GESTRA®

Level Transmitter

NRGT 26-2
NRGT 26-2s

EN
English

Original Installation &
Operating Manual

819876-01

Contents

Contents

Content of this Manual

Product:

- Level transmitter NRGT 26-2
- Level transmitter NRGT 26-2s

First edition:

BAN 819876-00/08-2019cm

Scope of delivery/Product package

- 1 Level transmitter NRGT 26-2
- 1 Sealing ring D 27 x 32, form D, DIN 7603-2.4068, bright annealed
- 1 Installation & Operating Manual

Marine version

- 1 Level transmitter NRGT 26-2s with flange DN50, PN40, DIN EN 1092-01
- 1 Installation & Operating Manual

Required accessories for NRGT 26-2 and NRGT 26-2s when installing for the first time

- 1 Cable jack, Hirschmann ELWIKA 5012

How to use this Manual

This Installation & Operating Manual describes the correct use of NRGT 26-2 and NRGT 26-2s level transmitters. 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

Ⓐ 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.

IEC 61508

International standard IEC 61508 describes both the type of risk assessment and actions taken to provide appropriate safety functions.

SIL (safety integrity level)

Safety integrity levels SIL 1 to 4 are used to quantify risk reduction. SIL 4 is the highest level of risk reduction. International standard IEC 61508 forms the basis for establishing, testing and operating technical safety systems.

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 pressurised steam boiler, for example, these parameters would be capacity, pressure and temperature.

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

A boiler that is operated at 10 bar and 180 °C may be designed for a pressure of 60 bar and a temperature of 275 °C, for example, which is not necessarily its operating point.

Usage for the intended purpose

Use as a water level controller

NRGT 26-2 and NRGT 26-2s level transmitters can be used to continually measure the water level in pressurised steam and hot-water plants, or in condensate and feedwater tanks. The calibrated measuring range from 0 % to 100 % constitutes the linear profile of the 4-20 mA current output.

- The transmitter's secure 4-20 mA actual value output (SIL 2) can be used with a suitable level controller, as a water level controller with MIN/MAX alarm, for example.

Influence of the fluid to be monitored

- NRGT 26-2 and NRGT 26-2s level transmitters can be used in fluids with different conductivity and in insulating media. However, a conductivity of less than 100 µS/cm has a major influence on the measured capacitance, which is why recalibration of the measuring range (see page 40) at the operating point* and after a cold start is extremely important.

  ** Operating point of the plant, see page 7.*
- To achieve the best possible reproducibility and maintain high-quality measurements (see "Technical data" on page 16), the sensor must be installed in a protective tube (see "Installation example with dimensions for the NRGT 26-2" on page 30 ff.).
- The dielectric constant of the measured medium may require an adjustment to the measurement frequency if it deviates significantly from that of the usual water ($Er = 80$). Please contact GESTRA Service.

Applicable directives and standards

NRGT 26-2 and NRGT 26-2s level transmitters have been tested and approved for use in the scope governed by the following directives and standards:

Directives:

■ Directive 2014/68/EU	EU Pressure Equipment Directive
■ Directive 2014/35/EU	Low Voltage Directive
■ Directive 2014/30/EU	EMC Directive
■ Directive 2011/65/EU	RoHS II Directive

Standards:

■ EN 60730-1	Automatic electrical controls – Part 1: General requirements
■ EN 61508	Functional safety of electronic systems

Standards documents:

- VdTÜV Bulletin BP WASS 0100-RL
  Requirements for water level control and limiting equipment

Approval for marine applications:

The NRGT26-2s level transmitter is approved for marine use.

- DNV-GL Class Guideline DNVGL-CG-0339

Usage for the intended purpose

Admissible system components, dependent on the required safety level

In accordance with EU Pressure Equipment Directive 2014/68/EU, standard EN 61508 and the technical rules of VdTÜV Bulletin BP WASS 0100-RL, the level electrode can be operated with safety integrity level SIL 2.

If an electronic control unit (diagnostic tester) that also has a SIL 2 rating is connected to the 4-20 mA output, the entire event chain system can be operated at this safety integrity level.

An electronic control unit (diagnostic tester) with a higher SIL rating does not increase the safety of the overall system. The maximum achievable safety level is dictated by the lowest SIL rating of a participant in the event chain as a whole.

Systems without SIL rating

In systems without a SIL rating, any controller, display unit or diagnostic tester with an input for a standard 4-20 mA signal can be connected.

To ensure proper use in all applications, please also read the Installation & Operating Manuals for the system components used.

- You can find the latest Installation & Operating Manuals for other system components on our website:

  http://www.gestra.com/documents/brochures.html

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 name plate.

The name plate indicates the technical features of the equipment.

Basic safety notes

Danger to life from scalding if the level electrode is removed under pressure. Steam or hot water can spurt forcefully out of the equipment.

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

Risk of severe burns if work is performed on a level electrode that has not been allowed to cool. The level electrode becomes very hot during operation.

- Always allow the level electrode to cool.
- Perform all installation and maintenance work only on a level electrode that has been allowed to cool.

There is a risk of electric shock during work on electrical systems.

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

Danger to life from a faulty NRGT 26-2 or NRGT 26-2s level electrode due to the sudden escape of hot steam or hot water.

Shocks and impacts during transport or installation can result in damage to or leaks in the level electrode, causing pressurised 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 tight when bringing into service.

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

- NRGT 26-2 and NRGT 26-2s level electrodes 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 unit is an item of equipment with a safety function (EU Pressure Equipment Directive) and may only be installed, electrically connected and brought into service by suitable, trained staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and conversions may only be performed by authorised staff who have undergone specific training.
Refits	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Fig. 1

Notes on product liability

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

Functional safety, safety integrity level (SIL)

NRGT 26-2 and NRGT 26-2s level transmitters have a secure 4-20 mA actual value output (SIL 2). If an electronic control unit (diagnostic tester) that also has a SIL 2 rating is connected to the 4-20 mA output, the entire event chain system can be operated at this safety integrity level.

When combined with the accessories, you will have a type B subsystem. The technical and safety characteristics in Fig. 2 below are based solely on NRGT 26-2 and NRGT 26-2s level transmitters.

Check the secure current output regularly

Check level electrode function at least once a year by bringing the system to the minimum and/or maximum water level (T1 = 1 year).

The test function is initiated on site using the rotary knob integrated in the terminal box, see page 45.

Reliability data to EN 61508

Description	Characteristic values of the NRGT 26-s / NRGT 26-2s
Safety integrity level	SIL 2
Architecture	1oo1
Type of equipment	Type B
Hardware error tolerance	HFT = 0
Overall failure rate for dangerous undetected failures	$\lambda_{DU} = < 40 * 10^{-9}$ 1/h
Overall failure rate for dangerous detected failures	$\lambda_{DD} = < 3000 * 10^{-9}$ 1/h
Safe failure fraction	SFF > 99.0 %
Test interval	T1 = 1 year
Probability of failure on demand	PFD < $200 * 10^{-6}$
Diagnostic coverage. Percentage of dangerous failures detected by a test.	DC > 98.0 %
Mean time to failure	$MTTF_D$ > 30 a
Diagnostic interval	T2 = 1 hour
Performance level (to ISO 13849)	PL = d
Probability of failure per hour	PFH < $40 * 10^{-9}$ 1/h
Ambient temperature as a basis for calculation	Tu = 60 °C
Mean time to repair	MTTR = 0 (no repair)
Fraction of undetected dangerous failures that have a common cause	beta = 2 %
Fraction of detected dangerous failures that have a common cause	beta d = 1 %

Fig. 2

Function

NRGT 26-2 and NRGT 26-2s level transmitters use the capacitance measurement principle and convert level data into a level-dependent 4-20 mA current signal. The 0 - 100 % measuring range can be scaled based on the effective length of the electrode rod.

Automatic self-test

An automatic self-test periodically monitors the safety and function of the level transmitters and measured value acquisition.

Faults in the electrical connection or electronic measuring equipment trigger an error message on the display, and the current output is set to 0 mA.

Transmitter function

The transmitter function is the ability of the electrode to provide a scalable measuring range on the 4-20 mA current output interface and to make this available to one or more recipients for analysis.

Conductivity transmitters do not have any controlling or limiting functions.

The level transmitters are installed on the inside of pressurised steam plants, tanks or feed lines of pressurised hot-water plants. A protective tube provided on site keeps it functioning reliably (see page 30 “Installation examples”).

A capacitive NRGT 26-2 or NRGT 26-2s level transmitter and a conductive NRG 1x-60 or NRG 1x-61 level electrode can be installed in the same protective tube or level pot.

Operation in external level pots

If a level transmitter is installed outside the boiler in a level pot that can be shut off, the connecting pipes must be flushed regularly.

If the steam pipe is ≥ 40 mm and the water pipe is ≥ 100 mm, installation is regarded as internal. In this case, upstream monitoring of flushing processes is not required.

Display and signals, see page 43 / 46 *

NRGT 26-2 and NRGT 26-2s level transmitters feature a green 4-digit, 7-segment display for showing readings, status information and fault codes. A red and green LED indicate the operating status.

Function

Behaviour when switched on *

The display alternately shows the software version, the type and then the scaled level reading.

