

GESTRA Steam Systems

NRGS 15-1



Installation Instructions 818479-00

Level Switch NRGS 15-1

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Dimensions

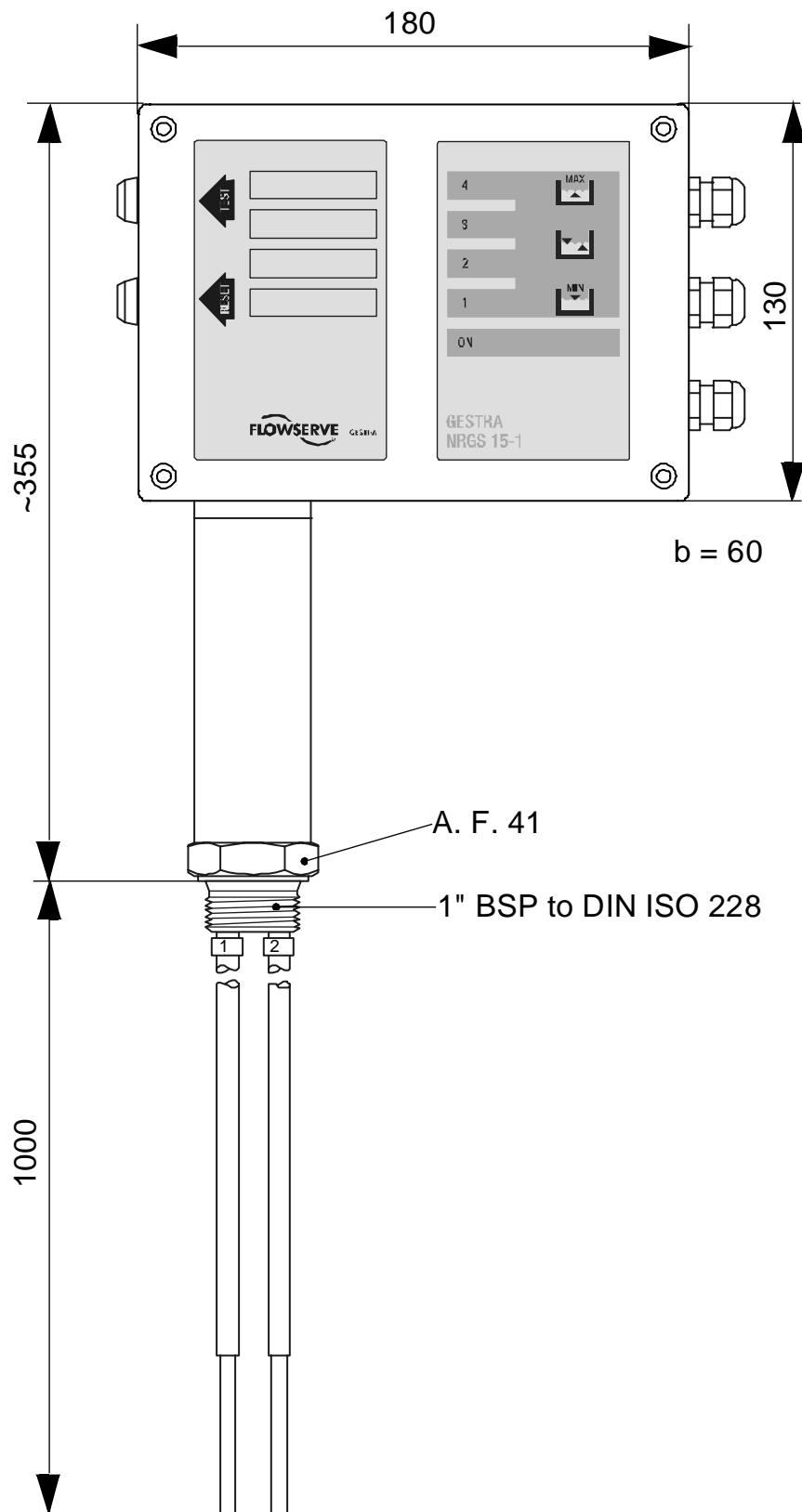


Fig. 1

Functional Elements

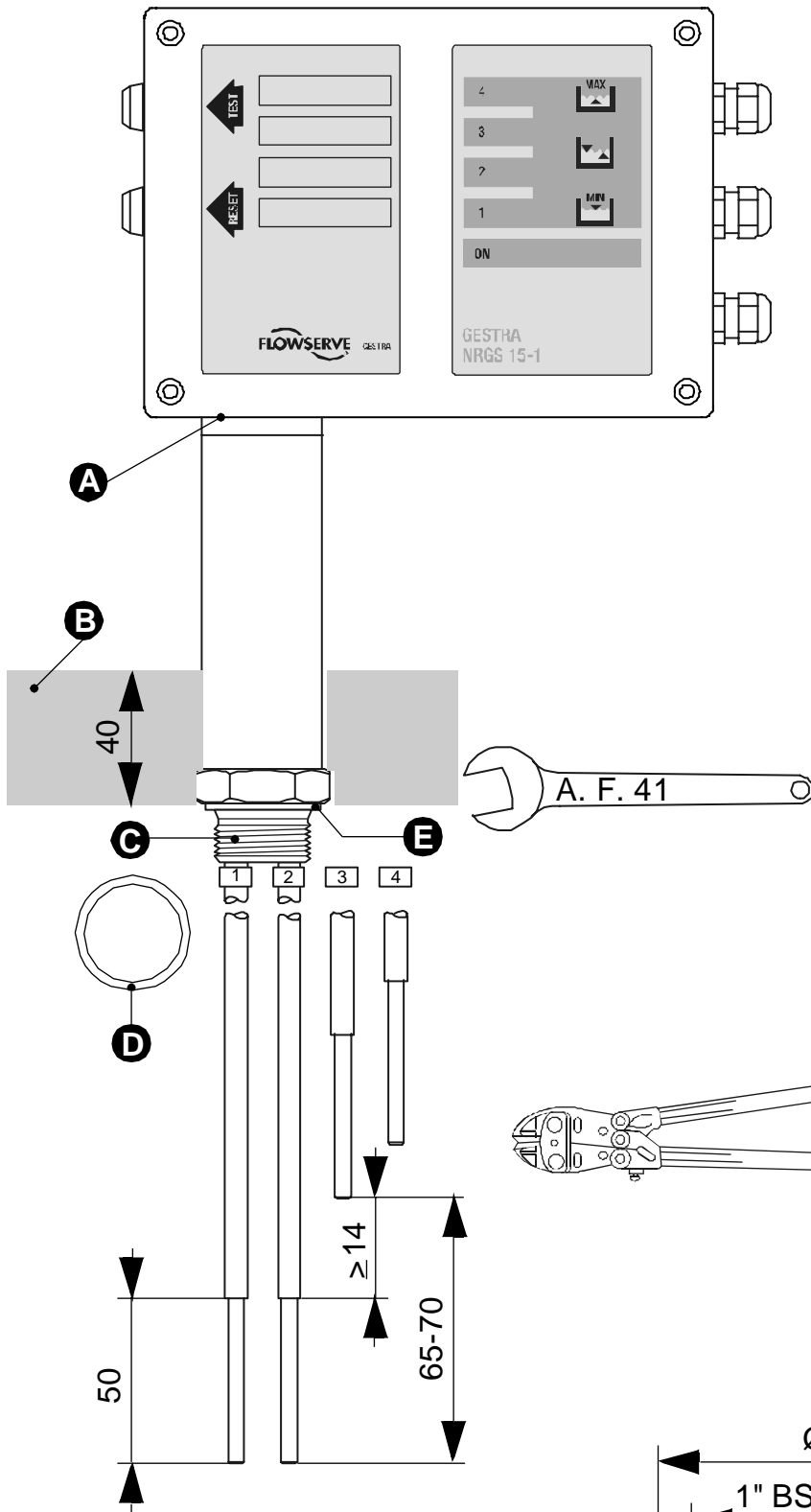
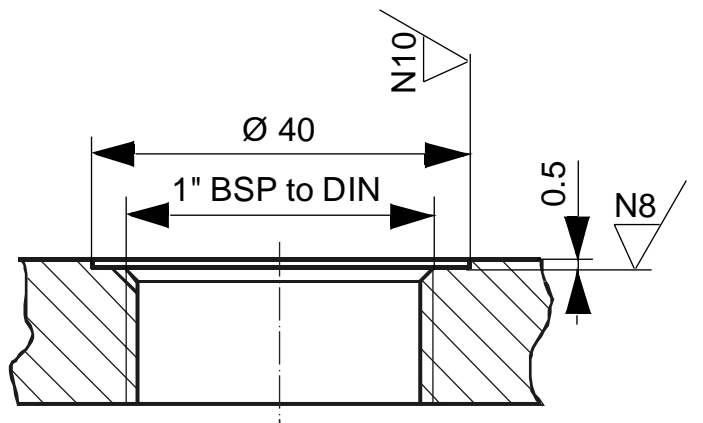


