FLOWSERVE GESTRA

GESTRA Steam Systems

NRG 16-42

GB

Installation Instructions 810295-03

Level electrode NRG 16-42

spector bus CANopen

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Important Notes

Usage for the intended purpose

Use level electrode NRG 16-42 only in conjunction with level switch NRS 1-42.

Safety note

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

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

Danger

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

The electrode is hot during operation. This presents the risk of severe burns to hands and arms. Installation and maintenance work should only be carried out when the system is cold.

If the internal ceramic insulation breaks, hot steam can escape through the lateral vent hole on the electrode body. This presents the risk of severe scalding. Do not stay near the electrode during operation.

Attention

The name plate indicates the technical specification on the equipment.
Do not commission or operate equipment without a name plate.

ATEX (Atmosphère Explosible)

According to the European Directive 94/9/EC the equipment must **not** be used in explosion-risk areas.

Explanatory Notes

Scope of supply

NRG 16-42

1 Level electrode type NRG 16-42
1 Joint ring (of stainless steel 1.4301) D 33 x 39 to DIN 7603, bright annealed
1 Terminating resistor 120 Ω
1 Installation manual

Description

The level electrode NRG 16-42 works according to the conductivity measurement principle.
With the NRG 16-42 a maximum of 4 levels can be signalled in conductive liquids:

- 4 levels with **one** switchpoint each.
- High level (MAX) alarm, Low level (MIN) alarm, pump ON, pump OFF with **one** switchpoint each.

Use level electrode NRG 16-42 in combination with level switch type NRS 1-42 or further system components. The level data are transferred to the level switch or another system component via CAN data bus, using the CANopen protocol.

Function

The conductivity of the liquid is used to signal the liquid level. Some liquids are conductive, which means that they allow an electric current to flow through them.
For the safe functioning of this device a minimum conductivity of the liquid to be measured is required.

The conductivity measurement method can detect two conditions: electrode rod submerged or exposed, meaning switchpoint reached (or exceeded) or not yet reached. Before installation, the length of the electrode rod must be cut to the required switching levels, e. g. for max./min. alarm, controlling of a valve or pump.

At regular intervals the level electrode NRG 16-42 sends a data telegram to the level switch NRS 1-42. The data are transferred via a CAN bus to DIN ISO 11898 using the CANopen protocol.

System components

NRS 1-42
Data exchange: CAN bus to DIN ISO 11898, using CANopen protocol.

URB 1, URB 2
Control terminal & display unit.
Functions: Parameterization and visual display (LCD).
Data exchange: CAN bus to DIN ISO 11898, using CANopen protocol.

Design

NRG 16-42:
Screwed design 1" BSP, EN ISO 228-1. **Fig. 2**

Technical data

NRG 16-42

Type Approval Nº
TÜV · WR · 04-399

Max. service pressure
32 bar g at 238°C

Connections
Screwed 1" BSP, DIN ISO 228-1
Flanged DN 50, PN 40, DIN 2635

Materials
Case: Die cast aluminium 3.2161 (G AlSi8Cu3)
Stem: S. S. 1.4571 (X6CrNiMoTi17-12-2)
Measuring electrodes: S. S. 1.4401 (X5CrNiMo17-12-2)
Electrode insulation: PEEK
Spacer disc: PTFE

Lengths supplied
500 mm
1000 mm
1500 mm

Supply voltage
18 – 36 V DC

Current consumption
65 mA

Fuse
Thermal fuse T_{max} = 85°C

Hysteresis
-2 K

Electrode voltage
10 V_{ss}

Data exchange
CAN bus to DIN ISO 11898, CANopen protocol

Indicators and adjustors
1 green LED "CAN BUS COMMUNICATION"
1 red LED "BUS FAULT"
1 10-pole code switch for node ID and baud rate settings

Electric connection
M 12 sensor connector, 5 poles, A-coded,
M 12 sensor jack, 5 poles, A-coded

Protection
IP 65 to DIN EN 60529

Max. admissible ambient temperature
70 °C

Weight
approx. 2.5 kg

Technical Data continued

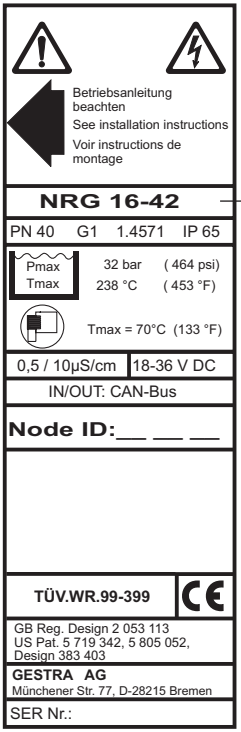
Corrosion resistance

When used for its intended purpose the safe functioning of the electrode will not be impaired by corrosion.