Behaviour in normal operation (no faults) *

The display shows the scaled level reading (3 digits + 1 decimal place), e.g. 050.3, and converts the level data into a level-dependent current signal from 4-20 mA.

The scale of the 0 – 100 % measuring range is factory-set at a maximum for the electrode length used. This way, meaningful level readings can be obtained immediately after installation.

Adjusting the measuring range when bringing into service (CAL.L, CAL.P or CAL.H)

When bringing into service, however, the measuring range should be adapted in line with your sight glass. Do this using the parameters CAL.L, CAL.P or CAL.H, see page 40 - 41. This is the only way to gain all the benefits of high-resolution readings in the sight glass range.

Behaviour in the event of malfunctions *

The error state or malfunction is permanently shown on the display by a fault code, e.g. E.005. For more on fault codes, see page 47.

Every time there is a fault, 0 mA is output via the current output.

Electrode faults cannot be acknowledged.

When the fault is corrected, the message disappears from the display, and the NRGT 26-2 or NRGT 26-2s level transmitter returns to normal operation.

* The tables on pages 44 - 45 clearly show the relationship between the equipment status, the display and the status LEDS.

Setting parameters and changing factory settings

If necessary, you can adapt the electrode parameters to suit conditions at the plant. You can set parameters and change factory settings using a rotary knob on the terminal box, see page 39 ff.

Technical data

Model and mechanical connection

■ NRGT 26-2	Thread G¾ A, EN ISO 228-1, see Fig. 8
■ NRGT 26-2s	Flange DN 50, PN 40, DIN EN 1092-01, see Fig. 9

Nominal pressure rating, admissible service pressure and temperature

■ NRGT 26-2, NRGT 26-2s	PN 40	32 bar (g) at 238 °C

Materials

■ Terminal box	3.2581 G AlSi12, powder-coated
■ Sheath	1.4301 X5 CrNi 18-10
■ Electrode rod insulation	PTFE
■ Screw-in body	1.4571, X6CrNiMoTi17-12-2
■ NRGT 26-2s:	
◆ Flange	1.0460 P250GH
◆ Spacer disc	PTFE

Max. installed length at 238 °C, all measurements in mm

■ **NRGT 26-2**

Max electrode length:	373	477	583	688	794	899	1004
Measuring range:	300	400	500	600	700	800	900

Max electrode length:	1110	1214	1319	1423	1528	1636	2156
Measuring range:	1000	1100	1200	1300	1400	1500	2000

■ **NRGT 26-2s**

Max electrode length:	316	420	526	631	737	842	947	1053
Measuring range:	275	375	475	575	675	775	875	975

Max electrode length:	1157	1262	1366	1471	1579	2099
Measuring range:	1075	1175	1275	1375	1475	1975

Do not shorten the electrode rod.

Technical data

Measurement quality

The information below applies to a compensated fluid conductivity range from 100 – 10000 µS/cm based on 25 °C.

- Reading error: +/- 1 % from the set measuring range at the operating point
- Resolution of reading on display: 0.1 %
- Resolution for internal processing: 15 bits with sign (16 bits)
- Resolution of 4-20 mA output: 15 bits equivalent to 0.49 µA/digit

Supply voltage

- 24 V DC +/-20 %

Power consumption

- Max. 7 VA

Current input

- Max. 0.3 A

Internal fuse

- T2A

Safety cutout at excessive ambient temperature

- The cutout at excessive ambient temperature takes place at $T_{amb.}$ = 75 °C

Analogue output

- 1 x actual value output 4 - 20 mA, proportional to level, galvanically isolated
- Maximum output load 500 Ω
- M12 connector, 5-pole, A-coded

Indicators and controls

- 1 x green 4-digit, 7-segment display for showing status information
- 1 x red LED for indicating an error state
- 1 x green LED for indicating an OK state
- 1 x rotary knob IP65 with button for menu navigation and test function

Protection class

- III Safety Extra Low Voltage (SELV)

IP rating to EN 60529

- IP 65

Technical data

Admissible ambient conditions

■ Service temperature:	0 °C – 70 °C	
■ Storage temperature:	- 40 °C – 80 °C	
■ Transport temperature:	- 40 °C – 80 °C	
■ Air humidity:	10 % – 95 %	non-condensing

Weight (dependent on length of electrode)

■ NRGT 26-2	approx. 1.8 kg (with 300 mm measuring range)
■ NRGT 26-2s	approx. 5.9 kg (with 275 mm measuring range)

Admissible installation positions

- Vertical
- Oblique to a maximum inclination of 45°. In this case, the length of the electrode rod is limited to 688 mm maximum.

Name plate/identification of NRGT 26-2

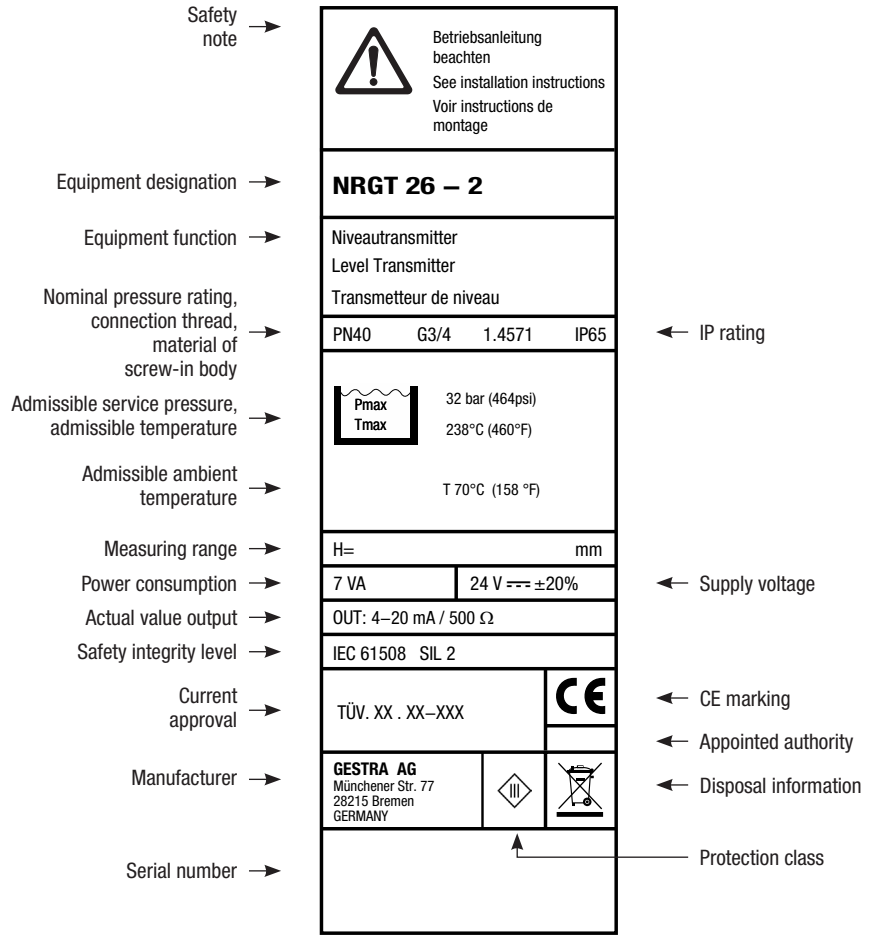


Fig. 3

The date of production is stamped on the screw-in body of the level transmitter.

Name plate/identification of NRGT 26-2s

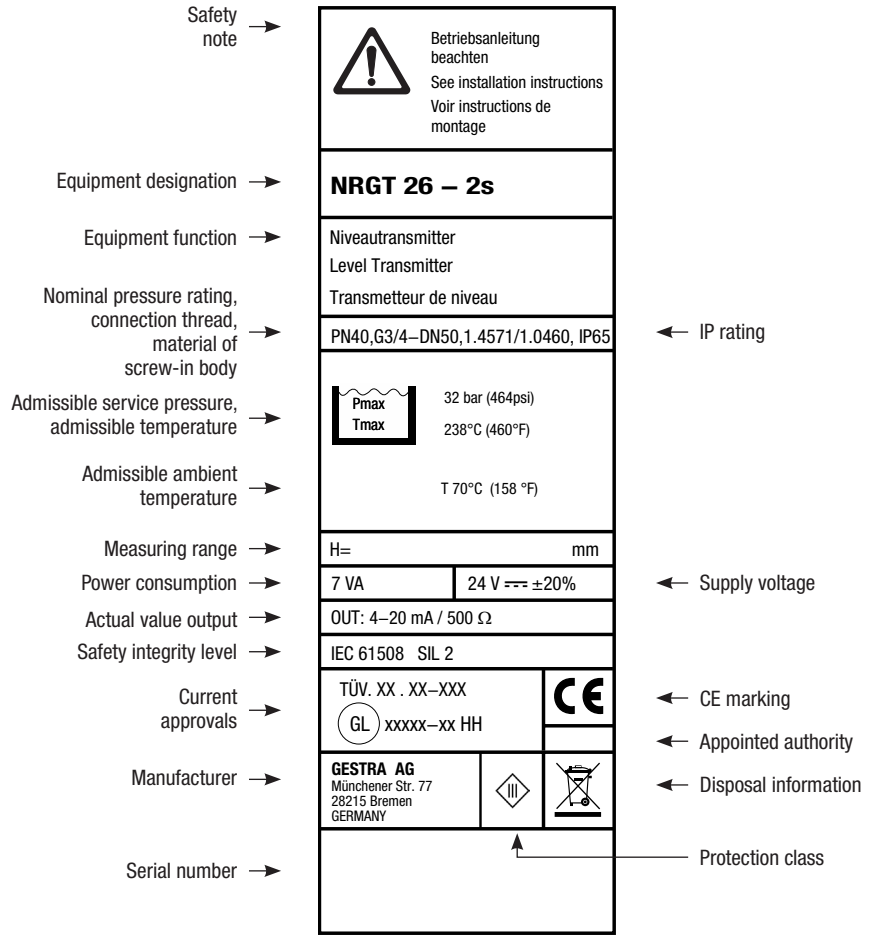


Fig. 4

The date of production is stamped on the screw-in body of the level transmitter.