Fig. 2

Fig. 3



Functional Elements

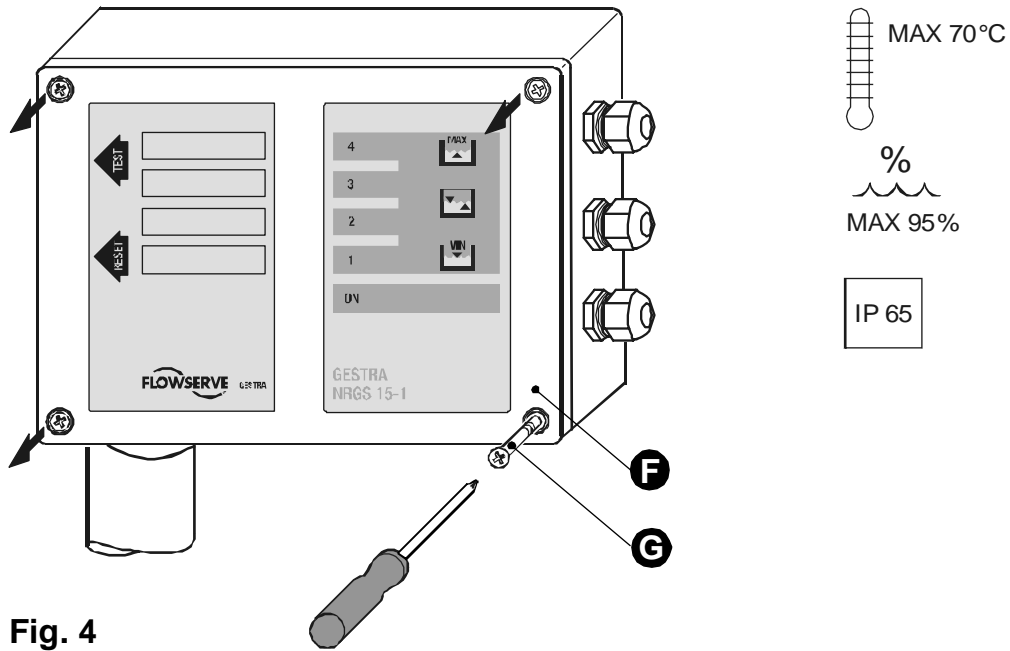


Fig. 4

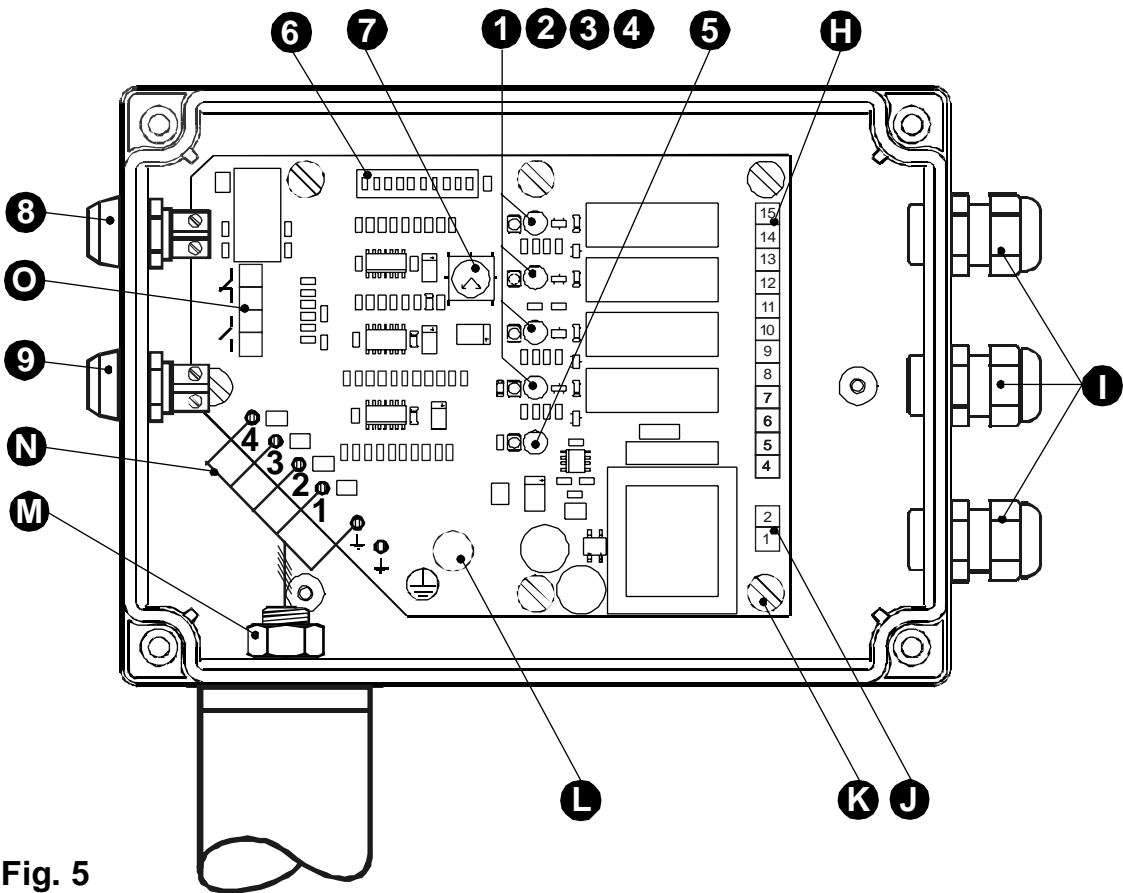


Fig. 5

Key

- ① LED 1 red
- ② LED 2 red
- ③ LED 3 yellow
- ④ LED 4 red
- ⑤ LED "Mains supply ON" green
- ⑥ Code switch S1
- ⑦ Potentiometer for time delay (0 to 30 sec.)
- ⑧ TEST button
- ⑨ RESET button

- Ⓐ Gasket
- Ⓑ Thermal insulation
- Ⓒ Electrode thread 1" BSP to DIN EN 228
- Ⓓ Joint ring Ø33x39 to DIN 7603 made from 1.4301
- Ⓔ Seating surface
- Ⓕ Housing lid
- Ⓖ Housing screws (cross recess head screws M4)
- Ⓗ Terminal strip for control cable connection
- Ⓘ Cable gland 3xM16x1.5
- Ⓙ Terminal strip for mains supply
- Ⓚ Fixing screws for electronics insert
- Ⓛ PE connection
- Ⓜ Fixing nut for terminal box
- Ⓝ Terminal lugs for electrode wires, functional earth
- Ⓞ Terminal strip for pushbuttons

Important notes

Usage for the intended purpose

The level switch NRGs 15 - 1 is designed for detecting and signalling levels in liquids with a minimum electrical conductivity.

The equipment must only be used within the admissible pressure and temperature ratings.

Any type of use differing from the usage described above must be considered as improper. The resulting risk will have to be borne by the user alone. The manufacturer hereby expressly rejects any claims for any damage resulting from improper usage.

Safety note

The equipment must only be installed 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



Danger

When loosening the level electrode steam or hot water might escape. This presents the danger of severe scalds to the whole body.

It is essential not to mount or dismantle the electrode unless the boiler pressure is verified to be zero!

The electrode becomes hot during operation. Touching the hot equipment presents the risk of severe burns to hands and arms. All installation, removal and maintenance work must only be performed when the system is cold.



Danger

The terminal strip of the level switch is live during operation. This presents the danger of electric shock!

Cut off power supply before opening the housing cover of the level switch! After removing the housing cover check again that the system is deenergized.

To check the power supply or the correct functioning, switch the level switch on again. This work must only be performed by qualified personnel.

Explanatory Notes

Scope of supply

NRGS 15-1

- 1 Level electrode with four tips
- 1 Terminal box with integrated level switch
- 1 Joint ring Ø33x39 to DIN 7603, made of 1.4301 E8P
- 1 Installation manual

or

NRGS 15-1

- 1 Level electrode with four tips
- 1 Terminal box with integrated level switch and built-in Test and Reset pushbutton
- 1 Joint ring Ø33x39 to DIN 7603, made of 1.4301 E8P
- 1 Installation manual

Function

The level switch NRGS 15-1 is a compact-type system consisting of a level electrode with four tips and an integrated level switch. For the correct functioning of the equipment the water must have a minimum conductivity of $>0.5\mu\text{S}/\text{cm}$ at 25°C .

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

The functions of the switching channels 1 and 4 are fixed, the switching channels 2 and 3 can be adjusted via code switch to suit individual requirements. The tips of the electrode are cut to length on site in order to establish the desired switchpoints of the associated switching channels.

