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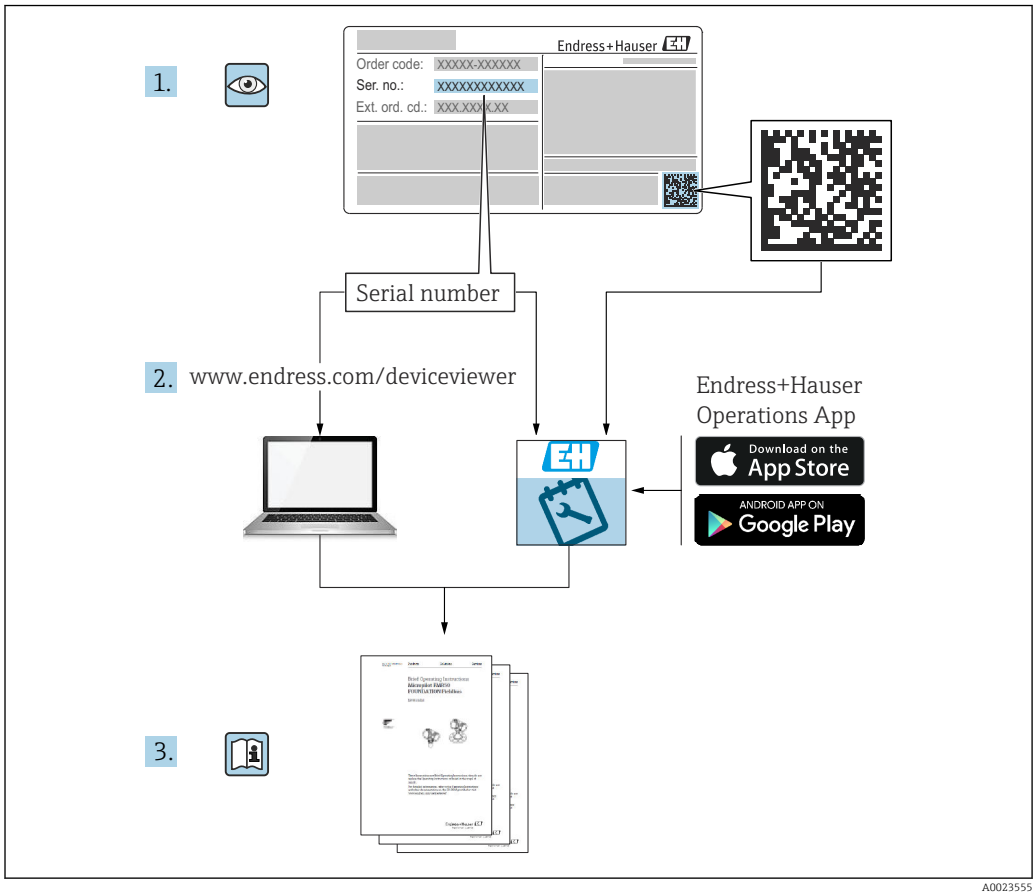
71559868
2022-03-18

Operating Instructions
NAR300 system for high temperature

Oil leak detector float sensor

Endress+Hauser
People for Process Automation


1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXX
Ext. ord. cd.: XXX XXX XX
Serial number
2. www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.
A0023555

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1 Document information

1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols used

1.2.1 Safety symbols

⚠ DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Alternating current

Direct current and alternating current

Direct current

Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:
- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Tool symbols

Phillips head screwdriver

Flat blade screwdriver

Torx screwdriver

Allen key

Open-ended wrench

1.2.4 Symbols for certain types of information and graphics

Permitted
Procedures, processes or actions that are permitted

Preferred
Procedures, processes or actions that are preferred

Forbidden
Procedures, processes or actions that are forbidden

Tip
Indicates additional information

Reference to documentation

Reference to graphic

Notice or individual step to be observed

1., 2., 3.
Series of steps

Result of a step

Visual inspection

Operation via operating tool

Write-protected parameter

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

Safety instructions
Observe the safety instructions contained in the associated Operating Instructions

Temperature resistance of the connection cables
Specifies the minimum value of the temperature resistance of the connection cables

1.3 Documentation

The following documents can be found in the Download area of our website (www.endress.com/downloads).