Sizing

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

Name plate / marking



Designation of the equipment

Fig. 1

Dimensions NRG 16-42

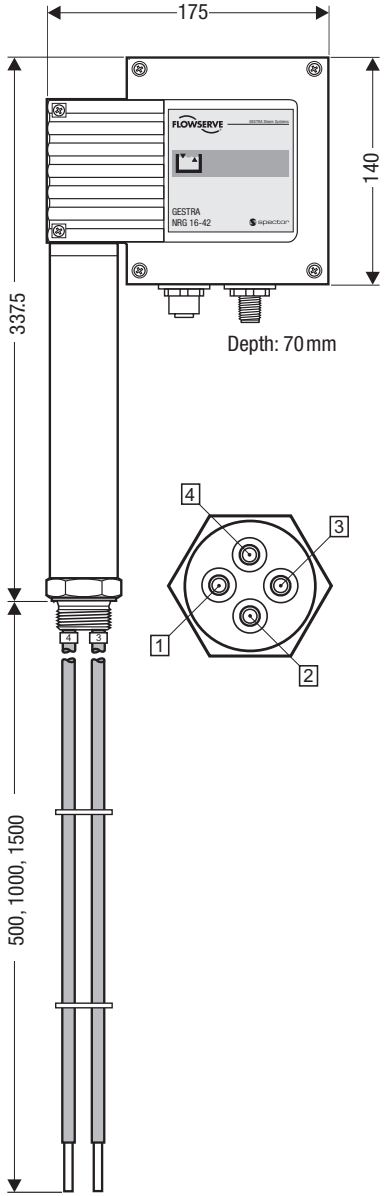


Fig. 2

Design

NRG 16-42

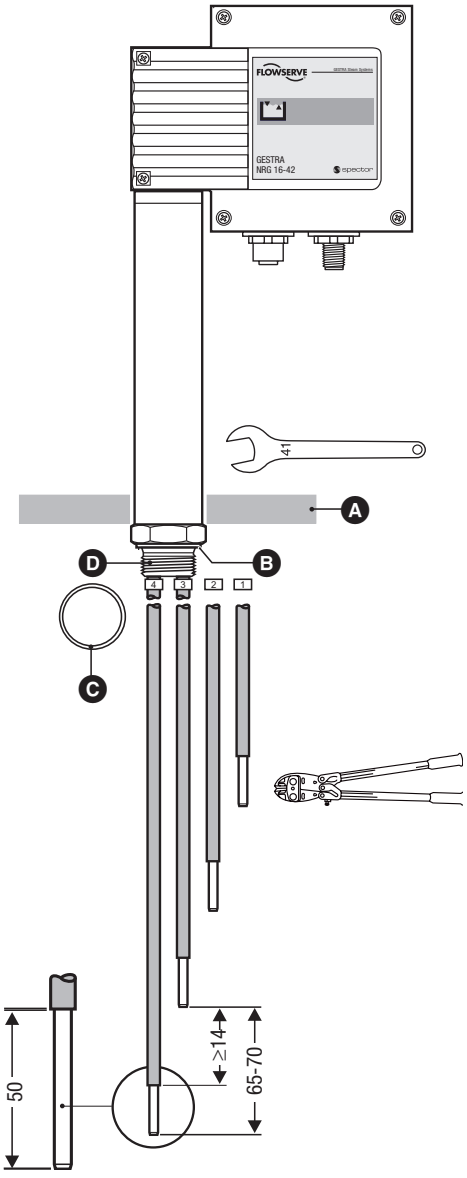


Fig. 3

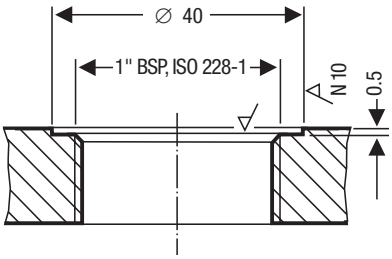


Fig. 4

Functional Elements

NRG 16-42

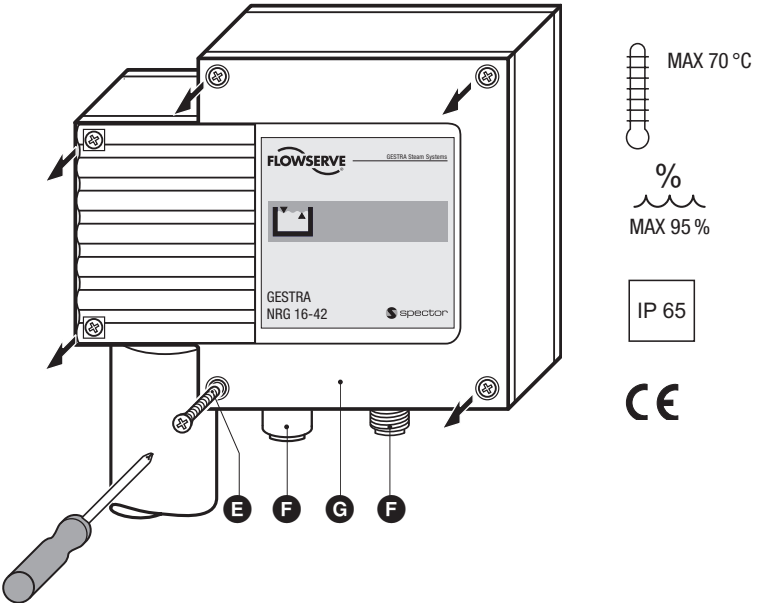


Fig. 5

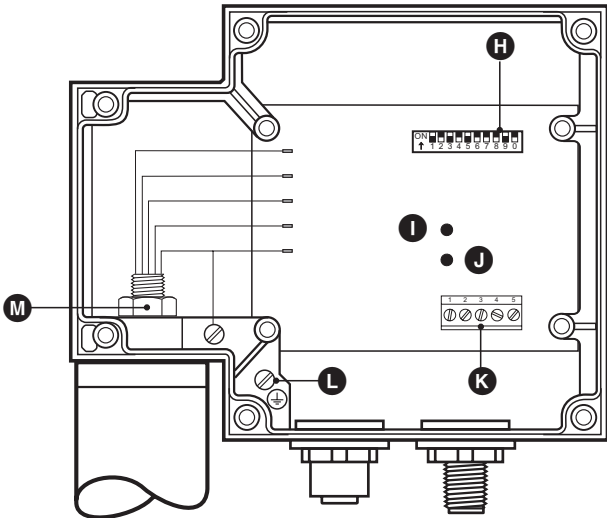


Fig. 6

Design / Functional Elements continued

Key

- **A** Thermal insulation, provided on site, d = 20 mm (outside of thermal insulation of the steam boiler)
- **B** Seating surface
- **C** Joint ring (of stainless steel 1.4301) D 33 x 39 to DIN 7603, bright annealed
- **D** Electrode thread 1" BSP, EN ISO 228-1
- **E** Housing screws M 4
- **F** M 12 sensor connector, 5 poles, A-coded
  M 12 sensor jack, 5 poles, A-coded
- **G** Housing cover
- **H** 10-pole code switch (for setting node ID and baud rate)
- **I** LED "CAN BUS COMMUNICATION" (flashes during data exchange), green
- **J** LED "BUS FAULT", red
- **K** Terminal strip
- **L** PE connection
- **M** Plug

Installation

NRG 16-42

1. Determine required measuring lengths of electrode rods and enter data in table “Functions”.
2. Cut electrode rods [1], [2], [3] and [4] accordingly, **Fig. 3**
3. Deburr faces of electrode tips.
4. Strip off 50 mm of PTFE insulation from the ends of electrode tips.
5. Check seating surfaces of threads or flange provided on vessel or boiler standpipe, **Fig. 4**
6. Place joint ring Ⓒ onto seating surface Ⓑ of electrode, **Fig. 3.** Use only joint ring (of stainless steel 1.4301) D 33 x 39 to DIN 7603 supplied with electrode.
7. Apply a light smear of silicone grease (e. g. Molykote® 111) to electrode thread Ⓓ.
8. Screw level electrode into threads or flange provided on vessel or boiler standpipe and tighten with a 41 mm open-end spanner. The torque required is **140 Nm** when cold.

