

## Purpose and Application

Self-monitoring high-level alarm with periodic self-checking with the GESTRA two-channel level switch type NRS 1-8 in steam boiler and pressurized hot-water plants.

The equipment meets the German regulations for use in steam boiler plants operating without constant supervision (TRD 604).

Type-approval No. of VdTÜV  
 for NRG 16-12, NRG 17-12, NRG 19-12/  
 NRS 1-8: 09-91-0112

## Design

The high-level alarm is a combination formed of a level electrode type NRG 16-12, NRG 17-12 or NRG 19-12 and a level switch type NRS 1-8.

The level electrodes types NRG 16-12, NRG 17-12 and NRG 19-12 consist of a measuring electrode fitted in a body. The electrode is insulated by special insulating seals.

The electric connection of the electrode is effected coaxially with a contact ring and a stud. A system of compression springs in the electrode body ensures sufficient sealing forces at the insulating seals, even if the temperatures vary. The stud is insulated by a Teflon foil. Contact ring and body are connected to the terminal block by PTFE insulated wires.

The electrode can be supplied in various lengths up to 1500 mm.

The combination electrode type NRG 16-12, NRG 17-12 or NRG 19-12 and level switch type NRS 1-8 complies with the regulations on protection circuits for firing equipment of furnaces in accordance with DIN 57116/VDE 0116.

The following designs are available:

- Level-control electrode type NRG 16-12 with screwed connection 3/4" BSP, PN 40
- Level-control electrodes types NRG 16-12.1 and NRG 16-12.2 with PN 40 flange supplied separately (see "Technical Data").
- Combination electrode type NRG 16-34 consisting of an electrode type NRG 16-12 and an electrode type NRG 16-11 with PN 40 flange supplied separately (see "Technical Data").
- Level-control electrode type NRG 17-12 with screwed connection 3/4" BSP, PN 63.
- Level-control electrode types NRG 17-12.1 and NRG 17-12.2 with PN 63 flange supplied separately (see "Technical Data").
- Combination electrode type NRG 17-34 consisting of an electrode type NRG 17-12 and an electrode type NRG 17-11 with PN 63 flange supplied separately (see "Technical Data").
- Level-control electrode type NRG 19-12 with screwed connection 3/4" BSP, PN 160.
- Level-control electrode types NRG 19-12.1 and NRG 19-12.2 with PN 160 flange supplied separately (see "Technical Data").

- Combination electrode type NRG 19-34 consisting of an electrode type NRG 19-12 and an electrode type NRG 19-11 with PN 160 flange supplied separately (see "Technical Data")

## Operation

The high-level alarm operates on the conductive measuring principle using the electrical conductivity of the water for level signalling.

Submergence of the electrode, i.e. high level, produces a positive imbalance of the bridge circuit provided in the level switch type NRS 1-8. This produces the high-level alarm signal and consequent cut-out of the burner circuit.

During normal operation, when the electrode tip is exposed, the imbalance of the bridge circuit is negative.

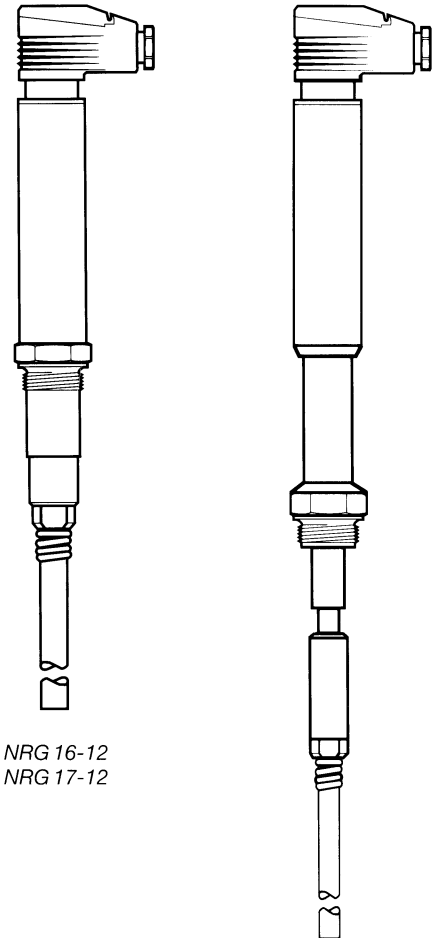
If the insulating seals placed between electrode and body are no longer tight due to deterioration caused by mechanical or chemical breakdown, liquid will penetrate into the cavity between body and stud. This produces a strong positive imbalance of the bridge circuit, which causes a high-level alarm. But in this case the signal is due to a malfunction. This means that the boiler level has to be checked in the water-level gauge glass if an alarm is signalled by the level switch.