For an overview of the scope of the associated Technical Documentation, refer to the following:
W@M Device Viewer (www.endress.com/deviceviewer): Enter the serial number from nameplate

1.3.1 Technical Information (TI)

Planning aid
The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

1.3.2 Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value
The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.3.3 Operating Instructions (BA)

The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.3.4 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

2 Basic safety instructions

2.1 Requirements for personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- Be specialists who are trained and have a relevant qualification for this specific function and task.
- Be authorized by the plant owner-operator.
- Be familiar with local/national regulations.
- Before starting work, read and understand the instructions in the Operating Instructions and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
- Be instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Designated use

Application and measured materials
Depending on the version ordered, the device can also be used with potentially explosive, flammable, poisonous or oxidizing materials.

Devices that are used in hazardous areas have corresponding labels on their nameplates.

To ensure that the device remains in proper condition for the operation time:
- Only use the device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Check the nameplate to verify if the device can be put to its intended use in hazardous areas.
- If the device is not operated at an atmospheric temperature, compliance with the relevant basic conditions specified in the relevant device documentation is absolutely essential.
- Protect the device permanently against corrosion from environmental influences.
- Observe the limit values in the "Technical Information".

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to local/national regulations.

2.4 Operational safety

Risk of injury!
- ▶ Operate the device in proper technical conditions and fail-safe conditions only.
- ▶ The plant owner-operator is responsible for interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
- ▶ If modifications are nevertheless required, contact your Endress+Hauser Sales Center.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe local/national regulations pertaining to repair of an electrical device.
- ▶ Use only original spare parts and accessories from Endress+Hauser.

Ex-area

Observe the following notes to eliminate the risk of danger to persons or the facility when the device is used in Ex-areas (e.g. explosion protection, pressure equipment safety):
- ▶ Check the model nameplate to ensure that the ordered device is explosion proof.
- ▶ Observe the specifications in the separate supplementary documentation attached to these Instructions.

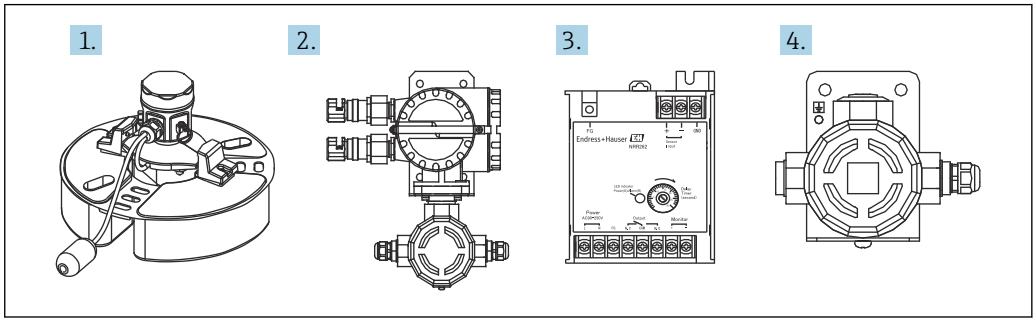
2.5 Product safety

This device was designed in accordance with GEP (Good Engineering Practice) to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. It meets the general safety standards and legal requirements.

3 Product description

3.1 Product design

The NAR300 system is configured mainly in combination with the following products.



1 NAR300 product design

1 Float sensor NAR300
2 Ex d [ia] transmitter NRR261
3 Ex [ia] transmitter NRR262
4 Ex [ia] sensor I/F Ex box

The NAR300 system is installed in an oil-retaining wall in a tank or in a sump pit near a plant or a pump yard, and it provides the ultimate leak detection function for oils, such as petrochemicals and vegetable oils. A sensor with a conductive detection function is used to monitor the detection conditions. A two-stage alarm logic allows for an extremely low false-positive alert, ensuring the safety of the tank yard with a precise and simple device configuration.