The following functions are possible:

- Electrode rod 1 exposed / switching channel 1 energizes relay 1 = low level 1 with optional performance test and lock-out function
- Electrode rod 2 exposed / switching channel 2 energizes relay 2 = low level 2
- Electrode rod 3 exposed or submerged / switching channel 3 energizes relay 3 as a function of time = timed pump control (fill/discharge control)
- Electrode rod 3 exposed or submerged / switching channel 3 energizes relay 3 = on/off pump control (fill/discharge control)
- Electrode rod 4 submerged / switching channel 4 energizes relay 4 = high level

Technical data

Service pressure

25 barg at 224 °C

Connection

Screwed 1" BSP, DIN ISO 228

Materials

Screw-in housing: 1.4571, CrNiMoTi 17 12 2

Electrode rods: 1.4571, CrNiMoTi 17 12 2

Electrode insulation: PTFE

Spacer disc: PTFE

Terminal box: polycarbonate

Electrode rods

Length supplied: 1000 mm

Diameter: 5 mm

Mains supply

220–240 V +10 /-15%, 50/60 Hz

110–120 V +10 /-15%, 50/60 Hz

24 V +10 /-15%, 50/60 Hz (optional)

Power consumption

3 VA

Sensitivity (at 25 °C)

Range 1: 0.5 µS/cm

Range 2: 10 µS/cm

The selection of the above range is done via a code switch.

Electrode voltage

20 Vss

Output

Four volt-free relay contacts.

Max. contact rating with a switching voltage of 24 V AC/DC, 115 V AC and 230 V AC: resistive / inductive 4 A.

Ensure interference suppression by providing contactor with an arc suppressor RC combination.

Contact material AgNi 0.15.

Energizing/de-energizing delay

Relay 1 and 2: 1 sec., factory set

Relay 3: 0-30 sec., adjustable via potentiometer

Relay 4: 3 sec., factory set

Technical data - continued -

Indicators and adjustors

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 ten-pole code switch to select the sensitivity range and to establish the functions.

1 test button in the terminal box to check the function of switching channel 1
(connected to terminals).

1 reset button in the terminal box to reset the lock-out function (connected to terminals).

Cable entry / Wiring

3 cable glands with integral cable clamps (M 16).

1 two-pole terminal strip for power supply.

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

1 four-pole terminal strip for test and reset button.

Screw-type terminal strips, conductor size $\leq 1.5 \text{ mm}^2$.

Protection

IP 65 to DIN EN 60529

Max. admissible ambient temperature

70 °C



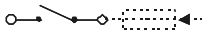
Weight



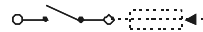
NRGS 15-1: approx. 1.4 kg

Explanatory Notes – continued –

Technical data - continued -

Name Plate 110-120 and 220-240 VAC

 					
<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					
PN 25	G 1 1.4571				
<table border="1"> <tr> <td>Pmax</td> <td>362psi (25 bar)</td> </tr> <tr> <td>Tmax</td> <td>435°F (224°C)</td> </tr> </table>	Pmax	362psi (25 bar)	Tmax	435°F (224°C)	
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Tmax	435°F (224°C)				
Tamb 133°F (70°C)	IP 65				
110 - 120 VAC	50 / 60 Hz				
0 - 30s	3VA 0,5 / 10 µS/cm				
 250 V ~ T 2,5 A					
<p>GESTRA GmbH Münchener Straße 77 D-28215 Bremen Phone: +49 (0) 421 / 3503-0 gestra.gmbh@flowserve.com</p>					

 					
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<p>GESTRA GmbH Münchener Straße 77 D-28215 Bremen Phone: +49 (0) 421 / 3503-0 gestra.gmbh@flowserve.com</p>					

Corrosion resistance

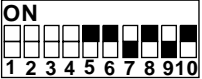

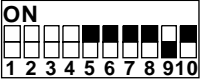

If the NRGS 15-1 is used for its intended purpose, its safety is not impaired by corrosion.

Establishing Functions

Select function

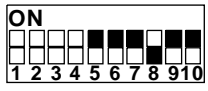
Before installing and commissioning the NRGs 15-1 ascertain the settings for the required functions.

Five functions are available:

Function 1		
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 sec.	
Electrode rod 4	High level	
Function 2		
Electrode rod 1	Low level 1 / burner off with test and reset button	
Electrode rod 2	Low level 2	
Electrode rod 3	Timed pump control (fill control) tv=0 – 30 sec.	
Electrode rod 4	High level	
Function 3		
Electrode rod 1	Low level alarm 1 / burner off	
Electrode rod 2	Feed pump on (fill control)	
Electrode rod 3	Feed pump off (tv=0 sec.)	
Electrode rod 4	High level	
Function 4		
Electrode rod 1	Low level alarm 1 / burner off with test and reset button	
Electrode rod 2	Feed pump on (fill control)	
Electrode rod 3	Feed pump off (tv=0 sec.)	
Electrode rod 4	High level	

Establishing Functions – continued –

Select function – continued –

Function 5	
	
Electrode rod 1	Low level alarm 1
Electrode rod 2	Pump off
Electrode rod 3	Pump on (discharge control) tv=0 sec.
Electrode rod 4	High level

Factory setting

The factory setting of level switch NRGS 15-1 without pushbuttons is function 1 and with pushbuttons is function 2.

The preset time delay for pump control is 5 sec. and the preset sensitivity range is 10 μ S/cm.

Cutting electrode tips to length

1. Determine the lengths of the electrode rods as a function of the level-dependent switchpoints (measured from the gasket face E) and enter the data in the table below.
2. Then cut all electrode tips (see Fig. 2) to the required lengths by using a bolt cutter.
3. Deburr faces of electrode tip ends.
4. Strip off 50mm of PTFE insulation from the ends of the electrode tips (see Fig. 2). Make sure that there is an electrical resistance path of ≥ 14 mm between the electrode tips.
5. Arrange PTFE spacer discs so that the electrode tips cannot come into contact with each other.

Electrode tip	Function	Cable/ Connector	Length [mm]
1		1	
2		2	
3		3	
4		4	

Establishing Functions – continued –

Adjust function

1. Undo the housing screws **G** and remove **F** the housing lid.
2. Set the code switch **6** to the desired function (see “Select function”). To set the code switch **6** located on the electronics insert (see Fig. 5) use a screwdriver with a thin blade.
3. Use a waterproof marker to enter the established functions in the labelling boxes on the lid (see Fig. 4).
4. After adjusting the functions replace housing lid **F** and fasten the housing screws **G**.