Function	Function	Electrode rod	Length [mm]
e.g. High level alarm		1	
e.g. Feed pump ON		2	
e.g. Feed pump OFF		3	
e.g. First low-level alarm		4	
	Please enter data.		Please enter data.

Attention

- The seating surfaces of the threads or flange provided on the vessel or boiler standpipe must be accurately machined. **Fig. 4**
- Do not bend electrode rod when mounting.
- Use only the supplied joint ring D 33 x 39 (of stainless steel 1.4301) to DIN 7603.
- Do not lag electrode body.
- Do not insulate electrode thread with hemp or PTFE tape.

Note

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

Tools

- Open-end spanner 17 mm A. F.
- Open-end spanner 41 mm A. F.
- Hacksaw
- Flat file, medium cut

Molykote® 111 is a registered trademark of DOW Corning Corp., Midland Michigan, USA

Examples of installation NRG 16-42

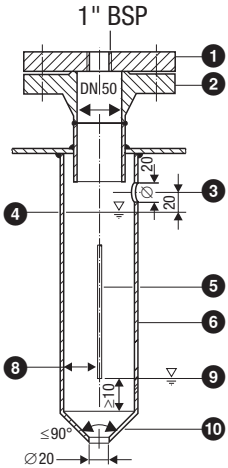


Fig. 7

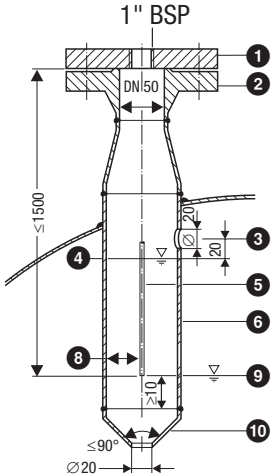


Fig. 8

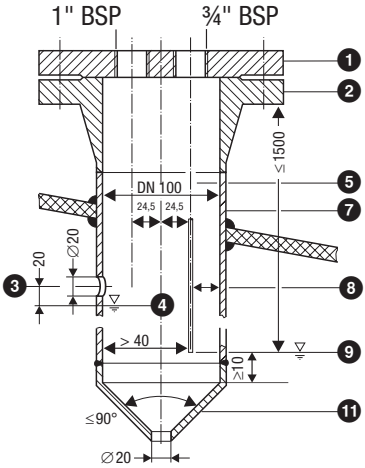


Fig. 9

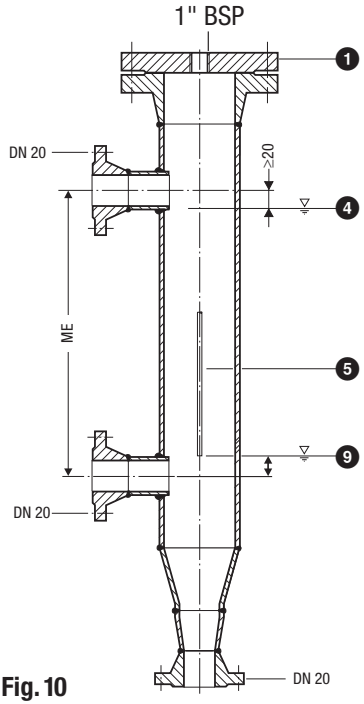


Fig. 10

Installation continued

Key

1. Flange PN 40, DN 50 (2"), DIN 2527
   Flange PN 40, DN 100 (4"), DIN 2527
2. For the approval of the boiler standpipe with connecting flange the relevant regulations must be considered.
3. Vent hole Provide vent hole as close as possible to the boiler wall.
4. High water (HW)
5. Electrode rod d = 5 mm
6. Protection tube DN 80
7. Protection tube DN 100
8. Electrode distance ≥ 14 mm
9. Low water (LW)
10. Reducer K-88.9 x 3.2 – 42.4 x 2.6 W to DIN 2616, part 2
11. Reducer K-114.3 x 3.6 – 48.3 x 2.9 W to DIN 2616, part 2

Wiring

NRG 16-42

Note that screened multi-core twisted-pair control cable is required, e. g. UNITRONIC®
BUS CAN 2 x 2 x ... mm² or RE-2YCYV-fl 2 x 2 x ... mm².

Prefabricated control cables (with connector and coupler) of various lengths for connecting the equipment are available as accessories.

The baud rate (data transfer rate) dictates the cable length between the bus nodes and the total power consumption of the sensor dictates the conductor size.

