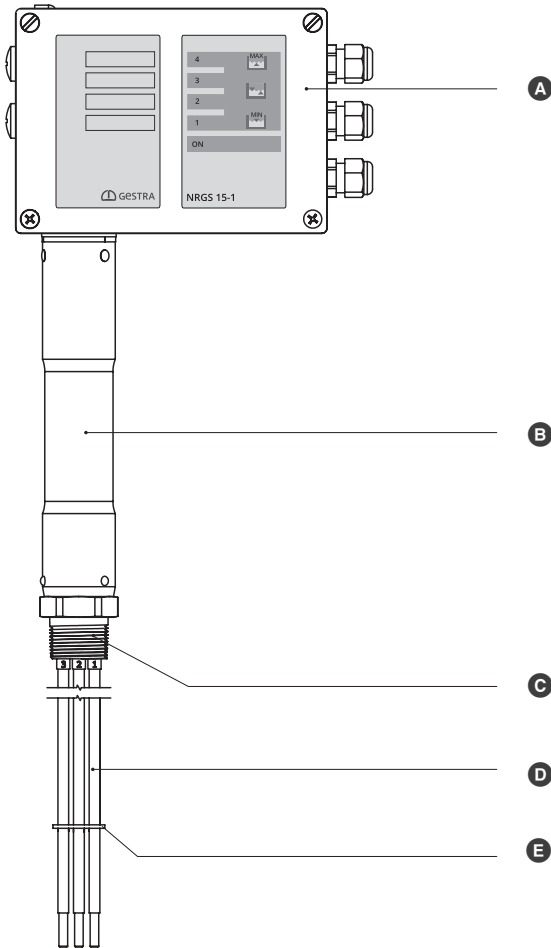


Fig. 2

Key

- A** Terminal box with level switch
- B** Cover tube for four-tip level electrode
- C** Electrode thread
- D** Electrode rods
- E** Spacer

Dimensions of the NRGs 15-1

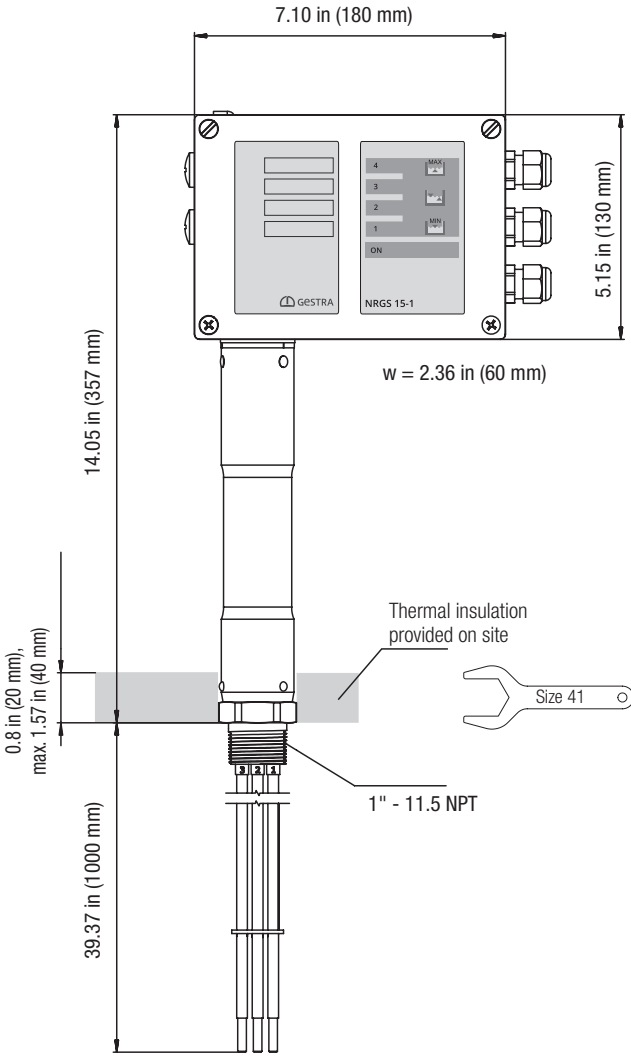


Fig. 3

Setting functions

Selecting a function

Before installation and bringing into service, please decide which function you wish the NRGs 15-1 level switch to work with. Three functions are available:

Function 1 Default factory setting		Code switch White toggle switch
Electrode rod 1	Low level 1 / burner off	
Electrode rod 2	Low level 2	
Electrode rod 3	Timed pump control (fill control) tv = 0 – 30 s	
Electrode rod 4	High level	
Function 2		
Electrode rod 1	Low level alarm 1 / burner off	
Electrode rod 2	Feedwater pump on (fill control)	
Electrode rod 3	Feedwater pump off (tv = 0 s)	
Electrode rod 4	High level	
Function 3		
Electrode rod 1	Low level alarm 1	
Electrode rod 2	Pump off	
Electrode rod 3	Pump on (discharge control) (tv = 0 s)	
Electrode rod 4	High level	

Setting functions

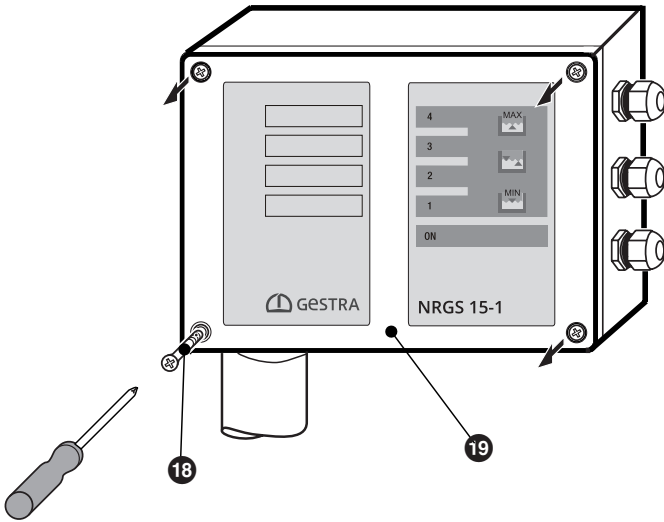


Fig. 4

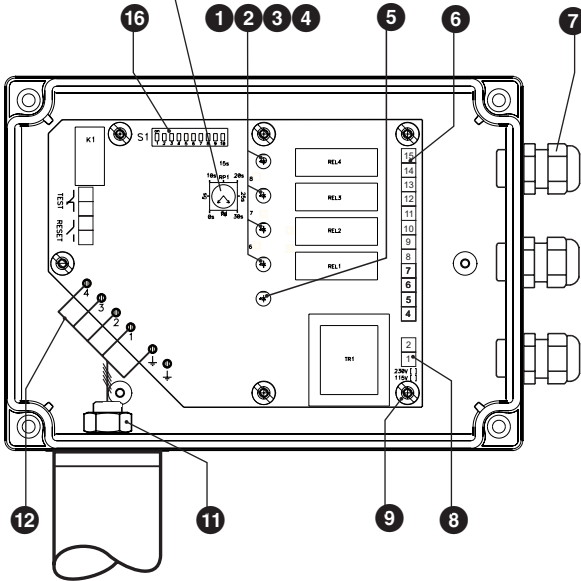
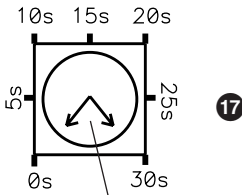


Fig. 5

Setting functions



Note

To set **functions**, the **time delay** and **response sensitivity**, please open the terminal box. To do so, undo the cover screws **18** and remove the cover **19**. When your settings are complete, put the cover **19** of the terminal box back on and fasten the cover screws **18** once more.

Setting functions

1. Set the code switch **16** to the desired function. To do this, use a thin blade screwdriver.
2. Use a waterproof marker to enter the set function for each electrode rod in the boxes provided on the cover (see **Fig. 4**).

Setting the time delay

The default time delay for pump control is factory-set to 5 seconds.