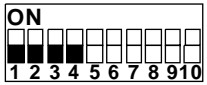
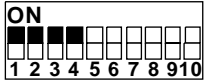
Set sensitivity range

The sensitivity is set at our works to $\geq 10\mu\text{S/cm}$.

If the electrical conductivity of the boiler water is below $10\mu\text{S/cm}$ at 25°C you have to change the sensitivity range.

1. Undo the housing screws **G** and remove the housing lid **F**.
2. Set the code switch **6** such that the desired function is established. To set the code switch **6** located on the electronics insert (see Fig. 5) use a screwdriver with a thin blade.

The following functions can be adjusted via code switch:

Code switch S1	Setting
	Sensitivity $\geq 0.5\mu\text{S/cm}$ at 25°C
	Sensitivity $\geq 10\mu\text{S/cm}$ at 25°C

3. After adjusting the functions replace housing lid **F** and fasten the housing screws **G**.

Tools

- Bolt cutter
- Hacksaw
- Flat file, medium cut
- Screwdriver for cross head screws, size 2
- Screwdriver for slotted screws, size 2.5, completely insulated according to VDE 0680

Installation

Level switch NRGs 15-1

We highly recommend that only qualified staff should carry out installation work in accordance with these installation instructions. The manufacturer expressly rejects any claims for damage caused by improper installation.

Before installing the electrode cut the electrode rods to length, make sure that 50 mm of the PTFE insulation are stripped off (see Fig. 2) and establish the functions.

The supplied spacer discs must be slipped over the electrode tips and distributed uniformly to ensure sufficient spacing between the tips.

1. Check that seating surfaces of threads or mounting flange provided on vessel or boiler standpipe (see Fig. 3) are accurately machined. If necessary rework the surfaces according to the specifications indicated in the drawing.
2. Place joint ring **D** (supplied with the electrode) onto the seating surface **E** of the electrode.
3. Apply a light smear of silicone grease to the electrode thread.
4. Screw electrode into threads or flange provided on vessel (see Fig. 3) and tighten with a 41 mm open-end spanner. The torque required when cold is 160 Nm.
5. Provide a max. thermal insulation of boiler of 40 mm at electrode (see Fig. 2).



Attention

Do not subject the electrode tips to shocks and do not bend the electrode tips when mounting.

Use only joint ring **D** Ø33x39 DIN 7603 made from 1.4301 E8P. Do not insulate the threads with hemp or PTFE tape!

Do not lag the electrode body above the hexagonal part.

The electrode must only be installed in a vertical position.

The specified torques must be strictly observed.



Note

For the approval of the boiler standpipe (see Fig. 3) the relevant regulations must be considered.

Carry out the installation work in compliance with the installation examples given in this installation manual.

Align terminal box

Align the terminal box such that the LEDs ①, ②, ③, ④, ⑤ can be seen by the operator.

1. Undo the housing screws ⑥ and remove the housing lid ⑦.
2. Use open-end spanner A. F. 18 (19) mm to loosen the fixing nut ⑧ and turn the terminal box into the desired direction (cable gland).
3. Re-tighten the fixing nut ⑧ with a torque of 25 Nm.
4. Replace the housing lid ⑦ and tighten the housing screws ⑥ firmly.

If necessary you can take off the terminal box in order to align the electrode part. The terminal box must be re-installed after alignment.

Remove terminal box

1. Undo the housing screws ⑥ and remove the housing lid ⑦.
2. Unplug the electrode wires from terminal lugs for electrode wires, functional earth ⑨ and mark them.
3. Use open-end spanner A. F. 18 (19) mm to unscrew the fixing nut ⑧. Pull electrode wires through fixing nut ⑧.
4. Remove terminal box. Run all electrode wires through the hole for the fixing screw (see Fig. 5).
5. Remove the gasket ⑩ between the electrode part and the housing.

Mount terminal box

1. Put gasket **A** onto electrode part.
2. Run all electrode wires through the hole for the fixing screw (see Fig. 5) in the terminal box.
3. Place the terminal box onto the electrode part and turn it into the desired direction (cable gland). Make sure that the gasket is properly placed between the electrode part and the housing.
4. Pull all electrode wires through fixing nut **M**. Use an open-end spanner A. F. 18 (19) mm to fasten the hexagon nut to the fixing screw, applying a torque of 25 Nm.
5. Connect the electrode wires according to the wiring diagram (see Fig. 6) to the terminal lugs for electrode wires, functional earth **N**.
6. Replace the housing lid **F** and tighten the housing screws **G**.



Attention

Close the lid **F** of the housing whenever interrupting the installation or removal work of the terminal box.

Check the gasket **A** for signs of damage. Re-use only undamaged gaskets.

Tools

- Open-end spanner 41 mm A. F.
- Open-end spanner 18 (19) mm A. F.
- Screwdriver for cross-recess head screws, size 2.5, completely insulated according to VDE 0680

Wiring

Connect level switch NRGS 15-1

Use multi-core flexible control cable with a min. conductor size of 0.75 mm² as mains and control cables.

1. Undo the housing screws **G** and remove the housing lid **F**.
2. Unplug the two-pole terminal strip **J** and the twelve-pole terminal strip **H** from the electronics insert.
3. Strip off approx. 40 mm of cable insulation coating and remove approx. 5 mm of conductor end insulation.
4. Loosen cable glands **I** and run the mains cables through the lower cable gland **I** and the control cables through the upper cable glands **I**.
5. Connect mains and control cables according to the wiring diagram (inside of housing lid) to terminal strips **H**, **J**.
6. Plug terminal strips **H**, **J** to electronics insert.
7. Seal cable entries by tightening cable glands **I**. Use sealing plugs **I** for cable glands that are not used.
8. Replace the housing lid **F** and tighten the housing screws **G** firmly.



Attention

The following relocations of cables with basic insulation are not permissible: Mains and control cables in low voltage areas

Provide level switch and control circuit with a slow-blow 2.5A fuse.

Provide connected contactors with RC combinations according to manufacturer's specification to ensure interference suppression.

Note that the sealing plugs are not scope of the supply.