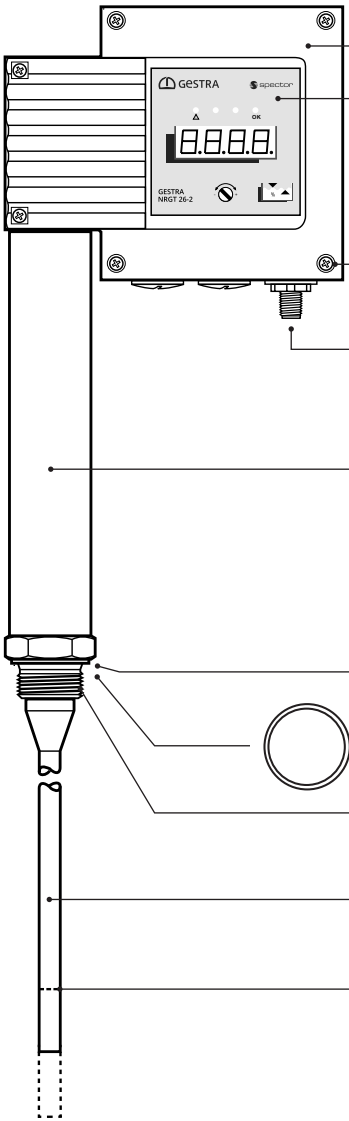
Factory settings

NRGT 26-2 and NRGT 26-2s level transmitters are delivered ex-works with the following settings.

Menu display	Parameter values	Unit	
CAL.L	variable	0 %	Raw value (hex) approx. 50 mV
CAL.P	variable	25 %	Raw value (hex)
CAL.H	variable	100 %	Raw value (hex) approx. 2.0 V
FiLt	0005	seconds	

Fig. 5

Overall view of the NRGT 26-2



A Terminal box

B Operating panel with 4-digit LED display/ malfunction and status LEDs and rotary knob, see page 43

C Cover screws M4 x 16 mm

D M12 connector, 5-pole, A-coded

E Sheath (simplified view)

F Seal seat for sealing ring

G Sealing ring D 27 x 32, form D, DIN 7603-2.4068, bright annealed

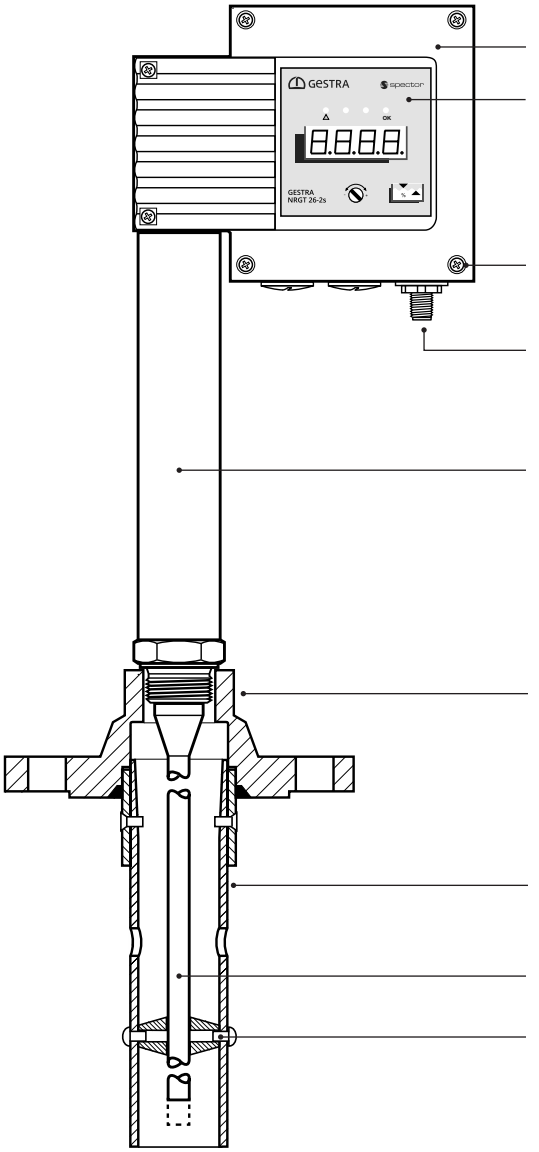
H Electrode thread

I Electrode

J Electrode rod insulation, PTFE

Fig. 6

Overall view of the NRGT 26-2s



A1 Terminal box

B1 Operating panel with 4-digit LED display/malfunction and status LEDs and rotary knob, see page 43

C1 Cover screws M4 x 16 mm

D1 M12 connector, 5-pole, A-coded

E1 Sheath (simplified view)