1. You can set time delays from 0 to 30 seconds by turning the potentiometer knob **17** clockwise or counterclockwise.

Key

- | | |
|--|--|
| 1 LED 1 red | 11 Fixing nut for terminal box |
| 2 LED 2 red | 12 Terminal lugs for electrode wires, functional ground |
| 3 LED 3 yellow | 16 Code switch |
| 4 LED 4 red | 17 Potentiometer for time delay |
| 5 Green LED for Power ON | 18 Cover screws (cross recess head screw M4) |
| 6 Terminal strip for control cables | 19 Cover of terminal box |
| 7 Cable gland M16 | |
| 8 Terminal strip for supply voltage | |
| 9 Fastening screws for electronic circuit board | |


Setting functions

Setting the response sensitivity

The default sensitivity is factory-set at ≥ 5 ppm ($10 \mu\text{S}/\text{cm}$).

If the boiler water has lower conductivity than 5 ppm ($10 \mu\text{S}/\text{cm}$) at 77 °F (25 °C), please change the sensitivity using the code switch 16. The code switch 16 is located on the electronic circuit board (see Fig. 5) and is set using a thin blade screwdriver.

The sensitivity can be set as follows:

Code switch White toggle switch	Sensitivity
	Sensitivity ≥ 5 ppm ($10 \mu\text{S}/\text{cm}$) at 77 °F (25 °C) (default)

Preparing for installation



If the equipment is to be installed outdoors, outside the protection of a building, environmental influences may adversely affect function.

- Pay attention to the admissible ambient conditions in the technical data, see pages 12 and 13.
- Do not operate the equipment if the temperature is below freezing.
 - ◆ At temperatures below freezing, use a suitable heat source (e.g., control cabinet heater, etc.).
- Connect all parts of the plant to a central ground point to prevent equalizing currents.
- Use a cover to protect the equipment from direct sunlight, condensation and heavy rain.
- Use UV-resistant cable ducts for routing the connecting cable.
- Take further measures to protect the equipment from lightning, insects and animals, and salty air.

You will need the following tools:

- Open-ended wrench size 41
- Scriber
- Bolt cutter
- Flat file
- Phillips screwdriver PH2
- Flat blade screwdriver 3/32 in (2.4 mm)

Installation

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if the level electrode is unscrewed under pressure.

- Reduce the boiler pressure to 0 psi (0 bar) and check the pressure before unscrewing the level electrode.
- Only remove the level electrode at 0 psi (0 bar) boiler pressure.

WARNING



The hot level electrode can cause severe burns.

The level electrode gets very hot during operation.

- Always let the level electrode cool down before performing installation and maintenance work.
- Only remove level electrodes that have cooled down.



Note

- Check the boiler standpipe and flange during the preliminary boiler inspection.
- Installation examples can be found on page 26.

ATTENTION



Incorrect installation can lead to malfunctions in the plant or the level electrode.

- Always install the level switch in a vertical position.
- Take care not to bend electrode rods during installation!
- Avoid subjecting electrode rods to hard impacts.
- Ensure a minimum of 1.2 in (30 mm) for insulating the electrode rods.
- Do **not** install the terminal box **A** or upper part of the level electrode cover tube **B** in the boiler's thermal insulation! **Fig. 2**
- Make sure that the boiler's thermal insulation is no more than max. 1.57 in (40 mm) thick in the vicinity of the level switch (see **Fig. 3**).
- Do not coat the electrode thread with conductive paste or grease!
- Make sure there is a creepage path of at least 0.55 in (14 mm) between the electrode tips and ground (flange, tank wall). **Figs. 8, 9, 10**
- Ensure minimum clearances when installing the electrode.