S 8	S 9	S 10	Baud rate	Cable length	Number of pairs and conductor size [mm²]
OFF	**ON**	**OFF**	**250 kBit/s**	**125 m**	2 x 2 x 0.34
Factory setting					
ON	ON	OFF	125 kBit/s	250 m	2 x 2 x 0.5
OFF	OFF	ON	100 kBit/s	335 m	2 x 2 x 0.75
ON	OFF	ON	50 kBit/s	500 m	on request, dependent on bus configuration
OFF	ON	ON	20 kBit/s	1000 m	
ON	ON	ON	10 kBit/s	1000 m	

The baud rate is set via a code switch. Reduce baud if cable is longer than specified in the table above. Make sure that all bus nodes feature the same settings.

To protect the switching contacts fuse circuit with 2.5 A (anti-surge fuse) or according to TRD regulations (1.0 A for 72 hrs operation).

When a max. cable length of more than 125 m (up to 1000 m) is desired, make sure to modify the baud rate accordingly. Refer to pages 19 and 20 for more details.

Aligning terminal box

1. Unscrew screws Ⓔ, remove housing cover Ⓖ. **Fig. 5**
2. Loosen screw Ⓜ with 17 mm spanner but do not remove. **Fig. 6**

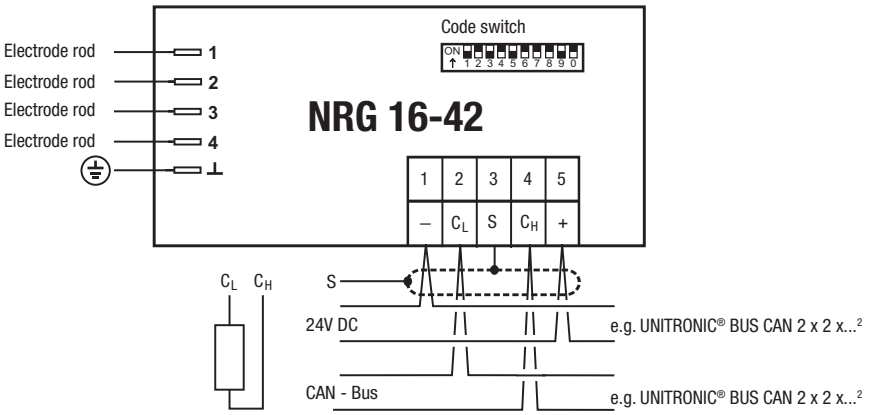
The electrode terminal can be turned through +/– 180°.

3. Turn electrode terminal into desired direction (+/– 180°).
4. Tighten plug Ⓜ with a torque of **25 Nm**.
5. Set node ID (see **"Basic Settings"**, **"Configure level electrode"**).
6. Replace housing cover Ⓖ and fasten screws Ⓔ.

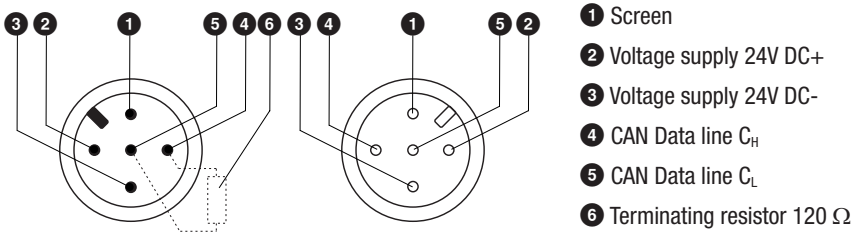
Note

- Wire the control cable according to the wiring diagram with connector and coupler.

Wiring diagram



Terminating resistor 120 Ω, paired cable.



1. Screen
2. Voltage supply 24V DC+
3. Voltage supply 24V DC-
4. CAN Data line C_H
5. CAN Data line C_L
6. Terminating resistor 120 Ω