Tools

- Screwdriver for cross recess head screws, size 1 and 2
- Screwdriver for slotted screws, size 2.5, completely insulated according to VDE 0680

Wiring diagram

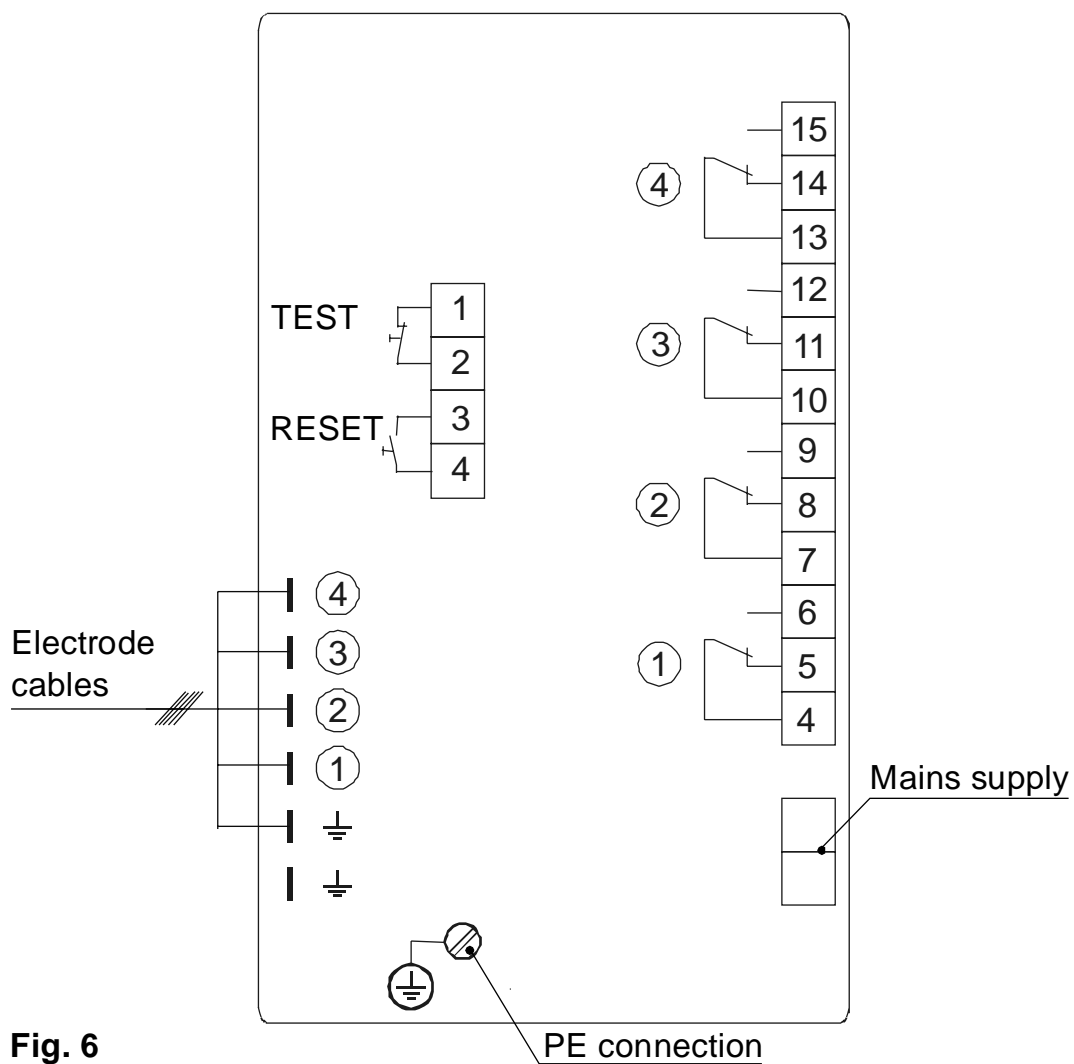


Fig. 6

Commissioning

Check wiring

1. Make sure that the level switch is correctly wired in accordance with the wiring diagram (see Fig. 6).
2. Make sure that the mains voltage agrees with the specification on the name plate.

Apply mains voltage

1. Undo the housing screws **G** and remove the housing lid **F**.
2. Apply mains voltage. The green LED **5** is illuminated. The other LEDs are lit as a function of the water level.
3. Check that all functions of the respective switchpoints work correctly. The LEDs **1**, **2**, **3**, **4** serve as optical indicators of the associated switchpoints. (see “Check switching functions”).
4. After establishing the functions replace housing lid **F** and tighten the housing screws **G**.



Danger

The terminal strip of the level switch is live during operation. This presents the danger of electric shock!

Cut off power supply before opening the housing cover of the level switch!
After removing the housing cover check again that the system is de-energized.

To check the power supply or the correct functioning, switch the level switch on again. This work must only be performed by qualified personnel.

Commissioning – continued –

Check switching functions

Use the following table as reference when checking the individual switching functions.

Electrode rod 1 = low level 1		
Electrode rod1 emerges	Relay 1 is de-energized after 1 sec.	LED1 illuminated
Electrode rod1 enters the liquid	Relay 1 is energized after 1 sec.	LED1 off
Test and lock-out function		
Press TEST button	Relay 1 is de-energized and locked out after 1 sec.	LED1 illuminated
Press RESET button for 3s	Relay 1 is energized after 1 sec.	LED1 off
Electrode rod1 emerges	Relay 1 is de-energized and locked out after 1 sec.	LED1 illuminated
Electrode rod1 enters the liquid Press RESET button for 3sec.	Relay 1 is energized after 1 sec.	LED1 off
Electrode rod 2 = low level 2		
Electrode rod2 emerges	Relay 2 is de-energized after 1 sec.	LED2 illuminated
Electrode rod2 enters the liquid	Relay 2 is energized after 1 sec.	LED2 off
Electrode rod 4 = high level		
Electrode rod4 enters the liquid	Relay 4 is de-energized after 3sec.	LED4 illuminated
Electrode rod4 emerges	Relay 4 is de-energized after 3sec.	LED4 off