3.2 Technical data

3.2.1 Float sensor NAR300

Item	Description
Protection class	IP67 (outdoor installation)
Power supply	Supplied by a sensor I/F Ex box or NRR261 (NAR300 sensor I/F Ex box, integrated type)
Wetted material	Float: SUS316L, conductive sensor: SUS316 and PTFE
Detection sensitivity [1)]	Water-filled pit: 10 ± 1 mm (0.04 in) with kerosene at the time of shipment from the factory
I/O cable	Dedicated shielded cable (PVC) as well as with cable float (Standard 6 m (19.69 ft))
Weight	Approx. 2.5 kg (5.5 lb) (including the dedicated shielded cable (PVC) 6 m (19.69 ft))

1) Adjusted with oil (kerosene: approx. density: 0.8), lower-layer water (water: approx. density: 1.0), static level condition and/or without surface tension.

3.2.2 Ex [ia] sensor I/F Ex box

Item	Description
Protection class	IP67 (outdoor installation)
Power supply	Supplied by NRR261 or NRR262
Cable entry	▪ NAR300 (float sensor) side: G1/2, with cable gland ▪ NRR261 or NRR262 (transmitter) side: G1/2, NPT1/2, M20
Weight	3.2 kg (7.1 lb)
Materials	Housing/cover: Aluminum casting

3.2.3 Ex d [ia] transmitter NRR261

Item	Description
Protection class	IP67 (outdoor installation)
Permissible power-supply voltage range	▪ AC power supply: 90 to 250 V_{AC}, 50/60 Hz ▪ DC power supply: 22 to 26 V_{DC} (built-in power supply arrester)
Maximum power consumption	▪ AC power supply: 20 VA DC ▪ Power supply: 2 W
Output	▪ Contact output: 1SPDT ▪ Maximum contact rating: 250 V_{AC}, 1 A, 100 VA or 100 V_{DC}: 1 A, 25 W ▪ Fail-safe function: Activated when the power is turned off and when it freezes (see "Alarm output table")
Cable entry	▪ G3/4 x2 (Ex d), G1/2 x1 (Ex ia) ▪ G1/2 x 2 (Ex d), G1/2 x 1 (Ex ia) ▪ NPT3/4 x2 (Ex d), NPT1/2 x1 (Ex ia) ▪ NPT1/2 x2 (Ex d), NPT1/2 x1 (Ex ia) ▪ M25 x2 (Ex d), M20 x1 (Ex ia) ▪ M20 (Ex d), M20 x1 (Ex ia) ▪ TIIS explosion-proof specifications are equipped with cable gland model SXBM
Lightning arrester	Built-in (power supply arrester)
Weight	Approx. 10 kg (22 lb)
Materials	Housing/cover: Aluminum casting

3.2.4 Ex [ia] transmitter NRR262

Item	Description
Protection class	IP20 (indoor installation), installed in non-hazardous locations
Permissible power-supply voltage range	▪ AC power supply: 90 to 250 V_{AC}, 50/60 Hz ▪ DC power supply: 22 to 26 V_{DC} (built-in power supply arrester)
Maximum power consumption	▪ AC power supply: 20 VA DC ▪ Power supply: 2 W
Output	▪ Contact output: 1SPDT ▪ Maximum contact rating: 250 V_{AC}, 1 A, 100 VA or 100 V_{DC}: 1 A, 25 W ▪ Fail-safe function: Activated when the power is turned off and when it freezes (see "Alarm output table")
Lightning arrester	Built-in (power supply arrester)
Weight	Approx. 0.6 kg (1.3 lb)
Materials	Housing: Plastic

