NRS 1-7

Installation Instructions 818546-00
Level Switch NRS 1-7
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Important Notes

Usage for the intended purpose

Use level switch NRS 1-7 only in conjunction with level electrodes NRG 16-11, NRG 17-11, NRG 19-11, NRG 111-11, NRG 16-11 S or NRG 16-38S for low-level limiting (low level alarm).

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

The terminal strip of the NRS 1-7 is live during operation. This presents the danger of electric shock!

Cut off power supply before attaching or detaching the housing lid and the terminal strips of the equipment.

ATEX (Atmosphère Explosible)

The equipment constitutes a simple item of electrical equipment as defined in DIN EN 50020 section 5.4. According to the European Directive ATEX 94/9/EC the equipment may only be used in potentially explosive atmospheres if it is provided with approved Zener barriers.

Applicable in Ex zones 1, 2 (1999/92/EC). The equipment does not bear an EX marking. The suitability of the Zener barriers is certified in a separate document.

Explanatory Notes

Scope of supply

NRS 1-7

1 Level switch NRS 1-7
1 Installation manual

Description


Application in steam and (pressurized) hot water boilers in accordance with TRD 602 and TRD 604 sheet 1 and sheet 2 as well as EN 12952 and EN 12953.
Explanatory Notes  – continued –

Function

The level switch NRS 1-7 is a two-channel unit provided with an automatic self-checking circuitry in accordance with DIN VDE 0116 prEN 50156 (directives for protection circuits). The self-checking is effected periodically. The test includes the checking of the cable between electrode and level switch and of the self-checking circuitry (redundancy). The output relays are not influenced by the internal tests.

In addition to this self-checking routine, the level switch can also be tested manually by pushing the button “Test 1”, simulating a defect in the electrode. The test switch “Test 2/Inspection” is provided for checking the function of the checking circuitry.

As the circuit of the relay contacts of the level switch is normally closed, alarm will also be signalled in the event of a mains failure.

The level switch can signal the following three operating conditions:

■ Normal operation (correct level)
■ Alarm (low level)
■ Alarm (malfunction in level switch or electrode)

The green LED indicates power supply. The low level or malfunction alarm is indicated by two red LEDs. The failure of one channel (loss of redundancy) is signalled by the illumination of a single red LED.

The combination of electrode NRG 16-11, NRG 16-11S, NRG 17-11, NRG 19-11, NRG 111-11 and level switch NRS 1-7 provides fail-safe protection against a first fault, i.e. the system will still continue to provide the safety function even after the occurrence of a first fault.

System components

**NRG 16-11**  
Level electrode **NRG 16-11**, PN 40

**NRG 16-11S**  
Level electrode **NRG 16-11S**, PN 40, for marine applications

**NRG 17-11**  
Level electrode **NRG 17-11**, PN 63

**NRG 19-11**  
Level electrode **NRG 19-11**, PN 160

**NRG 111-11**  
Level electrode **NRG 111-11**, PN 320

Design

**NRS 1-7**

Plug-in unit in plastic case for installation in control cabinets. The terminals in the case are accessible after loosening two screws and unplugging the unit from its base.

To avoid confusion with other plug-in units of the GESTRA range, inserts are fitted in the bases so that only the correct unit may be plugged into each base.

The plug-in unit may be snapped onto a 35 mm supporting rail or screwed into position on a mounting panel.
## Technical Data

### NRS 1-7

#### Type approval no.
TÜV · WB · 01-354  
EG 01202931-B-01-0077  
EG 01202931-B-01-0075

### Input
Four terminals for the connection of one level electrode  
NRG 16-11, PN 40  
NRG 16-11S, PN 40  
NRG 17-11, PN 63  
NRG 19-11, PN 160  
NRG 111-11, PN 320

### Output
Two volt-free relay contacts (mounted in series in the case of design “b”).  
Max. contact rating: 250 V, 300 W, 3 A resistive with a life of \(5 \times 10^3\) switching cycles of 0.35 A  
inductive with a life of \(2 \times 10^6\) switching cycles. Contact material silver, hard-gold plated.

### Delay of response
Default factory setting: 3 s  
Factory setting for marine applications: 15 s  
(Up to 25 s possible after prior consultation with TÜV)

### Sensitivity
10 µS/cm at 25 °C when used in conjunction with level electrode without measuring surface extension (cell constant \(C = 0.3\)).  
0.5 µS/cm at 25 °C when used in conjunction with level electrode with measuring surface extension (cell constant \(C = 0.13\)) — see data sheets “NRG 16-11”, “NRG 111-11”.