Installation

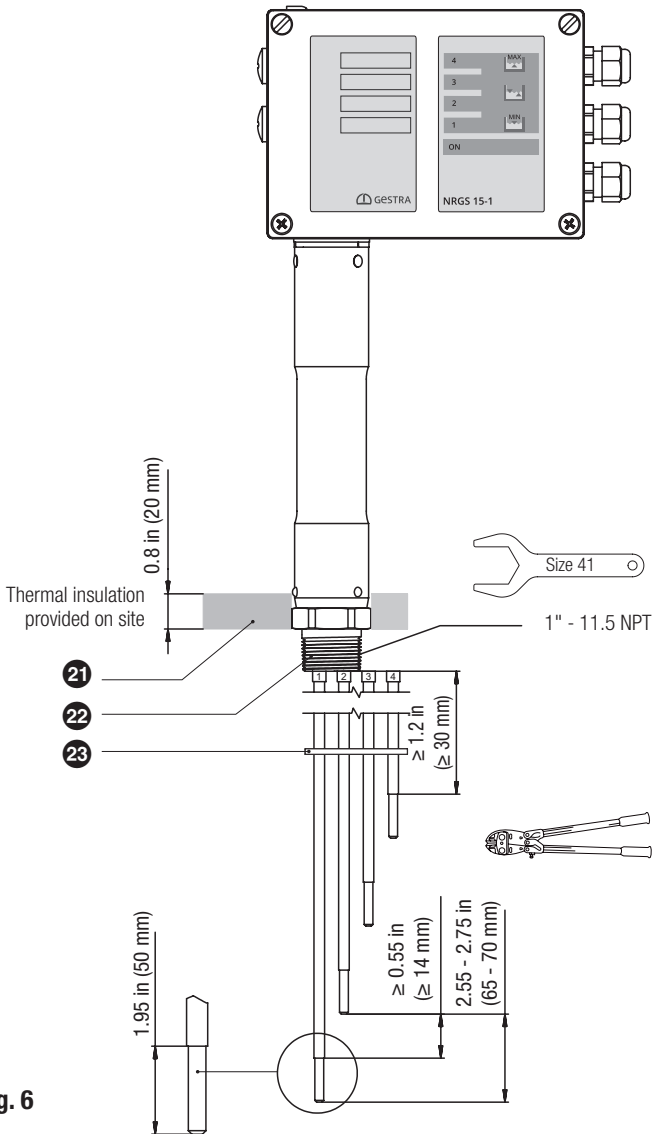


Fig. 6

Key

- 21 Thermal insulation (provided on site), d = 0.79 in (20 mm) (outside the thermal insulation of the steam generating unit)
- 22 Thread 1" - 11.5 NPT
- 23 Spacer

Installation

Installing the NRGs 15-1, step 1

1. Determine the measured lengths of the electrode tips and enter the dimensions in the "Functions" table.
2. Cut electrode tips **1** **2** **3** **4** with a bolt cutter.
3. Deburr the end faces of the electrode tips with a flat file.
4. Strip off 1.95 in (50 mm) of the PTFE insulation from the lower end of the electrode rod. Make sure that the remaining insulation measures at least 1.2 in (30 mm), measured from the lower edge of the screw thread. See **Fig. 6**.
5. Position the PTFE spacers evenly over the cut length.

Functions table

Electrode tip	Function	Wire/ connector	Length [mm]
1		1	
2		2	
3		3	
4		4	

Installation

Installing the NRGS 15-1, step 2

- Make sure that the internal and external threads are in perfect condition.
- Do not apply more than three windings of PTFE insulating tape around the electrode thread.

WARNING

Do not use too much tape. Do not use fitting lubricants or pastes.

- Fit the electrode and tighten first with your hand and then with a size 41 open-ended wrench. Do not use a pipe wrench.
- Recommendations for tightening torques cannot be given due to the conical/parallel type of connection.
- Avoid tightening excessively; part of the electrode thread should always remain visible.



The electrode body does not “sit” on the flange, i.e. the underside of the hexagon is not in contact with the flange (also see **Fig. 7**). If it is in contact, the internal thread is outside tolerance. In this case, the flange must be replaced.

After the electrode has been installed with PTFE sealing tape, you must ensure there is adequate electrical contact between the electrode and the boiler wall.

To do this, after installation measure the resistance between the electrode body and the boiler with a multimeter.

The reading must be < 10 ohms.

If the reading is > 10 ohms, connect the electrode to the boiler wall using a band grounding clamp. (The band grounding clamp is available as an optional accessory)

Next, measure the resistance again.