The electrode with standard tip (cell constant = 0.3) is suited for conductivities from 10  $\mu\text{S}/\text{cm}$  at 25 °C.

For conductivities from 0.5  $\mu\text{S}/\text{cm}$  an electrode with measuring surface extension (cell constant  $C = 0.13$ ) is required.

The phenomenon of polarization is avoided, as the electrode is fed with a low-voltage a.c. by the level switch.

The combination electrode NRG 16-12, NRG 17-12, NRG 19-12 used in conjunction with the level switch NRS 1-8 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.



NRG 16-12  
 NRG 17-12

NRG 19-12

## Technical Data

Types	NRG 16-12	16-12.1	16-12.2	16-34	NRG 17-12	17-12.1	17-12.2	17-34	NRG 19-12	19-12.1	19-12.2	19-34
Max. service pressure	32 barg (465 psig)				60 barg (870 psig)				100 barg (1450 psig)			
Saturation temperature	238 °C				275 °C				311 °C			
Connections Nominal size DN	¾" BSP  PN 40	¾" BSP with 50 mm PN 40 mounting flange <sup>1)</sup> (DIN 2527)	¾" BSP with 100 mm PN 40 mounting flange <sup>1)</sup> (DIN 2527) or square flange <sup>1)</sup> □ 128 mm		¾" BSP  PN 63	¾" BSP with 50 mm PN 63 mounting flange <sup>1)</sup> (DIN 2527)	¾" BSP with 100 mm PN 63 mounting flange <sup>1)</sup> (DIN 2527)		¾" BSP  PN 160	¾" BSP with 50 mm PN 160 mounting flange <sup>1)</sup>	¾" BSP with 100 mm PN 160 mounting flange <sup>1)</sup>	
Function	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup> /LWA <sup>3)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup> /LWA <sup>3)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup>	HWA <sup>2)</sup> /LWA <sup>3)</sup>
Cell constant C without measuring surface extension	0.3 cm <sup>-1</sup>											
Cell constant C with measuring surface extension	0.13 cm <sup>-1</sup>											
Lengths supplied	500, 1000, 1500 mm											
Materials												
Body	Austenitic stainless steel				1.4571				1.4571			
Flange	X 6 CrNiMoTi 17 12 2 (DIN No. 1.4571)				Forged alloy steel 13 CrMo 4 4 (1.7335)				Forged alloy steel 10 CrMo 9 10 (1.7380)			
Electrode tip	Forged steel C 22.8 (1.0460)				1.4401				1.4401			
	Stainless steel X 5 CrNiMo 17 12 2 (1.4401)											
Max. admissible ambient temperature at terminal box of electrode	70 °C											
Electric connection	1	1	1	2	1	1	1	2	1	1	1	2
	Four pole connector with screw terminals and cable strain relief Pg 11											
Approx. weight	1.1 kg	4.5 kg	8.5 kg	9 kg	1.1 kg	5.5 kg	11 kg	12 kg	1.5 kg	8 kg	15 kg	16.5 kg
Protection	IP 65											