### Indicators and adjustors
2 LEDs “Alarm”, 1 LED “Power”, 1 button “TEST 1”,  
1 switch “TEST 2/INSPECTION”

### Mains supply
230 V +/- 10 %, 50/60 Hz (please state voltage when ordering).  
Special voltage: 115 V +/- 10 %, 50/60 Hz or 24 V +/- 10 %, 50/60 Hz.  
The ancillary unit URN 1 can be used for 24 V d. c. supply.

### Power consumption
5 VA

### Protection
NRS 1-7 IP 40 to EN 60529

### Admissible ambient temperature
0 °C to 55 °C

### Case materials
Base: Noryl SE 1-GFN 2 UL 94 VO, black  
Cover: R-ABS UL 94 VO, stone grey

### Weight
Approx. 0.6 kg
Corrosion resistance

If the equipment is used for its intended purpose, its safety is not impaired by corrosion.

Name plate / marking

Fig. 1
Technical Data — continued —

Dimensions

Fig. 2

Fig. 3
Functional Elements

NRS 1-7

Fig. 7
Design / Functional Elements

Key

A Cover screws
B Base
C Cover
D Mounting clip
E Cable entry (flexible)
F Cable entry (housing)
G Hole d = 4.3 mm

1 Button “TEST 2 / INSPECTION” for internal self-checking
2 Red LED “Low level alarm”
3 Button “TEST 1” for simulating a low level alarm
4 Green LED “Power”, indicating power supply
Installation

NRS 1-7

On supporting rail (with mounting clip)
1. Clip level switch onto supporting rail.
2. Loosen cover screws A and unplug cover C from its base B.
3. Select cable entry E / F and remove corresponding seal.

On mounting panel
1. Loosen cover screws A and unplug cover C from its base B.
2. Unscrew mounting clip D.
3. Drill the hole G marked in the base to \( \odot 4.3 \) mm.
4. Fasten base with two screws M4 onto mounting panel.

Attention

- To provide sufficient ventilation, ensure a minimum spacing of 20 mm between adjacent units.

Tools

- Screwdriver (5.5/100)

Key

A Cover screws
B Base
C Cover
D Mounting clip
E Cable entry (flexible)
F Cable entry (housing)
G Hole \( d = 4.3 \) mm
H Supporting rail 35 x 15 mm to DIN EN 50022
Examples of Installation

Fig. 8

Fig. 9

Installation – continued –

MAX 55 °C

MAX 95 %

IP 20
Wiring

NRS 1-7

Cable required for wiring to the electrode: four-core screened cable, e.g. I-Y(St)Y 2 x 2 x 0.8 or LIYCY 4 x 0.5².
Max. cable length 100 m with a conductivity from 10 µS/cm.
Max. cable length 30 m with a conductivity from 0.5 µS/cm.
Max. cable length 15 m with a conductivity from 0.5 µS/cm when used in conjunction with inverter URN 1 (24 V d. c.)

Voltage table

Use this voltage table as reference when checking the level electrode for malfunction or submersion. Take the wiring diagram (see Fig. 10, Fig. 11) into account.

<table>
<thead>
<tr>
<th>$U_{1-2}$</th>
<th>$U_{1-\perp}$</th>
<th>$U_{2-\perp}$</th>
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<tbody>
<tr>
<td></td>
<td>Submerged</td>
<td>Exposed</td>
</tr>
<tr>
<td>10 V$_{\text{eff}}$ 0.5 µS/cm, $C = 0.13$ cm$^{-1}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 V$_{\text{eff}}$ 10 µS/cm, $C = 0.3$ cm$^{-1}$</td>
<td>$&lt; \frac{U_{1-2}}{2}$</td>
<td>$\geq \frac{U_{1-2}}{2}$</td>
</tr>
</tbody>
</table>

Attention

- To protect the switching contacts provide the circuit with a 2.5 A slow-blow fuse or according to TRD regulations (1.0 A for 72 hrs operation).
- The screen must not make any other electrical contact.

Note

- The self-checking routine of the amplifier NRS 1-7 reduces $U_{1-2}$ every 40 sec. considerably, even down to 0 volt.
- Connect screen only to terminal 8 of the temperature switch.
- The sensitivity is indicated on the name plate.
- The rated voltage is indicated on the name plate.
- When switching off inductive loads, voltage spikes are produced that may impair the operation of control and measuring systems. Inductive loads should therefore be provided with commercial arc suppressor RC combinations, e.g. 0.1 µF / 100 Ω.