The value must be < 10 ohms and entered as follows:

Measured resistance: _____ ohms

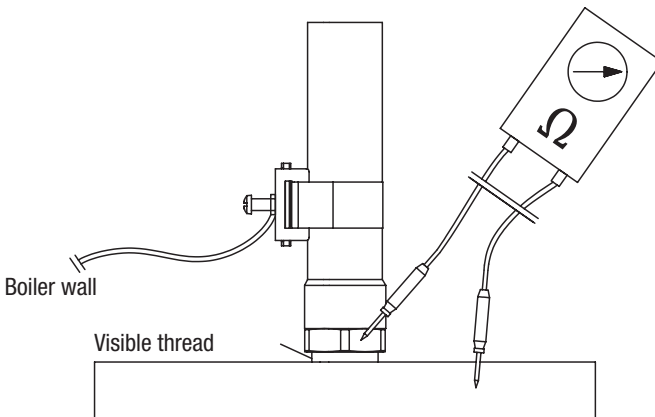


Fig. 7

Einbaubeispiel mit Maßvorgaben

Level pot for external use.

Illustration not to scale.

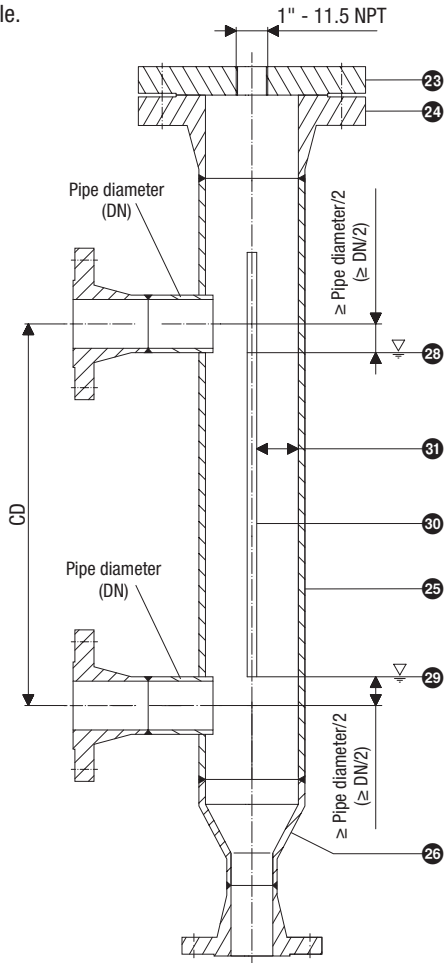


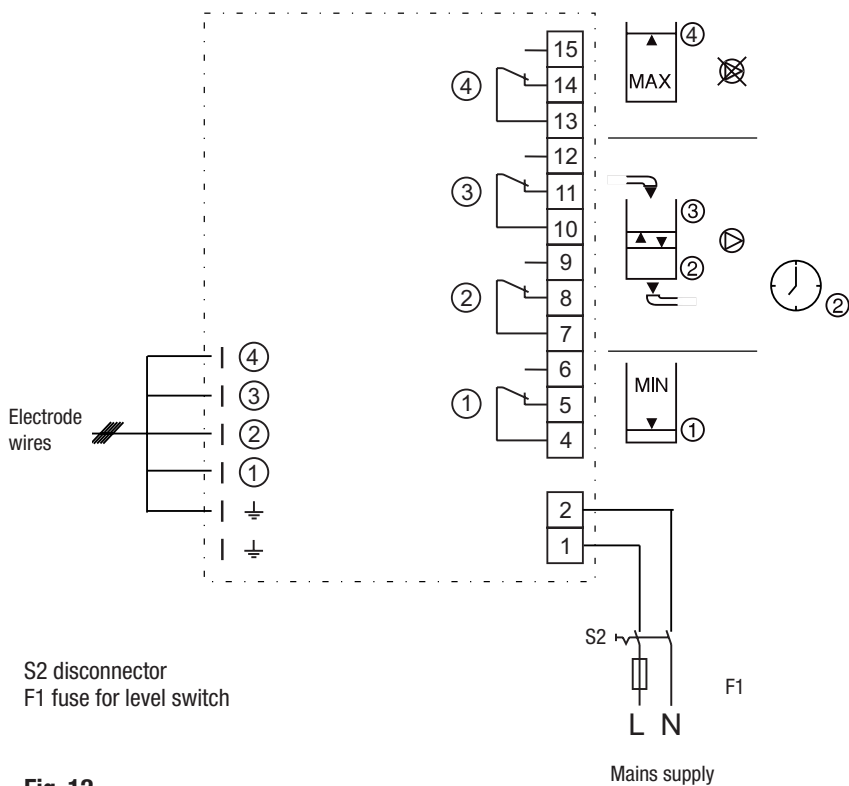
Fig. 10 All lengths and diameters in inches (mm)