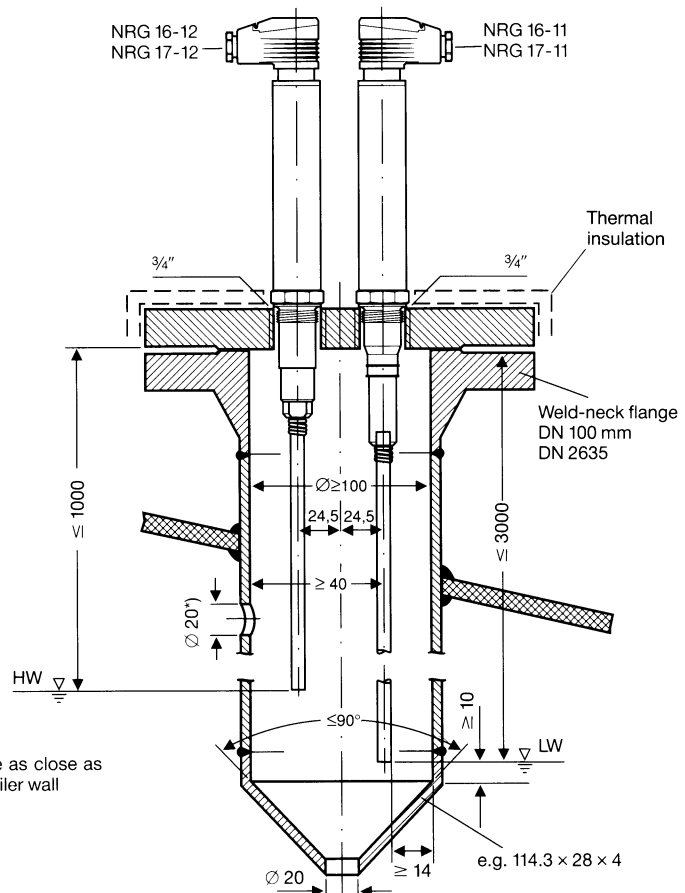
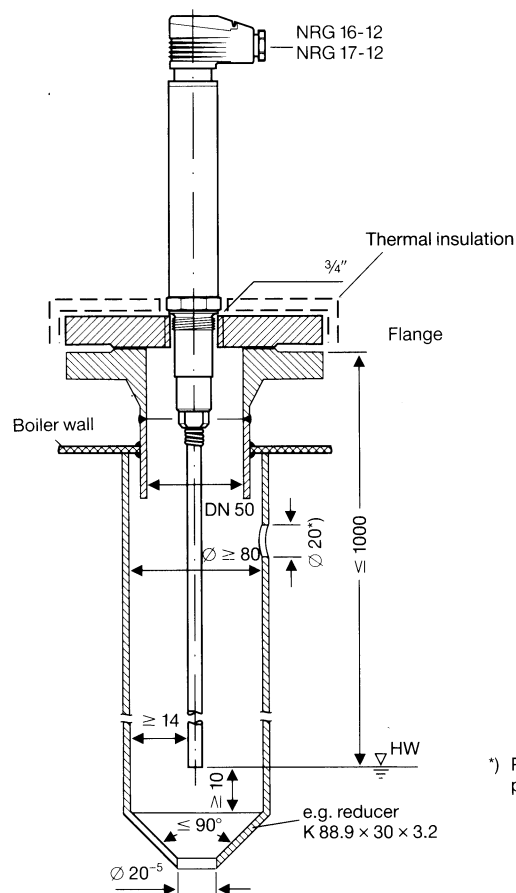
<sup>1)</sup> Inspection in accordance with DIN 50049-3.1 B

<sup>2)</sup> HWA = high-level alarm

<sup>3)</sup> LWA = low-level alarm

## Examples of Installation

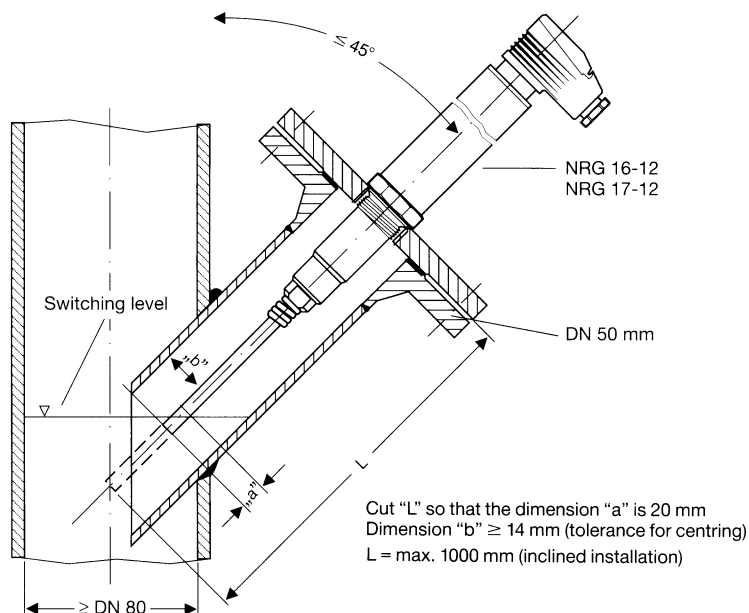
(with the exception of example 5 the illustrations show NRG 16-12, NRG 17-12)