Commissioning – continued –

Check switching functions - continued -

Electrode rod 3 = timed pump control (fill control)		
Electrode rod3 emerges	Relay3 is energized, pump ON	LED 3 illuminated
Electrode rod 3 enters the liquid	Relay3 is de-energized after a preset time delay (0–30 sec.) = pump OFF	LED 3 off
<p>Relay 3 is de-energized too early or too late: Increase or decrease time delay with the aid of the potentiometer and let electrode tip 3 emerge or enter the liquid again. Repeat the process until you have found the correct switchpoint for the pump. If 30sec. time delay is not enough for filling the boiler, please select the operation mode "on-off pump control".</p>		
Electrode rod 3 = on-off pump control (fill control)		
Set potentiometer for time delay to 0 sec.		
Electrode rods2 and 3 exposed	Relay3 is energized, pump ON	LEDs2 and 3 illuminated
Electrode rod 2 enters the liquid		LED 2 off
Electrode rod 3 enters the liquid	Relay3 is de-energized = pump OFF	LED 3 off
Electrode rods 2 and 3 = on-off pump control (discharge control)		
Set potentiometer for time delay to 0 sec.		
Electrode rods2 and 3 submerged	Relay3 is energized, pump ON	LED 2 off and LED 3 illuminated
Electrode rod 3 emerges		LED 3 off
Electrode rod 2 emerges	Relay3 is de-energized = pump OFF	LED 2 illuminated

Malfunctions / Troubleshooting

Fault finding list

Switchpoint "Pump OFF" exceeded - no function

Fault: Mains voltage is not applied.

Remedy: Switch on mains voltage. Connect level switch according to wiring diagram (Fig. 5).

Fault: The electrical conductivity is too low.

Remedy: Set code switch **6** to 0.5 µS/cm.

Fault: The earth connection to the vessel is interrupted.

Remedy: Clean seating surfaces (see Fig. 3) and insert metal joint ring **D** Ø33x39 DIN 7603 (made from s. s. 1.4301). Do not insulate the level switch with hemp or PTFE tape!

Fault: Electronic circuit board defective.

Remedy: Replace electronic circuit board.

Level below switchpoint "Low level" - no function

Fault: The electrode tips have earth contact.

Remedy: Check and, if necessary, change position of installation.

Fault: If the equipment is installed inside the boiler: The vent hole in the protection tube does not exist or is obstructed.

Remedy: Check installation of level switch. Make sure that the level in the protection tube corresponds to the actual water level (see Examples of Installation).

Switchpoint has been reached - incorrect function

Fault: The switching function has not been assigned correctly. The electrode tips have been cut to the wrong length.

Remedy: Assign the electrode tips correctly and change connections on the electronic circuit board **N** correspondingly.

Fault: The switching function does not correspond to the selected function. The code switch has been set to the wrong value.

Remedy: Set code switch **6** according to the selected function.

Replace electronic circuit board

1. Undo the housing screws **G** and remove the housing lid **F**.
2. Pull the electrode wires out of the terminal lugs **N** on the electronic circuit board. Unplug all terminal strips **H**, **J**, **O**.
3. Undo the PE connection **L**.
4. Unscrew the fixing screws of the electronic circuit board **K** and take out the electronic circuit board. The electronic circuit board is available as spare part type NRV 1-47.
5. Install the new electronic circuit board in reverse order.

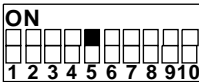
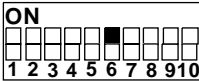
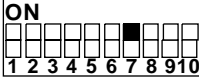
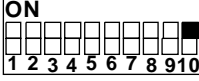
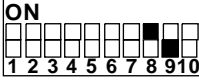
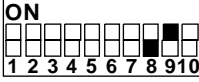
Annex

Adjust other functions

The level switch assigns one switching channel to each electrode tip. The functions of the switching channels 1 and 4 are fixed, the switching channels 2 and 3 can be adjusted via code switch ⑥ to suit individual requirements.

The assigned electrode tip is cut to length on site in order to establish the level-dependent switchpoint of each individual switching channel.

The code switch can also be used to establish other functions than the ones described in section "Select function".

Code switch	Function
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	No TEST button
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	No RESET button
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	On-off pump control switched on
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	Electrode tip ② separated from electrode tip ①
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	Pump fill control switched on
or	
 <p>ON 1 2 3 4 5 6 7 8 9 10</p>	Pump discharge control switched on

Installation in non-metallic vessel

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

Note that in this case the electrode tip **4** cannot be used for high level alarm but must be used as reference electrode.

For this purpose plug the connection of the electrode tip **4** into the free terminal lug for the functional earth **N**.

In addition, cut the electrode tip **4** to the same length as electrode tip **1** and strip off the whole insulation.