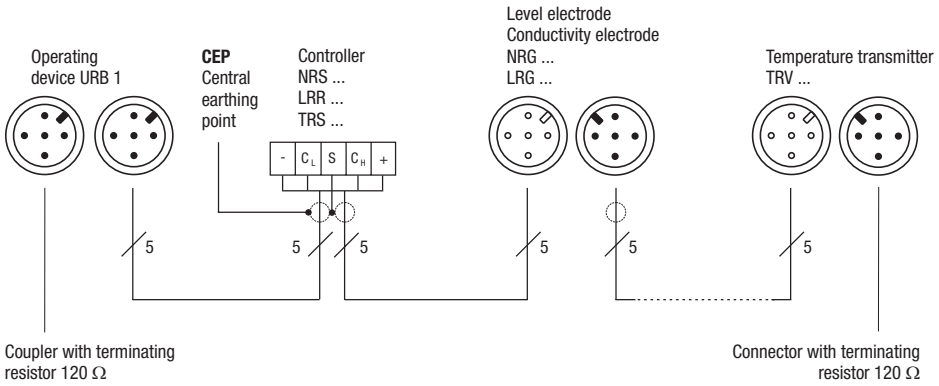


Fig. 11

UNITRONIC® is a registered trademark of LAPP Kabelwerke GmbH, Stuttgart

Wiring continued

Attention

- Wire equipment in series. Star-type wiring is not permitted!
- Interlink screens of control cables such that electrical continuity is ensured and connect them **once** to central earthing point (CEP).
- In a CAN bus network the first and the last equipment **must** be provided with a terminating resistor of 120 Ω. **Fig. 11**
- The CAN bus network mut **not** be interrupted while operating.

  An interruption will result in high/low level alarm!

Tools

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

Basic Settings

CAN bus

All level and conductivity controllers and associated electrodes are interconnected by means of a CAN bus adopting the CANopen protocol. Every item of equipment features an electronic address (Node ID). The four-core bus cable serves as power supply and data highway for high-speed data exchange.

The CAN address (Node ID) can be set between **1** and **123**.

The NRG 16-42 is configured at our works and ready for service with other GESTRA system components without having to set the node ID.

If several systems of the same kind are to communicate in one CAN bus network, be sure to assign one node ID for each individual system component (e. g. controller). Refer to the following pages for more details.

Node-ID

Reserved	NRS 1-42	NRG 16-42	
X - 1	X	X + 1	
	20	21	Factory setting

Reserved area

Attention

The node IDs of the individual units have to be adjusted manually.
For more information refer to the respective installation manuals.

Factory setting

The level electrode features the following factory set default values:

- Baud rate: **250 kB/s**
- Sensitivity: **10 µS/cm**
- Node ID: **021**

Factory set default node IDs

Switching Controller		Level Electrode	
NRS 1-40	ID: 001	NRG 16-40	ID: 002
NRS 1-40.1	ID: 001	NRG 16-40	ID: 003
NRS 1-41	ID: 006	NRG 16-41.1	ID: 004
NRS 1-42	ID: 020	TRV 5-40	ID: 005
NRS 2-40	ID: 039	NRG 16-41	ID: 007
NRR 2-40	ID: 040	NRG 16-42	ID: 021
LRR 1-40	ID: 050	NRG 26-40	ID: 041
		LRG 16-40	ID: 051

Assigning / changing node ID

If several systems of the same kind are to communicate in one CAN bus network, be sure to establish one node ID for each individual system component (e. g. controller).

1. Undo screws Ⓔ and remove housing cover Ⓖ.
2. Change code switch Ⓗ settings as required. For more information refer to page 20.
3. Re-attach housing cover Ⓖ and fix it with screws Ⓔ.

Attention

- Do **not** assign the same node ID twice within the CAN bus network.

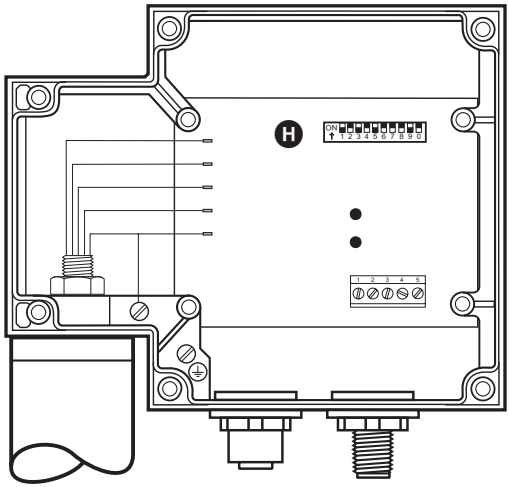


Fig. 12

Code switch settings for node ID / baud rate

		Node ID	21
S1	**ON**	1	
S2	OFF	2	
S3	**ON**	4	
S4	OFF	8	
S5	**ON**	16	
S6	OFF	32	
S7	OFF	64	

Fig. 13 (Factory setting)