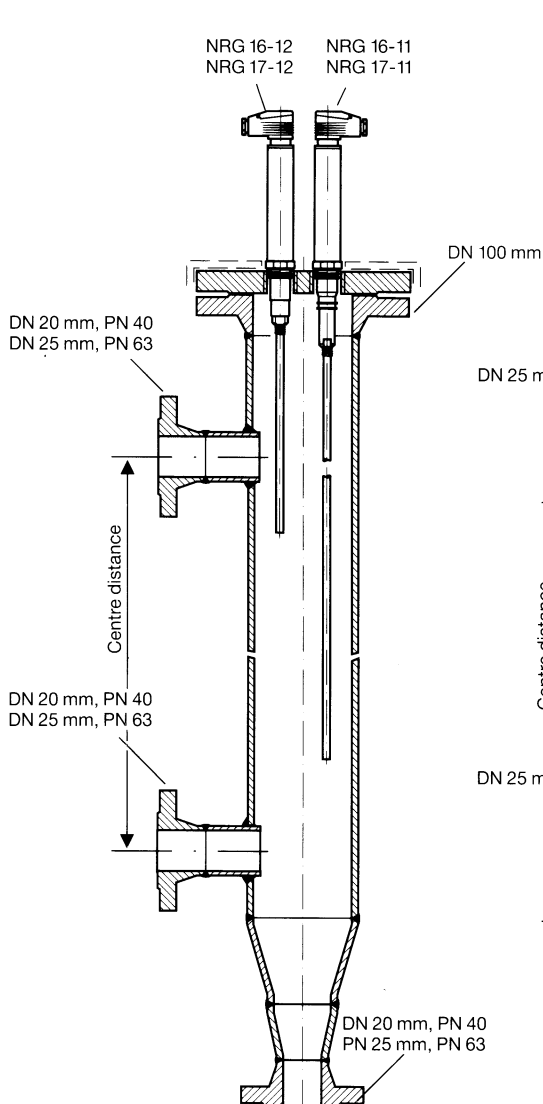
<sup>\*)</sup> Position vent hole as close as possible to the boiler wall

**Example 1:** Protection tube (to be provided on site), if the electrode NRG 16-12 or NRG 17-12 is installed inside the boiler

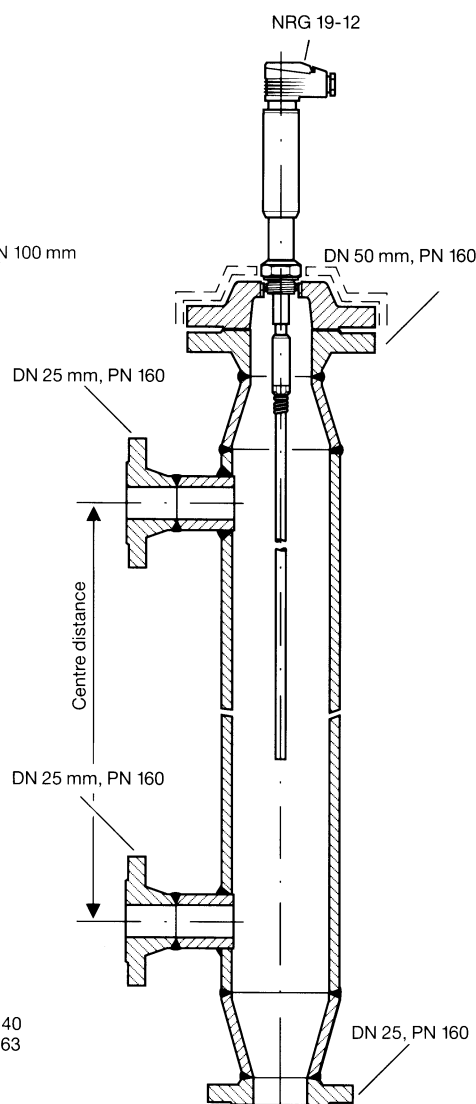
**Example 2:** Protection tube for combination electrode NRG 16-34 (NRG 16-12 + NRG 16-11) or NRG 17-34 (NRG 17-12 + NRG 17-11) installed inside the boiler as high-level alarm and low water-level limiter