Revised

Index	Description	Date
00	New installation instructions	28 May 2004

Examples of Installation

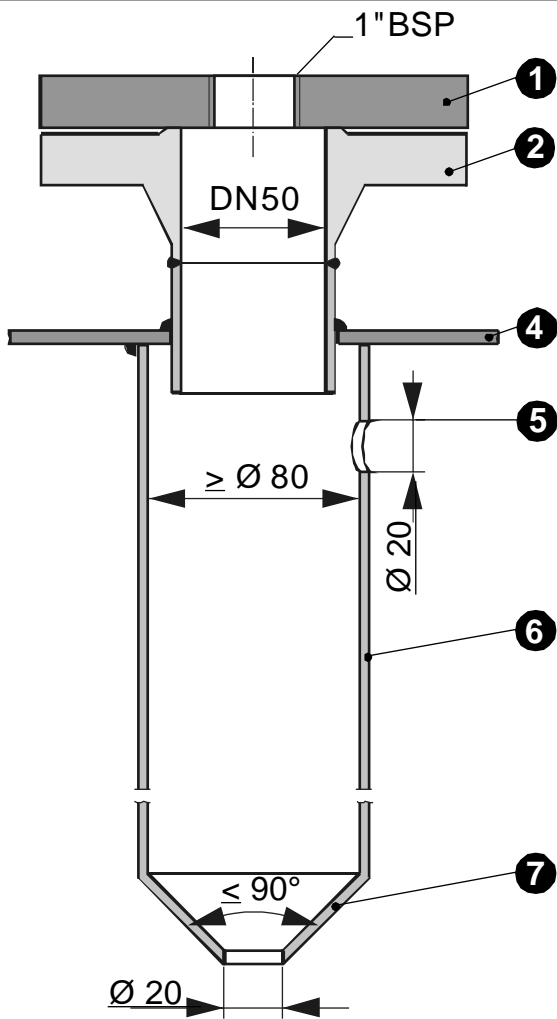


Fig. 7

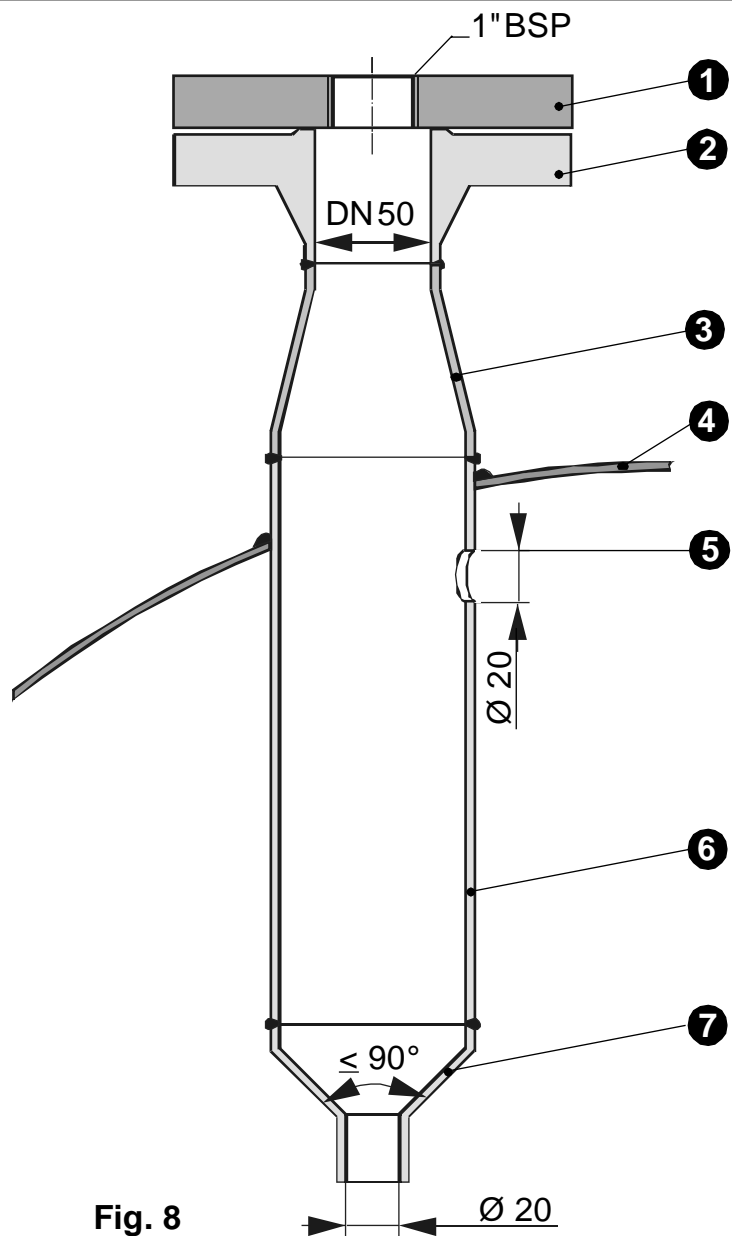


Fig. 8

Key

- ① Flange PN40, DN50, DIN 2527
or flange PN40, DN100, DIN 2527
- ② For the approval of the boiler standpipe with connecting flange the relevant regulations must be considered.
- ③ e. g. reducer K88.9x60.3x3.2 DIN 2616
- ④ Boiler wall
- ⑤ Provide vent hole as close to the boiler wall as possible!
- ⑥ Protection tube \geq DN80
- ⑦ e. g. reducer K88.9x30x3.2 DIN 2616

For your notes



GESTRA

www.gestra.de

España

GESTRA ESPAÑOLA S.A.

Luis Cabrera, 86-88

E-28002 Madrid

Tel. 00 34 91 / 51 52 032

Tel. 00 34 91 / 41 36 747; 51 52 036

E-mail: aromero@flowserve.com

Poland

GESTRA POLONIA Spolka z.o.o.

Ul. Schuberta 104

PL - 80-172 Gdansk

Tel. 00 48 58 /306 10-02 od 10

Fax 00 48 58 /306 33 00

E-mail: gestra@gestra.pl

Great Britain

Flowserve Flow Control (UK) Ltd.

Burrel Road, Haywards Heath

West Sussex RH 16 1TL

Tel. 00 44 14 44 / 31 44 00

Tel. 00 44 14 44 / 31 45 57

E-mail: gestraukinfo@flowserve.com

Portugal

Flowserve Portuguesa, Lda.

Av. Dr. Antunes Guimarães, 1159

Porto 4100-082

Tel. 0 03 51 22 / 6 19 87 70

Fax 0 03 51 22 / 6 10 75 75

E-mail: jtavares@flowserve.com

Italia

Flowserve S.p.A.

Flow Control Division

Via Prealpi, 30

I-20032 Cormano (MI)

Tel. 00 39 02 / 66 32 51

Fax 00 39 02 / 66 32 55 60

E-mail: infoitaly@flowserve.com

USA

Flowserve DALCO Steam Products

2601 Grassland Drive

Louisville, KY 40299

Tel. 00 15 02 / 4 95 01 54, 4 95 17 88

Fax 00 15 02 / 4 95 16 08

E-mail: dgoodwin@flowserve.com

GESTRA AG

Postfach 10 54 60, D-28054 Bremen

Münchener Str. 77, D-28215 Bremen

Telefon +49 (0) 421 35 03-0

Telefax +49 (0) 421 35 03-393

E-Mail gestra.ag@flowserve.com

Internet www.gestra.de