F1 Flange DN 50, PN 40, DIN 1092-01

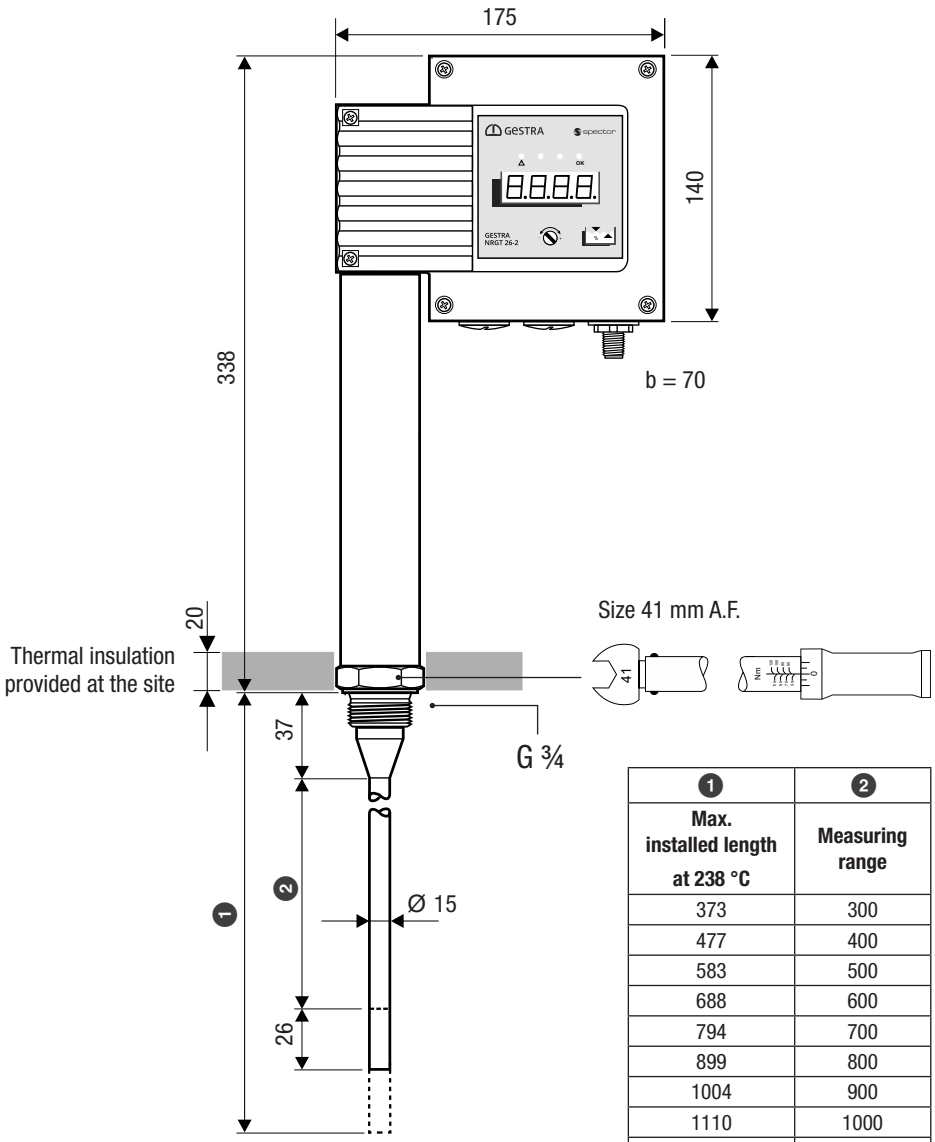
G1 Protective tube

H1 Electrode

I1 Spacer disc

Fig. 7

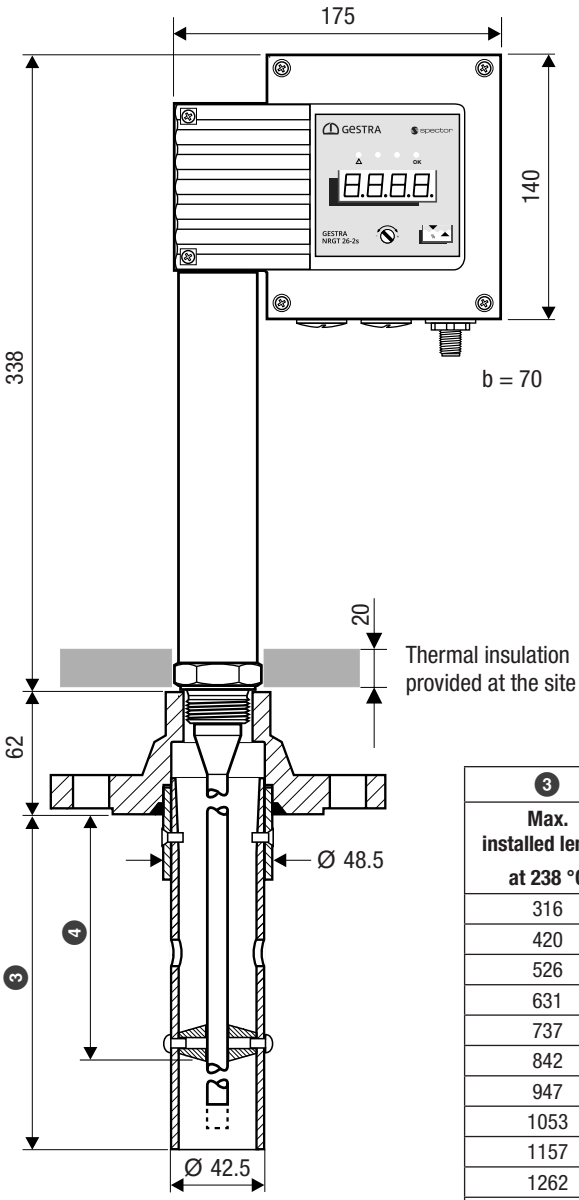
Dimensions of the NRGT 26-2



❶	❷
Max. installed length at 238 °C	**Measuring range**
373	300
477	400
583	500
688	600
794	700
899	800
1004	900
1110	1000
1214	1100
1319	1200
1423	1300
1528	1400
1636	1500
2156	2000

Fig. 8 All lengths and diameters in mm

Dimensions of the NRGT 26-2s



❸ Max. installed length at 238 °C	❹ Measuring range
316	275
420	375
526	475
631	575
737	675
842	775
947	875
1053	975
1157	1075
1262	1175
1366	1275
1471	1375
1579	1475
2099	1975

Fig. 9 All lengths and diameters in mm

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 page 18.
- 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 plant parts to a central earthing point to prevent equalisation 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:

NRGT 26-2

- Torque wrench (with size 41 mm A.F. open-ended spanner attachment), see page 24.

NRGT 26-2s

- The NRGT 26-2s is delivered ex-works with flange and protective tube already fitted. The flange must be secured on site with M16 screws. Required size = AF24.

⚠ 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 bar and check the pressure before unscrewing the level electrode.
- Only remove the level electrode at a boiler pressure of 0 bar.

⚠ WARNING

The hot level electrode can cause severe burns.

The level electrode becomes 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.

⚠ ATTENTION

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

- Inspect the sealing surfaces of the tank standpipe or flange cover to ensure they are perfectly machined, see Fig. 10.
- Do not shorten the electrode rod or protective tube*.

  ** The protective tube of the NRGT 26-2s*
- Take care not to bend the level electrode during installation!
- Do not subject the electrode rod to hard impacts.
- Do **not** install the terminal box Ⓐ / Ⓐ1 or the upper part of the sheath Ⓔ / Ⓔ1 of the level electrode in the thermal insulation of the boiler!
- Pay attention to the minimum clearances when installing the level electrode, see installation examples Fig. 12 to Fig. 16.
- To prevent current leaks, maintain a minimum distance of 14 mm between the electrode and earth (flange or tank wall).
- Check the boiler standpipe and flange during the preliminary boiler inspection.

- **For oblique installation of the NRGT 26-2**

  The level electrode must not be inclined more than 45° maximum, and the electrode rod is limited to 688 mm maximum, see Fig. 16.

Installation

Installing the NRGT 26-2

1. Inspect the sealing surfaces of the tank standpipe or flange cover.

   Sealing surfaces must be perfectly machined, as shown in Fig. 10.

Sealing surface dimensions of the NRG 26-2

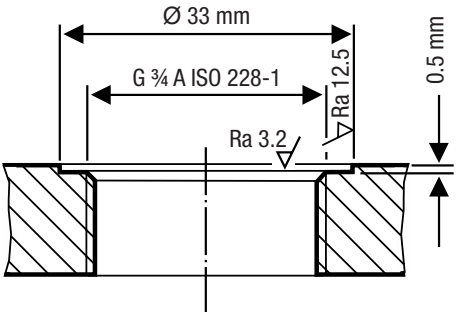


Fig. 10

2. Push the supplied sealing ring Ⓖ onto the seal seat Ⓕ of the electrode, or lay it on the sealing surface of the flange.

Example

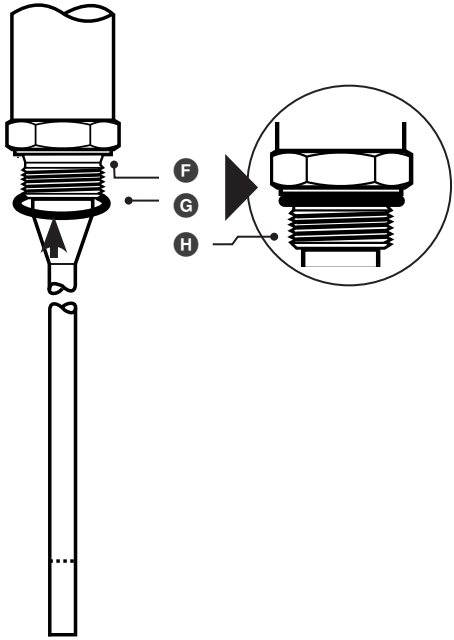


Fig. 11

⚠ DANGER

Danger to life from escaping hot steam if incorrect or defective seals are used.

- Only use the supplied sealing ring for sealing the electrode thread Ⓗ.
  - **Sealing ring D 27 x 32** DIN 7603-2.4068, bright annealed

Prohibited seal materials:

- Hemp, PTFE tape
- Conductive pastes

3. If necessary, apply a small quantity of silicone grease (e.g. Molykote® III) to the electrode thread Ⓗ.
4. Screw the NRGT 26-2 level electrode into the tank standpipe or flange cover, and tighten securely using a torque wrench (with size 41 open-ended spanner attachment).

   Tighten to the torques stated below.

   Tightening torque when cold:

   - NRGT 26-2 = 160 Nm

   Installation example with dimensions, see Fig. 12, page 30

Installing two level electrodes in a flange

1. Fit the first electrode as described above.
2. Slacken and remove the rear body panel of the second electrode opposite the operating unit.
3. Unfasten the electrode wiring from the PCB.
4. Slacken the nut in the body of the second electrode using a size 19 open-ended spanner.
5. Screw in the second electrode and tighten the nut in the body to a torque of 25 Nm.
6. Reconnect the electrode wiring to the PCB.
7. Close the rear body panel of the second electrode and screw back on.

   Installation example with dimensions, see Fig. 14, page 32

Installing the NRGT 26-2s

1. Inspect the sealing surfaces of the flange and coupling.

   The sealing surfaces must be perfectly machined and clean.
2. Position the required flat gasket on the coupling.
3. Carefully place the flange cover and NRGT 26-2s level transmitter on the coupling and tighten the screws uniformly crosswise.

   Additional information for maritime classification according to Lloyd's Register:

   - When using NRGT 26-2s level electrodes with a protective tube length of ≥ 1000 mm, always attach a ring-shaped mounting bracket at around 900 mm from the start of the protective tube. With a protective tube length of ≥ 1500 mm, always attach an additional ring-shaped mounting bracket at around 100 mm from the end of the protective tube.

Installation example with dimensions for the NRGT 26-2

Protective tube (provided on site) for internal installation

Illustration not to scale.