Key

- | | | | |
|----|---|----|--|
| 23 | Flange | 28 | High water HW |
| 24 | Perform preliminary inspection of standpipe and flange during the boiler inspection | 29 | Low water LW |
| 25 | Protective foam tube/level pot | 30 | Electrode rod |
| 26 | Reducer | 31 | Electrode spacing ≥ 0.55 in (14 mm) (air gap and creepage path) |
| 27 | Pressure relief hole | CD | center distance |

Electrical connection

Wiring diagram



Tools

- Phillips screwdriver PH2
- Flat blade screwdriver 3/32 in (2.4 mm)

Electrical connection



Attention

- The following cables with basic insulation must not be relocated: mains and control cables in the extra-low voltage range.
- Provide an external slow blow 2.5 A fuse to prevent the output contacts from welding together.
- Switching off inductive loads produces surges that can have a major adverse effect on open and closed-loop control systems. Connected inductive loads must therefore have interference suppression (RC combination) as per the manufacturer's specifications.
- Provide the level switch with an external slow blow 63 mA fuse for 240 V, and a slow blow 120 mA fuse for 120 V.
- To enable isolation of the level switch, install a disconnector near the equipment in an easily accessible location.
- Mark the disconnector as an isolating device for the level switch.

Bringing into service



Danger

When bringing into service, switch the water level control system to manual mode. Only fill or drain the steam boiler or tank in manual mode.

Checking the electrical connection

1. Check that the level switch is connected according to the wiring diagram. **Fig. 12**
2. Check that the supply voltage matches the data on the rating plate.

Switching on the supply voltage

1. Switch on the mains supply. The green LED **5** Power ON lights up. LEDs **1**, **2**, **3**, **4** **Fig. 4** light up depending on the water level.

Checking switchpoints and functions

1. Check switchpoints and functions by filling the tank and by draining some water, as appropriate. See the **Checking switchpoints and functions** table on pages 31 and 32.

Bringing into service

Checking switchpoints and functions



Danger

The terminal strips of the level switch are live during operation!

There is a risk of serious injury due to electric shock.

Always cut off power to the level switch before working on it or on the terminal strips (installation, removal, connecting cables).

Start		
Action	Display	Function
Switch on supply voltage.	ON LED lights up	
	LEDs ①, ②, ③, ④ light up depending on the water level.	

MIN water level = electrode rod 1		
Drain water until it is below the MIN level. Electrode rod 1 is exposed.	LED 1 lights up red	After 1s: MIN output contact 4/5 closed, 4/6 open.
Fill tank until water is above the MIN level. Electrode rod 1 is immersed.	LED 1 is not lit	After 1s: MIN output contact 4/5 open, 4/6 closed
MIN water level 2 = electrode rod 2		
Drain water until it is below MIN level 2. Electrode rod 2 is exposed.	LED 2 lights up red	After 1s: MIN output contact 7/8 closed, 7/9 open.
Fill tank until water is above MIN level 2. Electrode rod 2 is immersed	LED 1 is not lit	After 1s: MIN output contact 7/8 open, 7/9 closed.
MAX water level = electrode rod 4		
Fill tank until water is above the MAX level. Electrode rod 4 is immersed.	LED 4 lights up red	After 3s: MIN output contact 13/14 closed, 13/15 open.
Drain water until it is below the MAX level. Electrode rod 4 is exposed.	LED 4 is not lit	After 3s: MIN output contact 13/14 open, 13/15 closed.