		Node ID	71
S1	**ON**	1	
S2	**ON**	2	
S3	**ON**	4	
S4	OFF	8	
S5	OFF	16	
S6	OFF	32	
S7	**ON**	64	

Fig. 14 (Example)

S8	S9	S0	Baud rate	Length of cable
OFF	**ON**	OFF	250 kBit/s	125 m
ON	**ON**	OFF	125 kBit/s	250 m
OFF	OFF	**ON**	100 kBit/s	335 m
ON	OFF	**ON**	50 kBit/s	500 m
OFF	**ON**	**ON**	20 kBit/s	1000 m
ON	**ON**	**ON**	10 kBit/s	1000 m

Fig. 15 (Factory setting 250 kBit/s)

Commissioning

Check wiring

Check whether the level electrode NRG 16-42 and the associated level switch NRS 1-42 have been wired according to the wiring diagram. **Fig. 11**

Apply mains voltage

Turn on the power for level switch NRS 1-42.

Operation

Level electrode with CAN bus

During operation the level switch detects the level electrode via CAN bus.
The communication via CAN bus is faultless – there are no fault messages.

Note

- To analyse and eliminate malfunctions refer to “Fault finding list for troubleshooting” on pages 21 - 22.

Malfunctions

Fault finding list for troubleshooting

Equipment fails to work – Indication of a malfunction

Fault: In spite of correct wiring and commissioning of the equipment an interference signal is indicated.

Remedy: The interference signal is caused by H. F. interferences coming from the installation. For interference suppression of the voltage supply we supply ferrite rings, stock code 147253. The 230 V supply lines should be looped through the ferrite ring five to ten times.
If several controllers are used in the system, they can be fed from the interference suppressed supply lines. For the interference suppression of the bus line we supply hinged-shell ferrite rings, stock code 147254. The hinged-shell ferrite rings are clamped onto the bus line close to the terminal strip of the controller.

Malfunctions continued

Fault finding list for troubleshooting continued

The equipment fails to work – no function

Fault: LED “Power” does not light up.
Remedy: Apply mains voltage. Wire equipment according to the wiring diagram.

Fault: The thermal fuse has been triggered.
Remedy: The ambient temperature must not exceed 70 °C.

Fault: The LED ❶ does not light up. No data exchange.
Remedy: Check level switch NRS 1-42. Connect electode according to the wiring diagram.

Switchpoints reached / level below switchpoints – no function

Fault: The electric conductivity is too low.
Remedy: Set sensitivity of level switch NRS 1-42 to ≥ 0.5 µS/cm.

Fault: The electrode rods have earth contact.
Remedy: Change installation position.

Fault: The electrode housing does not have earth connection to the boiler.
Remedy: Clean seating surfaces and insert metal joint ring (of stainless steel 1.4301) 33 x 39 to DIN 7603. Do **not** insulate compact system with hemp or PTFE tape!

Fault: The vent hole in the protection tube does not exist, is obstructed or flooded.
Remedy: Check protection tube and, if necessary, provide vent hole.

Fault: The isolating valves of the external measuring pot (optional) are closed.
Remedy: Open isolating valves.

Switchpoints reached / level below switchpoints – incorrect function

Fault: The switching function has not been correctly allocated. Electrode rods have been cut to the wrong size.
Remedy: Identify electrode supply wire and reconnect the circuit board in the terminal box accordingly.

Fault: The internal seal of the electrode rod is damaged.
Remedy: Replace level electrode.

If faults occur that are not listed above or cannot be corrected, please contact our service centre or authorized agency in your country.

Decommissioning

Danger

Risk of severe burns and scalds to the whole body!

Before removing the level electrode make sure that the vessel and the measuring pot are depressurised (0 bar) and cooled down to room temperature (20 °C).

Disposal

Remove the level electrode and separate the waste materials, using the material specifications as a reference. Electronic components (circuit boards) must be disposed of properly.

For the disposal of the level electrode observe the pertinent legal regulations concerning waste disposal.

Annex

Declaration of conformity CE

We hereby declare that the equipment **NRG 16-42** conforms to the following European guidelines:

- LV guideline 73/23/eec version 93/68/eec
- EMC guideline 89/336/eec version 93/68/eec
- ATEX Directive 94/9/EC of 23 March 1994

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

Bremen, 3rd January 2005
GESTRA AG

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