Key, see page 35

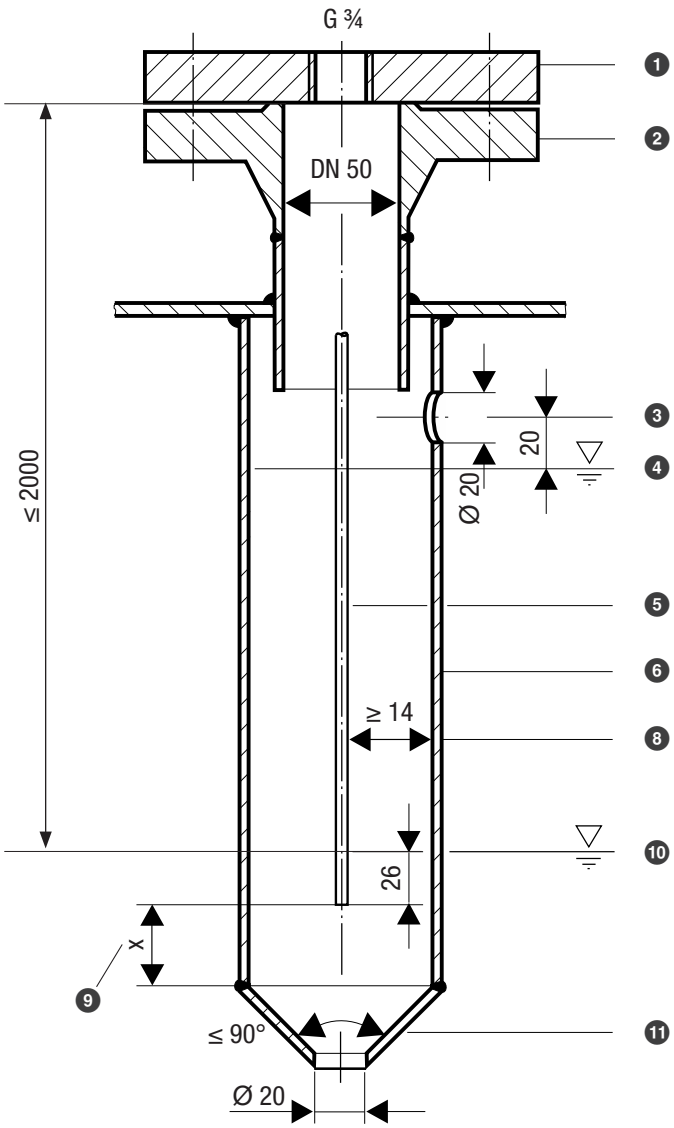


Fig. 12 All lengths and diameters in mm

Installation example with dimensions for the NRGT 26-2

Protective tube (provided at the site) for internal installation.

Illustration not to scale.

Key, see page 35

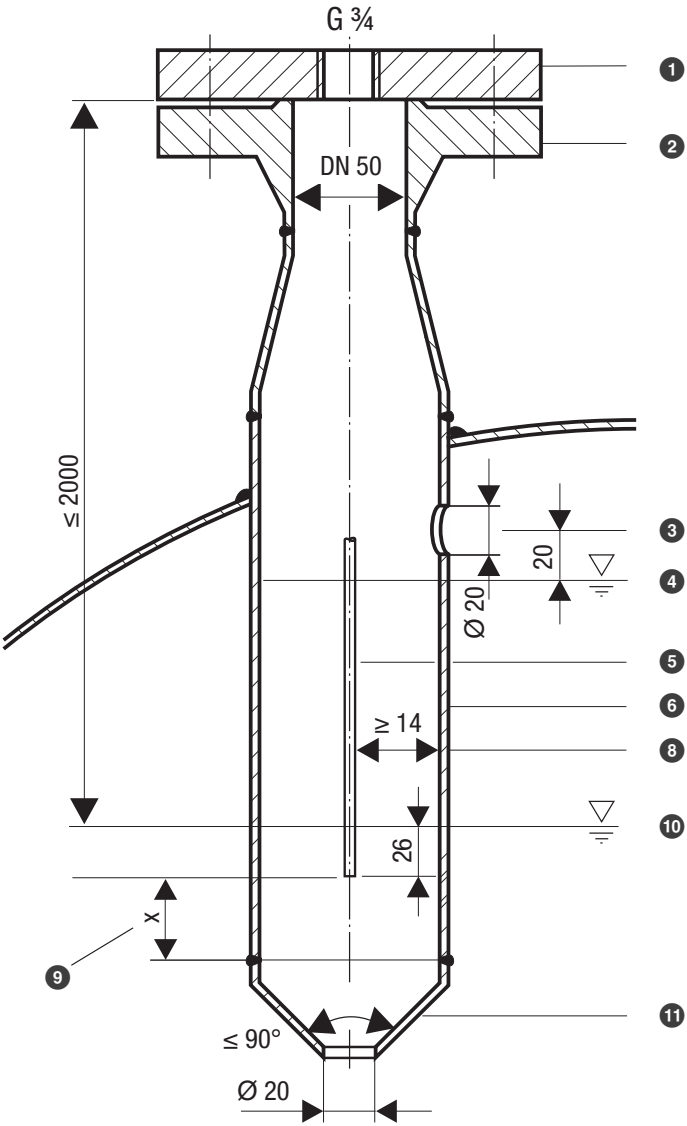


Fig. 13 All lengths and diameters in mm

Installation example with dimensions for the NRGT 26-2

Protective tube (provided at the site) for internal installation, combined with other equipment from GESTRA AG.

Illustration not to scale.

Key, see page 35

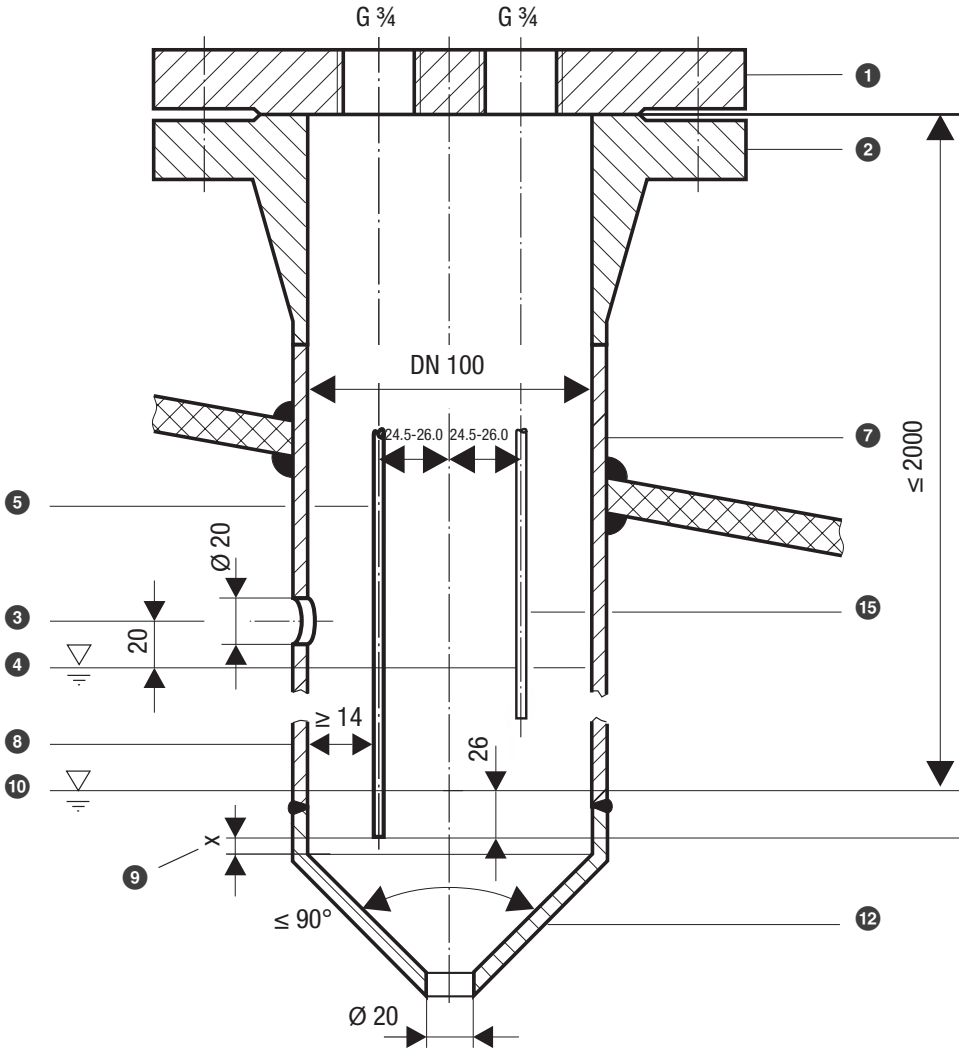


Fig. 14 All lengths and diameters in mm

Installation example with dimensions for the NRGT 26-2

Level pot (≥ DN 80) for external use.

Illustration not to scale.