3.3 Process conditions

3.3.1 Float sensor NAR300 / sensor I/F Ex box

Item	Description
Requirements for object detection	▪ Density is at least 0.7 g/cm^3 but less than 1.0 g/cm^3 ▪ Floats in water (if the density is 0.9 g/cm^3 or higher, the viscosity must be at least 1 mPa·s. Water ≒ 1 mPa·s) ▪ Water-insoluble ▪ Non-conductive ▪ Liquid
Operating temperature	▪ Ambient temperature: −20 to 100 °C (−4 to 212 °F) ▪ Measured liquid temperature: 0 to 100 °C (32 to 212 °F)
Requirements for pit water	▪ Density is at least 1.0 g/cm^3 but less than 1.13 g/cm^3 (only if the kinematic viscosity is 1 mm^2/sec) [1)] ▪ Not frozen ▪ Conductivity is at least 10 µS/cm (not more than 100 kΩ·cm) ▪ Cannot be used at sea level or in locations that may be penetrated by seawater
Other	▪ Promptly remove any debris that adheres to the sensor unit. ▪ Ensure that there is no caked-on mud (dried solids), etc. ▪ Avoid installation conditions that cause the float sensor to tilt off-balance or change the draft line. ▪ Install measures, such as a breakwater, to avoid cross-currents and waves.

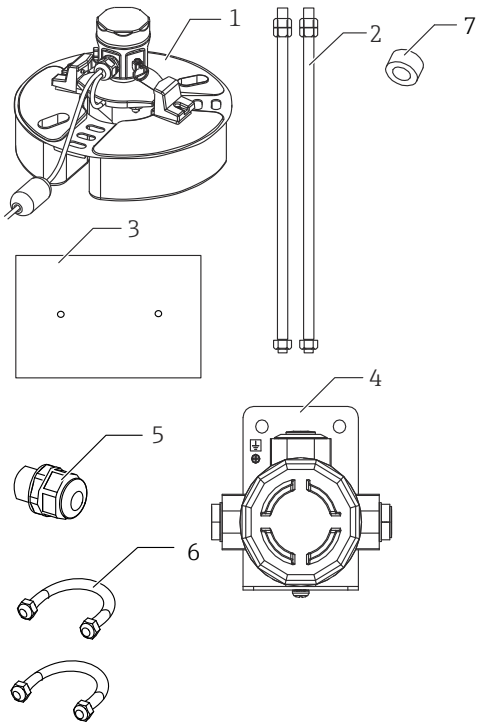
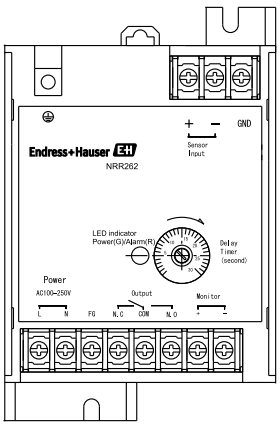
1) Sensitivity will vary with the specific gravity of lower-layer water that differs from the factory-setting environment, such as when an antifreeze is used.

3.3.2 Connector cable (connection to transmitter NRR261/262 from sensor I/F Ex box)

Item	Description
Connecting cables	Maximum inductance: 2.3 mH, maximum capacitance: 83 nF Example: Use of KPEV-S (instrumentation cable) C = 65 nF/Km, L= 0.65 mH/km CW/C = 0.083 µF / 65 nF = 1.276 km....1 LW/L = 2.3 mH / 0.65 mH = 3.538 km.....2 Maximum extended cable length: 1.27 km The smaller of 1 or 2 is the maximum cable length (round down instead of rounding off)
Operating temperature	−20 to 60 °C (−4 to 140 °F)