Bringing into service

Checking switchpoints and functions

Timed pump control (fill control) = electrode rod 3		
Action	Display	Function
Drain water until it is below the Pump ON switchpoint. Electrode rod 3 is exposed.	LED 3 lights up yellow	Pump output contact 10/12 closed, 10/11 open.
Fill tank until water is above the Pump OFF switchpoint. Electrode rod 3 is immersed.	LED 3 is not lit	After the set time delay (0-30s): Pump output contact 10/12 open, 10/11 closed.
Relay 3 is de-energized too early or too late: Set a shorter or longer time using the potentiometer and allow electrode rod 3 to come out of the water then be immersed again. Repeat this process until you determine the correct pump switchpoint. If a time delay of 30s is not sufficient for filling the boiler, please select on/off pump control mode.		

On/off pump control (fill control) = electrode rods 2 and 3		
Using the potentiometer, set the time delay to precisely 0 s		
Drain water until it is below the Pump ON switchpoint. Electrode rods 2 and 3 are exposed.	LEDs 2 and 3 light up	Pump output contact 10/12 closed, 10/11 open.
Fill tank until water is above the Pump ON switchpoint. Electrode rod 2 is immersed.	LED 2 is not lit	
Fill tank until water is above the Pump OFF switchpoint. Electrode rod 3 is immersed.	LED 3 is not lit	Pump output contact 10/12 open, 10/11 closed.
Electrode rods 2 and 3 = on/off pump control (discharge control)		
Using the potentiometer, set the time delay to precisely 0 s		
Fill tank until water is above the Pump ON switchpoint. Electrode rods 2 and 3 are immersed.	LED 2 is not lit, LED 3 lights up	Pump output contact 10/12 closed, 10/11 open.
Drain water until it is below the Pump ON switchpoint. Electrode rod 3 is exposed.	LED 3 is not lit	Pump output contact 10/12 open, 10/11 closed.
Drain water until it is below the Pump OFF switchpoint. Electrode rod 2 is exposed.	LED 2 lights up	

Fault indications and troubleshooting

Indications, diagnosis and corrective action



Attention

Please check the following before fault diagnosis:

Supply voltage: Is the level switch supplied with the voltage specified on the rating plate?

Wiring: Does the wiring conform to the wiring diagram?

MIN level switchpoint		
Status and display	Error	Corrective action
Water below MIN level switchpoint, LED 1 is not lit.	Electrode rod is too long.	Cut electrode rod to appropriate length for the switchpoints.
	Electrode rod has contact with ground.	Check installation location and change if necessary.
	For internal installation: Upper pressure relief hole in protective tube is missing or obstructed.	Check level switch installation and make sure that the level in the protective tube corresponds to the actual water level.
	A protective tube is required/recommended for internal installation.	
MIN level switchpoint reached, LED 1 lights up red.	Electrode rod is too short.	Replace level switch and cut electrode rods to appropriate length for the switchpoints.
	Ground connection to tank is interrupted.	Check ground connection and fit band grounding clamp if necessary (see page 25 for installation).
	Electrical conductivity of boiler water is too low.	Set response sensitivity to 0.25 ppm (0.5 µS/cm).
	Difference in level between water in the boiler and the protective tube (internal installation).	Check level switch installation and make sure that the level in the protective tube corresponds to the actual water level.
	For internal installation: The upper pressure relief hole is flooded.	

MAX level switchpoint		
Water below MAX level switchpoint, LED 4 lights up red.	Electrode rod is too long.	Cut electrode rod to appropriate length for the switchpoints.
	Electrode rod has contact with ground.	Check installation location and change if necessary.
	For internal installation: Upper pressure relief hole in protective tube is missing or obstructed.	Check level switch installation and make sure that the level in the protective tube corresponds to the actual water level.
MAX level switchpoint reached, LED 4 is not lit.	Electrode rod is too short.	Replace level switch and cut electrode rods to appropriate length for the switchpoints.
	Ground connection to tank is interrupted.	Check ground connection and fit band grounding clamp if necessary (see page 25 for installation).
	Electrical conductivity of boiler water is too low.	Set response sensitivity to 0.25 ppm (0.5 µS/cm).
	For internal installation: The upper pressure relief hole is flooded.	Check level switch installation and make sure that the level in the protective tube corresponds to the actual water level.