Key, see page 35

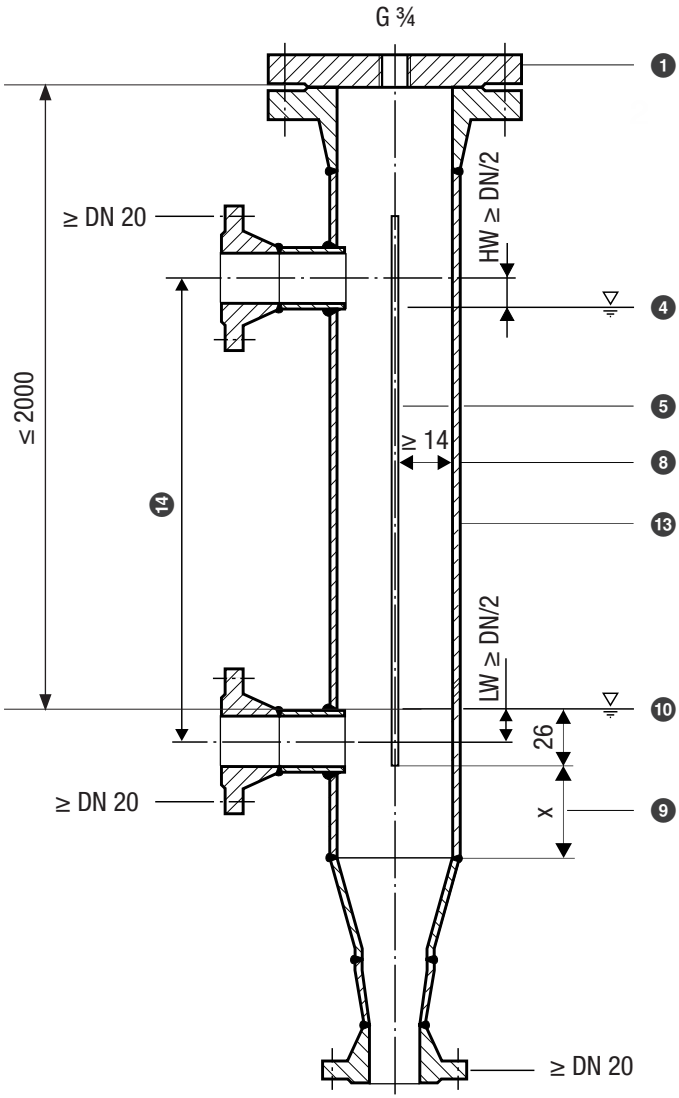


Fig. 15 All lengths and diameters in mm

Installation example with dimensions for the NRGT 26-2

Oblique installation, e.g. in pressurised steam plants.

The level electrode or level transmitter must not be installed at an inclination of more than 45° maximum, and the length of the electrode rod is then limited to 688 mm maximum (equivalent to measurement range H=600mm).

Illustration not to scale.

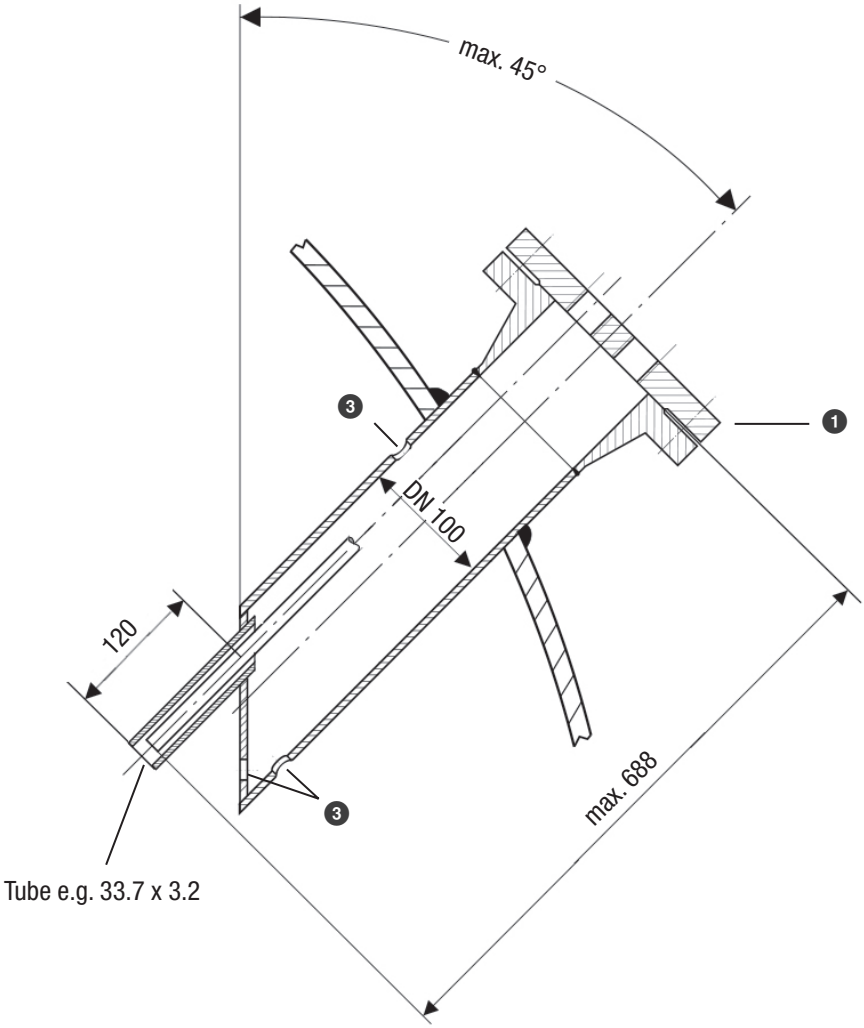


Fig. 16 All lengths and diameters in mm

Installation example with dimensions for the NRGT 26-2

Key Fig. 12 to Fig. 16

❶ Fig. 12, 13: Flange (PN 40, DN 50) DIN EN 1092-01 (single electrode)
Fig. 15: Flange (PN 40, ≥ DN 80) DIN EN 1092-01 (single electrode)
Fig. 14, 16: Flange (PN 40, DN 100) DIN EN 1092-01 (two electrodes installed in one flange)

❷ Standpipe for connecting flange (perform preliminary inspection of standpipe during boiler inspection)

❸ Vent hole Ø 20 mm

❹ Highest possible HW mark

❺ Electrode rod (NRGT26-2 maximum measurement range 2000 mm)

❻ Protective tube DN 80 (in France as per AFAQ ≥ DN 100)

❼ Protective tube DN 100

❽ Distance between electrode rod and protective tube ≥ 14 mm

❾ Minimum dimension (x) = 10 mm below the maximum installed length
(for installed length, see pages 24 and 25)

❿ Lowest possible LW mark (end of measuring range)

⓫ Reducer DIN EN 10253-2, K-88.9 x 3.2 - 42.4 x 2.6 W

⓬ Reducer DIN EN 10253-2, K-114.3 x 3.6 - 48.3 x 2.9 W

⓭ Level pot ≥ DN 80

⓮ Centre distance of standpipe

⓯ Additional electrode

Aligning the terminal box

If necessary, you can orientate the display in the desired direction by rotating the terminal box.

⚠ ATTENTION

Rotating the terminal box ≥ 180° will damage the internal wiring of the NRGT 26-2 or NRGT 26-2s level transmitter.

- Never rotate the terminal box more than 180 degrees in either direction.

Functional elements of the NRGT 26-2 / NRGT 26-2s

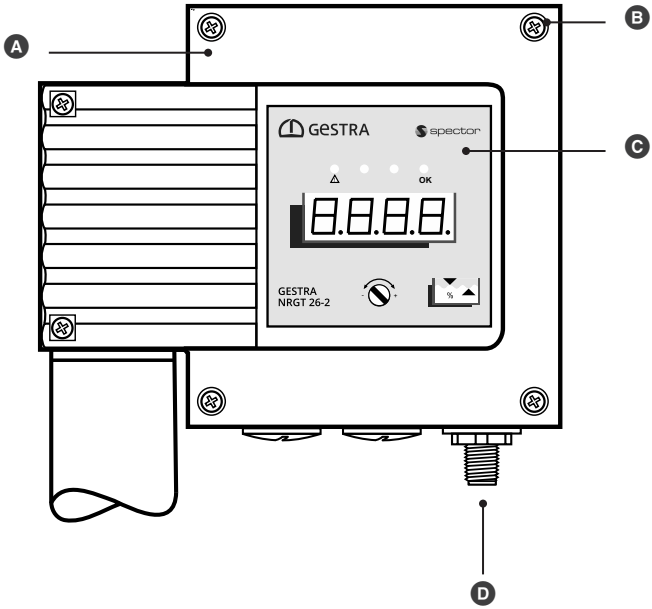


Fig. 17
Example
NRGT 26-2

- **A** Terminal box
- **B** Cover screws M4 x 16 mm
- **C** Operating panel with 4-digit LED display/malfunction and status LEDs and rotary knob, see page 43
- **D** M12 connector, 5-pole, A-coded

Electrical connection

Notes on electrical connection

- Use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm², e.g. LiYCY 4 x 0.5 mm².
- Pre-wired control cables (with plug and coupling) are available as accessories in various lengths.

Connecting the 24V DC power supply

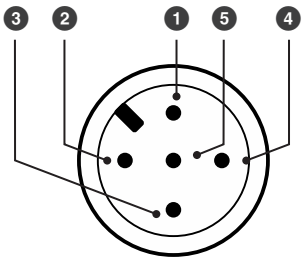
- The NRGT 26-2 or NRGT 26-2s level transmitter is supplied with 24 V DC.
- A safety power supply unit that delivers a Safety Extra Low Voltage (SELV) and is isolated from connected loads must be used to supply the equipment with 24 V DC.

Connecting the actual value output (4-20 mA)

- Please note the maximum output load of 500 Ω.
- Maximum cable length = 100 m.

Pin assignment of the M12 connector for non pre-wired control cables

If non pre-wired control cables are used, you must wire the cable to match the pin assignment of the M12 connector.



Connector

1	S	Shield
2	+ 24 V	Power supply
3	- 0 V	Power supply
4	+ 20 mA	Data line
5	- 20 mA	Data line

Fig. 18

Bringing into service

- Before bringing into service, check that the level transmitter is correctly connected.
- Next, switch on the supply voltage.