3.4 Delivery example by order code

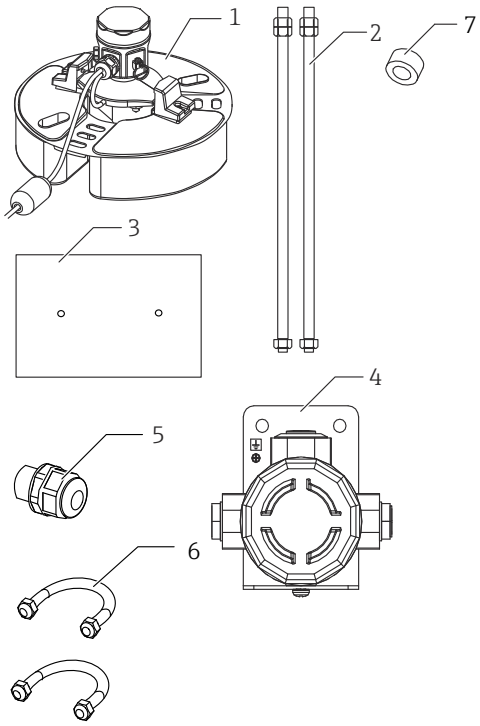
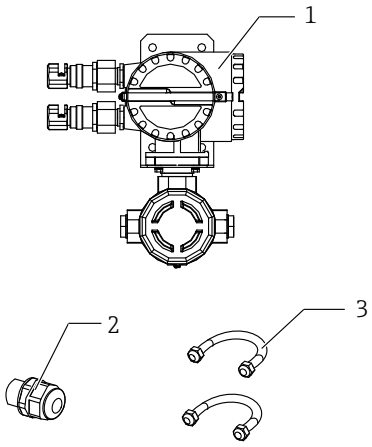
Delivery example 1

Float sensor order code	Transmitter order code
NAR300- * 6* * 2 or 3 *	NRR262
	

1 Float sensor
2 Float guide (bar) packaged separately
3 Weight (packed in the bottom of the box with the transmitter)
4 Sensor I/F Ex box
5 Cable gland (Ex [ia] cable entry) is only included with TIIS explosion-proof specifications
6 U-bolt

The sensor I/F Ex box is included in the order code NAR300-x6xxxx. The intrinsically safe system is used in combination with NRR262.

Delivery example 2

Float sensor order code	Transmitter order code
NAR300- * 6* * 2 or 3*	NRR261-3/5**
 *1 Float sensor* *2 Float guide (bar) packaged separately* *3 Weight (packed in the bottom of the box with the transmitter)* *4 Sensor I/F Ex box* *5 Cable gland (Ex [ia] cable entry) is only included with TIIS explosion-proof specifications* *6 U-bolt*	 *1 NRR261* *2 Cable gland (Ex [ia] cable entry) included with TIIS explosion-proof specification only* *3 U-bolt*

The sensor I/F Ex box is included in the order code NAR300-x6xxxx. The pressure-resistant, intrinsically safe system is used in combination with NRR261-3/5**.

3.5 Operating conditions

3.5.1 Detection sensitivity

If the electrode tip is pulled out of the lower-layer water due to increased thickness of the oil layer, water may cling onto the electrode tip like an icicle even if the electrode tip is in oil. In this case, detection sensitivity may increase by 1 to 2 mm (0.04 to 0.08 in). When an accurate detection check is required, apply a small amount of neutral detergent to the electrode tip to keep water from clinging to the electrode.

3.5.2 Pit water

The high-temperature specification is exclusively for applications in which there is always water in the pit.

Do not use in sea water

The oil leak detector is not designed for use in sea water. The following problems may occur if it is used in sea water:

- Failed or delayed alarm when overturned by waves
- Delayed alarm caused by generation of a bypass circuit between the conductive sensor and the float itself due to salt coating
- Failure due to sea water corrosion

Other special pit water

If the float sensor is used in certain special pit water, such as pit water containing solvents, it may become corroded or damaged.

Pit water with high electrical resistance

Use in pit water with high electrical resistance, such as in a steam drain and pure water, may activate the alarm. Ensure that the conductivity of pit water is at least 10 µS/cm (not more than 100 kΩ·cm).

Example: Pure water: 1 to 0.1 µS/cm (1 to 10 MΩ·cm)

Frozen pit water

If ice forms in the pit, the alarm may be triggered (fail-safe function). Implement anti-freeze measures to prevent freezing.