**Example 3:** Laterally inclined installation of electrode NRG 16-12 or NRG 17-12 in a rising feed main of a pressurized hot-water plant



**Example 4:** External chamber type XIII for installation of electrodes outside the boiler



**Example 5:** External chamber type III for installation of electrode outside the boiler

## Important Notes

Cable required for wiring to the electrode:  
Four-core overall screened cable, minimum conductor size 0.5 mm<sup>2</sup>.

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 1b (24 V d.c.).

We recommend installation of the electrode in accordance with the examples of installation on page 3.

The electrode can be installed vertically or laterally inclined up to 45°. In the latter case the length of the electrode must not exceed 1000 mm. To reduce costs and maintenance installation directly inside the steam boiler is recommended. In this case a protection tube (DN ≥ 80 mm) is required.

In pressurized hot-water plants the electrode may also be installed in the feed main (DN ≥ 80 mm) in a position inclined by 45°.

The combination electrodes types NRG 16-34, NRG 17-34 and NRG 19-34 are installed vertically. For installation inside the boiler a protection tube of DN ≥ 100 mm has to be provided in accordance with the installation example 2.

If the electrode is installed in an external chamber purging of the chamber is required at regular intervals. For this purpose the GESTRA logic unit for monitoring type SRL 6 is available.

## Order and Enquiry Specifications

GESTRA self-monitoring level-control electrode for self-monitoring high-level alarm:

- Level-control electrode type NRG 16-...  
PN 40, connection ...  
Cell constant C ...  
Length ... mm  
Inspection ...
- Level-control electrode type NRG 17-...  
PN 63, connection ...  
Cell constant C ...  
Length ... mm  
Inspection ...
- Level-control electrode type NRG 19-...  
PN 160, connection ...  
Cell constant C ...  
Length ... mm  
Inspection ...

**The following test certificates can be issued on request, at extra cost:**

In accordance with DIN 50049-2.1, -2.2 and 3.1B.

All inspection requirements have to be stated with the order. After supply of the equipment certification cannot be established. For tests and inspection charges please consult us.

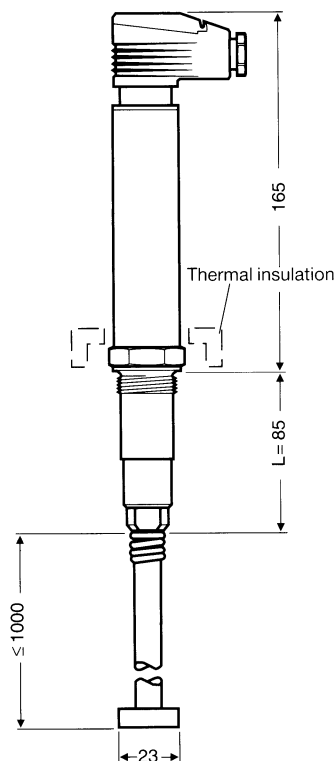
## Associated Electronic Control Unit

Two-channel level switch type NRS 1-8 with periodic self-checking.

## Ancillary Equipment

Logic unit for monitoring type SRL 6 to ensure automatic intermittent purging of the external chamber for electrodes installed outside the boiler.

## Dimensions



*Level-control electrode NRG 16-12, NRG 17-12  
with measuring surface extension*

Supply in accordance with our general terms of business.

Technical modifications reserved.