Tools

- Screwdriver for slotted screws, size 2.5, completely insulated according to VDE 0680-1.
This wiring diagram is only applicable for France!
Commissioning

Checking wiring

Check that the NRS 1-7 and the associated level electrode are wired in accordance with the wiring diagram, Fig. 10, Fig. 11.

Apply mains voltage

Apply mains voltage to level switch NRS 1-7.

Performance test

Low-level limiter

1. Check length of electrode rod (see installation manual of the level electrode).
2. When switching on the mains voltage the green LED 4 should be permanently illuminated, Fig. 7.
3. Completely open valves of water-level gauge glass on steam boiler.
4. Fill boiler with feedwater (2 cm above required level).
5. Decrease level in boiler until the level falls below low level. After the response delay indicated on the name plate the two red LEDs 2 on the level switch must light up.
   If the automatic self-checking test is initiated during this phase an alarm will only be raised after twice the nominal delay period.
6. A low-level alarm can be simulated by pushing the button “TEST 1” 3 with the electrode tip submerged. Push the button until the response delay has expired. Both red LEDs 2 must light up.
7. The checking circuitry of the level switch can also be checked. Operate switch “TEST 2/Inspection” 1 in the direction of the arrow with the electrode tip submerged. After max. two minutes the two red LEDs 2 should signal low-level alarm. The button “TEST 1” 3 must not be operated during this test nor must the level fall below the low level mark.
   After the test return switch 1 into its original position. After the response delay the two red LEDs 2 must extinguish.
Operation

Water-level alarm

Application in steam and (pressurized) hot water boilers in accordance with TRD 401, TRD 602, TRD 604, EN 12952, EN 12953 or in accordance with national regulations.

Note
- For troubleshooting consult section “Operational Malfunctions” on pages 17/18.

Operational Malfunctions

Fault-finding list for troubleshooting

Electrode submerged – low-level alarm

**Fault:** The level switch indicates a low-level alarm before the level in the boiler has fallen below the low level mark.

**Remedy:** Check length of electrode tip. Measure the conductivity of the process or boiler water and compare the values obtained with the marking on the name plate. Check correct wiring of level switch and electrode in accordance with wiring diagram, Fig. 10, Fig. 11.

**Fault:** After raising the water level above the low-level mark, the two red LEDs 2 are not extinguished or only after quite a considerable period.

**Remedy:** Check whether a vent hole has been provided in the protection tube. If the electrode is fitted in a measuring pot outside the boiler, check position of isolating valves.

**Fault:** One or both red LEDs 2 light up without the level having fallen below the low-level mark.

**Remedy:** This means electronic failure within the level switch, i.e. failure of one or two of the channels. Replace level switch.

Low-level reached – no function

**Fault:** The water level falls below the low-level mark but neither of the two red LEDs 2 lights up.

**Remedy:** Check whether a vent hole has been provided in the protection tube. If the electrode is fitted in a measuring pot outside the boiler, check position of isolating valves.

**Fault:** The testing with the switch “TEST 2/ INSPECTION” 1 was not successful, i.e. only one red LED 2 or none of the two lighted up at the latest two minutes after the start of the test.

**Remedy:** Replace level switch.

If faults occur that are not listed above, please contact our Technical Services or agency in your country.
Decommissioning

Danger

The terminal strip of the NRS 1-7 is live during operation. This presents the danger of electric shock!
Cut off power supply before attaching or detaching the housing lid and the terminal strips of the equipment.

Disposal

Remove the level switch and separate the waste materials in accordance with the material specification.
Electronic components (boards) must be disposed of separately.
For the disposal of the level switch observe the pertinent legal regulations concerning waste disposal.
Annex

Declaration of conformity  

We hereby declare that the equipment **NRS 1-7** conforms to the following European guidelines:

- LV guideline 73/23/eeec version 93/68/eeec
- EMC guideline 89/336/eeec version 93/68/eeec
- Pressure Equipment Directive (PED) 97/23/eeec of 29th May 1997, provided that the equipment is not excluded from the scope of this directive according to section 3.3
- LV standard EN 50178
- EMC standard EN 50081-2, EN 50082-2

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

Bremen, 20th February 2004
GESTRA AG

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