Changing the factory settings if necessary

You will need the following tools

- Slotted screwdriver, size 2.5

Notes for bringing into service for the first time

During commissioning, the scaling of the measurement range 0 – 100 % is set ex-works at a maximum for the corresponding electrode length.

After installation, set the measurement range to effective, system-specific values.

Bringing into service

Selecting and setting a parameter:

1. 

Using the screwdriver, turn the rotary knob clockwise or anti-clockwise until the desired parameter appears on the display. The set value is displayed after approx. 3 seconds.

The display alternates between the set parameter and its actual value, e.g. Filt. ➞ "value" ➞ Filt.

The following parameters are shown one after the other when you turn the knob clockwise:

"Actual value" ➞ °C.in ➞ CAL.L ➞ CAL.P ➞ CAL.H ➞ Filt ➞ diSP ➞ "Actual value"

Key to parameters, see page 40.

If you do not enter anything for 30 seconds, the display automatically returns to the actual value.

2. 

Once you have selected a parameter, press and hold the rotary knob until the current value of this parameter flashes on the display.

3. 

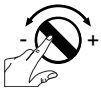
Set the desired value.

– / + Reducing/increasing the value

Each parameter has an individual, admissible value range.

By pressing the knob briefly, you can jump to the next digit. This is a more convenient way of making large changes to values.

If you do not set a parameter within 10 seconds, the process is aborted ("quit") and the old parameter value is retained.

4. 

Save your settings by pressing the rotary knob for approx. 1 second.

The message "donE" is shown and the parameter appears on the display once more.

Bringing into service

Key to parameters:

- 099.9 = actual value display, the current measured level based on the 0 - 100 % calibration
- °C.in = display ambient temperature of terminal box
- CAL.L = lower limit calibration to 0 %
- CAL.P = calibrates measuring range to an intermediate value above 25 % (alternative to CAL.H)
- CAL.H = upper limit calibration to 100 %
- Filt = filter constant
- diSP = initiate a display test

Notes on calibration

Always perform calibration with the boiler fluid at the operating point

If you set the measuring range while the fluid is cold, the settings will change when subject to heat and will then need to be corrected at the operating point.

Calibration to the lower limit of the active measuring range "CAL.L" (0 % calibration value)

Bring the level to 0 % and perform calibration.

Pay attention to the setting instructions on page 39 and proceed as follows:

1. Reduce the level of water in the boiler to the 0 % limit of the desired measuring range.
2. Select the parameter "**CAL.L**", the old value will appear in hexidecimal display after approx. 3 seconds.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.
5. Continue with calibration "**CAL.P**" or "**CAL.H**".

Bringing into service

Independent rapid calibration at a water level of > 25 % of the active measuring range “CAL.P”

This parameter enables partial filling of the boiler, as an alternative to complete filling. The value set for partial filling is extrapolated to 100 % of the boiler level.

Pay attention to the setting instructions on page 39 and proceed as follows:

1. Increase the level of water in the boiler to > 25 % of the desired measuring range.
2. Select the parameter “**CAL.P**”. After approx. 3 seconds, the old value is shown as a hexadecimal display.
3. Press and hold the rotary knob until the value (e.g. 0025) appears. The last digit flashes.
4. Set the desired reading > 25 % to match the set level.
5. Save your setting by pressing the rotary knob for approx. 1 second.

Calibration to the upper limit of the active measuring range “CAL.H” (100 % calibration value)

Calibration with “CAL.H” ensures the best possible accuracy for setting the measuring range.

Pay attention to the setting instructions on page 39 and proceed as follows:

1. Raise the water level in the boiler to the 100 % limit of the required measurement range.
2. Select the parameter “**CAL.H**”. After approx. 3 seconds, the old value is shown as a hexadecimal display.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.

Setting the filter constant “Filt”

Here, you can set a time constant to smooth the output signal for the level controller and the display.

Pay attention to the setting instructions on page 39 and proceed as follows:

1. Select the parameter “**Filt**”. First of all, the current filter constant is displayed.
2. Press and hold the rotary knob until the current time constant flashes on the display.
3. Set the desired time constant (1 to 30 seconds).
4. Save your setting by pressing the rotary knob for approx. 1 second.

Bringing into service

Manually initiating a display test

Pay attention to the setting instructions on page 39 and proceed as follows:

1. Select the parameter "**diSP**".
2. Press and hold the rotary knob until the display test starts and shows "**....**".
3. The following numbers and decimal points run across the display from right to left:
   "...., 1, 2, 3, 4, 5, 6, 7, 8, 9, ..."
4. Check that all numbers and decimal points are displayed correctly.
   The display test runs automatically until it has finished, and cannot be interrupted.
5. The display test ends with "**donE**".

Replacing faulty equipment

Faulty equipment is a danger to system safety.

- If numbers or decimal points are displayed incorrectly or not at all, you must replace the level transmitter with an identical one from GESTRA AG.

Checking the level display by raising or reducing the level

Incorrectly installed or bent level electrodes result in a loss of function that can jeopardise plant safety.

Therefore, proceed as follows when bringing into service and when replacing level electrodes:

- Check the level display by raising and lowering the fluid to different levels within the measuring range of the level electrode. Always perform this check with the plant at its operating point.
- Never start up any plant that has not passed the above tests.
- NRGT 26-2 and NRGT 26-2s level transmitters may only be repaired by the manufacturer, GESTRA AG.
- Only replace a faulty device with an identical device from GESTRA AG.

Checking the safety function by initiating a test function

Check the safety function by initiating the test function with the rotary knob,
see page 45, Test table.

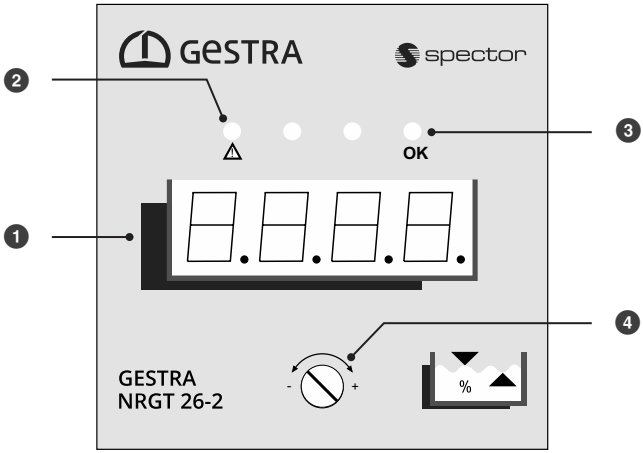


Fig. 19
Example NRGT 26-2

The operating panel:

1. Actual value display/fault code/limit value, green, 4 digits
2. LED 1, fault, red
3. LED 2, function OK, green
4. Rotary knob for operation and settings

Notes on the priority of the various indications

Fault indications are displayed based on their priority. Indications with higher priority are shown continuously before those with low priority. If several indications need attention, the display does not alternate between them.

Priority of fault code display

Higher priority fault codes overwrite lower ones on the display! See page 47 ff. for fault indications and the fault code table.

Starting, operation and testing

Cross-reference of displays and LEDs and the operating state of the level transmitter:

Starting		
Switch on the supply voltage	All LEDs light up - Test **Display:** S-xx = software version t-08 = equipment type NRGT 26-2	The system is started and tested. The LEDs and display are tested.

Normal operation		
The electrode rode is immersed within the set measuring range	**Display:** e.g. 047.3 **LED 2**: Operating LED lights up green	Displays the current level as % of the calibrated measuring range.

See the following pages for more information and tables.

Behaviour in the event of a malfunction (fault code display)		
On the occurrence of a fault	**Display:** e.g. E005 **LED 1**: Fault LED lights up red	A fault code is permanently displayed, fault codes see page 47 There is an active fault
	LED 2: Operating LED is OFF	A fault is present
■ In the event of a fault or error state, an analogue value of 0 mA is displayed.		

Electrode faults cannot be acknowledged.
When a fault is corrected, the message disappears from the display, and the level transmitter returns to normal operation.

<table>
<tr><th colspan="3">Test</th></tr>
<tr><th colspan="3">Checking the safety function via simulation in operating mode</th></tr>
<tr><td rowspan="4">In operating mode:
Press the rotary knob on the NRGT 26-2 / NRGT 26-2s and hold until the end of the test:
On each test, the equipment function toggles between levels 0 % and 100 %, and the actual value output delivers the corresponding signal, 4 mA or 20 mA.</td><td>Display:
0000 (%) or 0100 (%)</td><td>The test simulates water falling below the LW mark or rising above the HW mark.
The simulated reading is displayed for each test.</td></tr>
<tr><td>LED 2:
Operating LED lights up green</td><td>Test function is active</td></tr>
<tr><td>LED 1:
Fault LED is OFF</td><td>No fault</td></tr>
<tr><td colspan="2">■ The secure current output can be simulated and tested
■ When the rotary knob is released, the test ends</td></tr>
</table>

Faulty equipment is a danger to system safety.

- If the level transmitter does not behave as described above, the equipment may be faulty.
- Perform failure analysis.
- NRGT 26-2 and NRGT 26-2s level transmitters may only be repaired by the manufacturer, GESTRA AG.
- Only replace faulty equipment with identical equipment from GESTRA AG.