Fault indications and troubleshooting

Indications, diagnosis and corrective action

Switchpoints reached - incorrect function		
Status and display	Error	Corrective action
Incorrect function when switchpoints are reached.	Electrode rods were cut to the wrong length.	Assign electrode rods correctly and change connections in the electronic circuit board.
	Code switch incorrectly set.	Set code switch in line with the selected function.

Level switch is not working		
No supply voltage. ON LED is not lit.	No power supply.	Switch on supply voltage. Check all electrical connections.
No function.	Ground connection to tank is interrupted.	Clean sealing surfaces and screw in level switch with metal sealing ring. Do not insulate with hemp or PTFE tape.
	Electronic circuit board is faulty.	Replace electronic circuit board.

Replacing the electronic circuit board

To replace the electronic circuit board, take the level switch out of service and cut off the power supply.

1. Undo the cover screws **18** and remove the cover **19**. (Figs. 4, 5)
2. Disconnect the electrode wires from the terminal lugs **12** on the electronic circuit board. Detach all terminal strips **6**, **8**, **14**.
3. Unscrew the fastening screws **9** for the electronic circuit board and take out the circuit board. The electronic circuit board is available as a spare part.
4. Install the new electronic circuit board in reverse order to the above.



Note

When ordering spare parts, please state the material numbers on the rating plate. After you have replaced the electronic circuit board, please repeat the steps for bringing into service.

Taking out of service

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if the level electrode is unscrewed under pressure.

- Reduce the boiler pressure to 0 psi (0 bar) and check boiler pressure before unscrewing the level electrode.
- Only remove the level electrode at **0 psi (0 bar) boiler pressure**.

WARNING



The hot level electrode can cause severe burns.

The level electrode gets very hot during operation.

- Always let the level electrode cool down before performing installation and maintenance work.
- Only remove level electrodes that have cooled down.

Removing the level switch

Proceed as follows:

To remove the level switch, take it out of service and **cut off the power supply**.

1. Undo the cover screws **18** and remove the cover **19**. (**Figs. 4, 5**)
2. Disconnect all connecting cables from terminal strips **6**, **8** and pull the cables out of the cable glands.
3. Make sure that the level switch is cold and not under pressure before removal.

Disposal

Dispose of the level transmitter in accordance with statutory waste disposal regulations.

Returning decontaminated equipment

If products have come into contact with media that are hazardous to health, they must be drained and decontaminated before being returned to GESTRA AG.

The term 'media' can refer to solid, liquid or gaseous substances or mixtures, as well as radiation.

GESTRA AG can accept returned products only if accompanied by a completed and signed return note and also a completed and signed declaration of decontamination.



The return confirmation and declaration of decontamination must be attached to the outside of the return package, as processing will otherwise be impossible and the products will be returned to the sender at their expense.

Please proceed as follows:

1. Let GESTRA AG know about the return beforehand by e-mail or phone.
2. Wait until you have received the return confirmation from GESTRA.
3. Fill out the return confirmation (including declaration of decontamination) and send it with the products to GESTRA AG.

UL components

The level switch is registered under XACN.E513189.



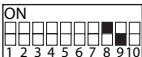

Annex

Setting other functions

In the level switch, each electrode tip has a switching channel assigned to it. The function of switching channels 1 and 4 is fixed, while switching channels 2 and 3 are defined via the code switches 16.

The switchpoints of each channel depend on the level and are determined by cutting the relevant electrode tip.

In addition to the information given in the “Selecting a function” section, other functions can also be set using the code switch.

Code switch White toggle switch	Function
	On/off pump control switched on
	Electrode rod [2] separated from electrode rod [1]
	Pump fill control switched on
or	
	Pump discharge control switched on

Installation in non-metallic tanks

The level switch can also be installed in non-metallic tanks.

Provided that the safety high level limiter function is not used, electrode rod [4] must be used as a reference electrode.

In this case, insert the connection of electrode rod [4] into the free terminal lug for functional ground 12.

In addition, cut electrode rod [4] to the same length as electrode rod [1] and strip insulation over the entire length.

For your notes

For your notes



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