System malfunctions

Causes

System malfunctions occur as the result of incorrect installation, overheating of equipment, radiated interference to the supply network, or faulty electronic components.

Check the installation and configuration before systematic troubleshooting!

Installation:

- Check that the installation location complies with the admissible ambient conditions in terms of temperature, vibration, interference sources, minimum distances, etc.

Wiring:

- Does the wiring conform to the wiring diagrams?
- Does the 4 - 20 mA current loop have the correct polarity and is it closed?
- Is the 4-20 mA current loop below the overall output load of 500 Ω?

⚠ ATTENTION

An open circuit in the 4-20 mA current loop can cause a system shutdown and a malfunction is indicated.

- Bring the plant into a safe operating state before commencing work on the installation.
- Switch off the voltage to the plant and secure so that it cannot be switched back on.
- Check that the system is not carrying live voltage before commencing work.

System malfunctions

Indication of system malfunctions using fault codes

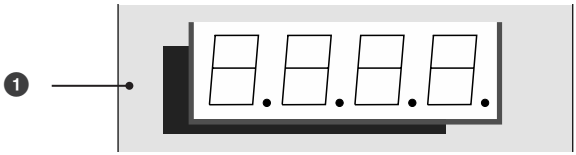


Fig. 20 ❶ Actual value display/fault code/limit value, green, 4 digits

Error code display			
Error code	**Internal designation**	**Possible errors**	**Remedy**
E.001	MinCh1Err	Channel 1 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check installation location. If necessary, replace the level transmitter
E.002	MinCh2Err	Channel 2 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check installation location. If necessary, replace the level transmitter
E.003	MaxCh2Err	Channel 2 reading above maximum, possible internal open circuit	Replace the level transmitter
E.004	Ch1Ch2DiffErr	Difference between channels 1 and 2 exceeds 10 % error tolerance, internal short circuit	Replace the level transmitter
E.005	MaxCh1Err	Channel 1 reading above maximum, possible internal open circuit	Replace the level transmitter
E.006	MinTSTCh1Err	Channel 1 reading internal capacitance (47pF)	Replace the level transmitter
E.007	MaxTSTCh1Err	Channel 1 reading reference capacitance (1nF ‖ 47pF)	Replace the level transmitter
E.008	MinTSTCh2Err	Channel 2 reading internal capacitance (47pF)	Replace the level transmitter
E.009	MaxTSTCh2Err	Channel 2 reading reference capacitance (1nF ‖ 47pF)	Replace the level transmitter
E.010	PWMTSTCh1Err	Channel 1 reading with disabled measurement signal	Replace the level transmitter
E.011	PWMTSTCh2Err	Channel 2 reading with disabled measurement signal	Replace the level transmitter
E.012	FreqErr	Measurement signal frequency	Replace the level transmitter

System malfunctions

Error code display			
Error code	**Internal designation**	**Possible errors**	**Remedy**
E.013	VMessErr (VMeas-Err)	4 - 20 mA analogue output error	Check wiring and output load
E.014	ADSReadErr	16-bit AD converter is not responding	Replace the level transmitter
E.015	UnCalibErr	Factory calibration invalid (not measuring range calibration)	Replace the level transmitter
E.016	PlausErr	Measuring range plausibility error	Check measuring range calibration, repeat if necessary
E.017	ENDRVErr	Second shutdown path of 4-20 mA analogue output faulty	Replace the level transmitter
E.019	V6Err	System voltage 6 V outside tolerance	Replace the level transmitter
E.020	V5Err	System voltage 5 V outside tolerance	Replace the level transmitter
E.021	V3Err	System voltage 3 V outside tolerance	Replace the level transmitter
E.022	V1Err	System voltage 1 V outside tolerance	Replace the level transmitter
E.023	V12Err	System voltage 12 V outside tolerance	Replace the level transmitter
E.025	ESMG1Err	µC error	Replace the level transmitter
E.026	BISTErr	µC periphery self-test error	Replace the level transmitter
E.027	OvertempErr	PCB temperature, ambient temperature > 75 °C	Check installation location. Lower the ambient temperature of the terminal box (cool if necessary)

All fault codes E 018 to E 024 not listed here are available as reserves

Virtually all of the aforementioned fault codes can be caused by EMC interference. This is less likely to be the case in the event of permanent faults, but should be considered for sporadic fault messages.

System malfunctions

Common application and usage errors

The 0 % and 100 % measuring range limits are obviously outside the sight glass level.	
Possible causes if no error messages appear	**Remedy**
The measuring range is incorrectly set.	■ Check the measuring range calibration. ■ Repeat calibration if necessary.

The characteristic of the measurement signal in the measuring range is reproducible, but not linear.	
Possible causes if no error messages appear	**Remedy**
The level electrode was installed without a protective tube. The protective tube is required as a counter electrode.	■ Install a protective tube.

The characteristic of the displayed reading appears implausible compared with the tendency of the level in the sight glass.	
Possible causes if no error messages appear	**Remedy**
The vent hole is clogged or flooded, or may even be missing completely.	■ Check the protective tube. ■ If necessary, add a pressure relief hole.
The shut-off valves of an externally mounted measuring cylinder (option) are closed.	■ Inspect the shut-off valves, open if necessary.

A correctly set electrode that has been in operation for a long period delivers increasingly imprecise readings.	
Possible causes if no error messages appear	**Remedy**
Increasing soiling due to build-up of deposits on the electrode rod.	■ Remove the level electrode and clean the electrode rod with a damp cloth.

A connected electronic control unit (diagnostic tester) indicates alarms, e.g. MIN or MAX, even though the level visible in the sight glass remains within the admissible measuring range limits.	
Possible causes if no error messages appear	**Remedy**
■ The measuring range is incorrectly set. ■ The electrode or protective tube is contaminated.	■ Calibrate the measuring range at the operating point. ■ Inspect the electrode and protective tube for soiling and clean if necessary.

System malfunctions

The display or control unit reacts to changes of level too slowly or too quickly.	
Possible causes if no error messages appear	**Remedy**
The damping coefficient “FiLt” is incorrectly set.	Correct the damping coefficient “FiLt”.

The equipment fails to work. No display and the LEDs do not light up.	
Possible causes if no error messages appear	**Remedy**
Supply voltage failure.	■ Switch on the supply voltage. ■ Check all electrical connections.

The equipment fails to work. The display is on and the LEDs light up.	
Possible causes if no error messages appear	**Remedy**
The earth connection to the tank is interrupted.	■ Clean the sealing surfaces. ■ Screw in the NRGT 26-2 level electrode with a metal sealing ring, see page 28.

Flashing values from t-71 to t-75 appear on the display	
Possible causes	**Remedy**
The ambient temperature of the electrode terminal box is high, between 71 °C and 75 °C. If the temperature rises above 75 °, the fault code E.027 (Overtemp Err) appears and the 0 mA current output causes a fault shutoff.	■ Reduce the ambient temperature around the terminal box, e.g. by cooling.

System malfunctions

Checking installation and function

When you have remedied system malfunctions, perform a function test as follows.

- Check the level display by raising and lowering the fluid to different levels within the measuring range of the level electrode. Always perform this check with the plant at its operating point.
- Also check that the level remains within the MIN and MAX limits when limit indicators are connected.
- Check the switchpoints when bringing into service and every time the NRGT 26-2 or NRGT 26-2s level transmitter is replaced.

System malfunctions in the NRGT 26-2 or NRGT 26-2s level transmitter result in an output of 0 mA at the analogue output.

If you require assistance, please tell us the indicated fault code.

In the event of malfunctions or errors that cannot be remedied with the aid of this Installation & Operating Manual, please contact our service centre or authorised agent in your country.

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 bar and check the pressure before you unscrew the level electrode.
- Only remove the level electrode at a **boiler pressure of 0 bar**.

⚠ WARNING

The hot level electrode can cause severe burns.

The level electrode becomes 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.

Proceed as follows:

1. Reduce the boiler pressure to 0 bar.
2. Allow the level electrode to cool to room temperature.
3. Switch off the supply voltage.
4. Detach the plug-in connection.
5. Next, remove the level electrode.

Cleaning the measuring electrode of the level transmitter

Cleaning interval

We recommend cleaning the electrode at least once a year, such as during maintenance work, depending on the operating conditions.

Before cleaning the electrode rod, take the level transmitter out of service and remove it, see page 52.

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 (and declaration of decontamination) and send it with the products to GESTRA AG.

EU Declaration of Conformity

We hereby declare that the NRGT 26-2 / NRGT 26-2s level transmitter conforms to the following European Directives:

- Directive 2014/68/EU EU Pressure Equipment Directive
- Directive 2014/35/EU Low Voltage Directive
- Directive 2014/30/EU EMC Directive
- Directive 2011/65/EU RoHS Directive

Please see our Declaration of Conformity for details on the conformity of our equipment with European directives.

The current Declaration of Conformity can be found on the internet at www.gestra.com or requested from us.

GESTRA®

You can find our authorised agents around the world at: **www.gestra.com**

GESTRA AG

Münchener Strasse 77
28215 Bremen
Germany
Phone +49 421 3503-0
Fax +49 421 3503-393
e-mail info@de.gestra.com
Web www.gestra.com

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