3.6 Gasoline application

If the object to be detected is gasoline, check with your Endress+Hauser Sales Center and order the gasoline application specifications under special specifications.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

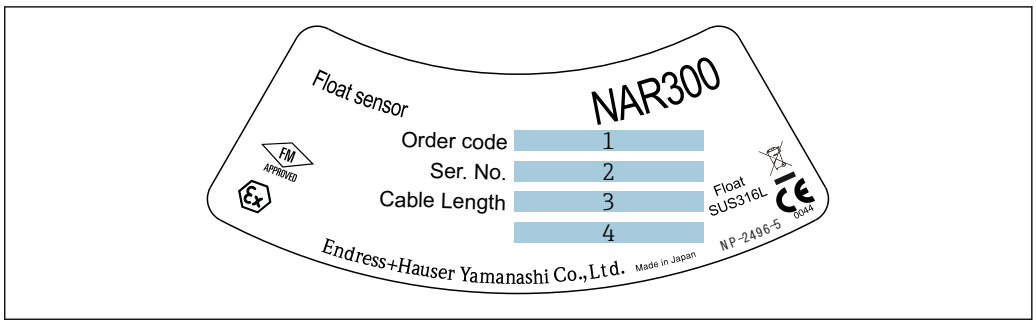
Upon receipt of the goods, check the following:
- Are the order codes on the delivery note and the product label identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) enclosed?

If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

4.2 Product identification

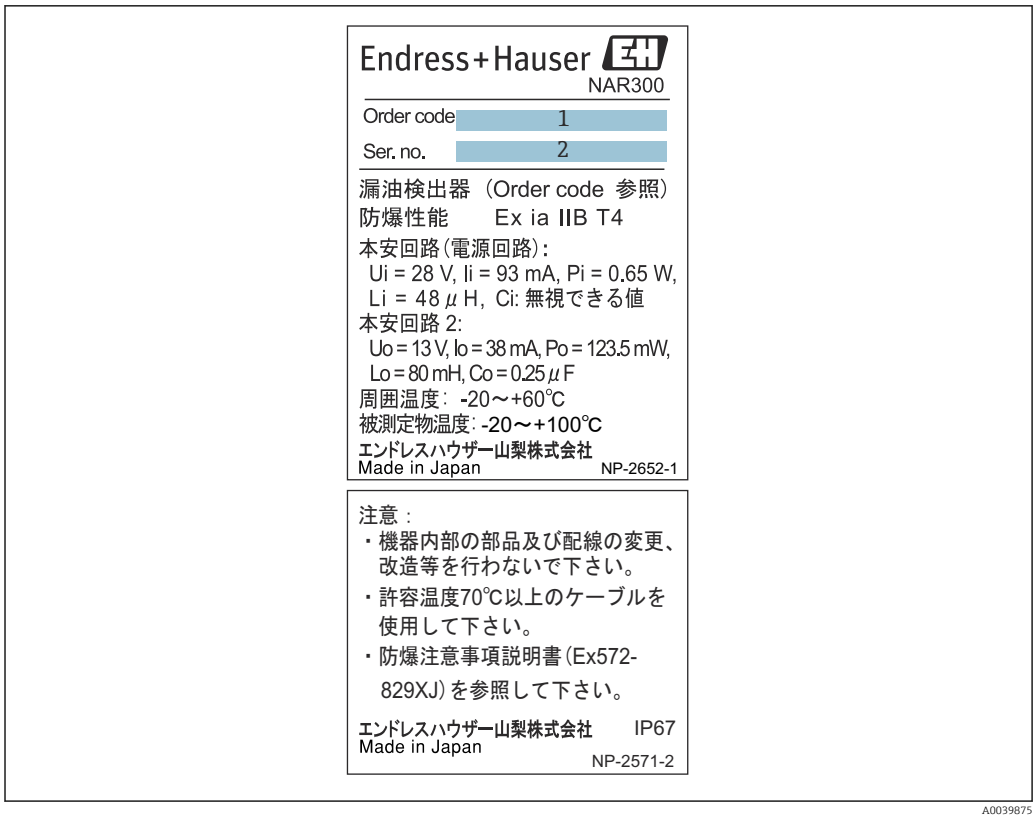
The following options are available for identification of the device:
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate; this will display all the information about the device.

4.2.1 Nameplate



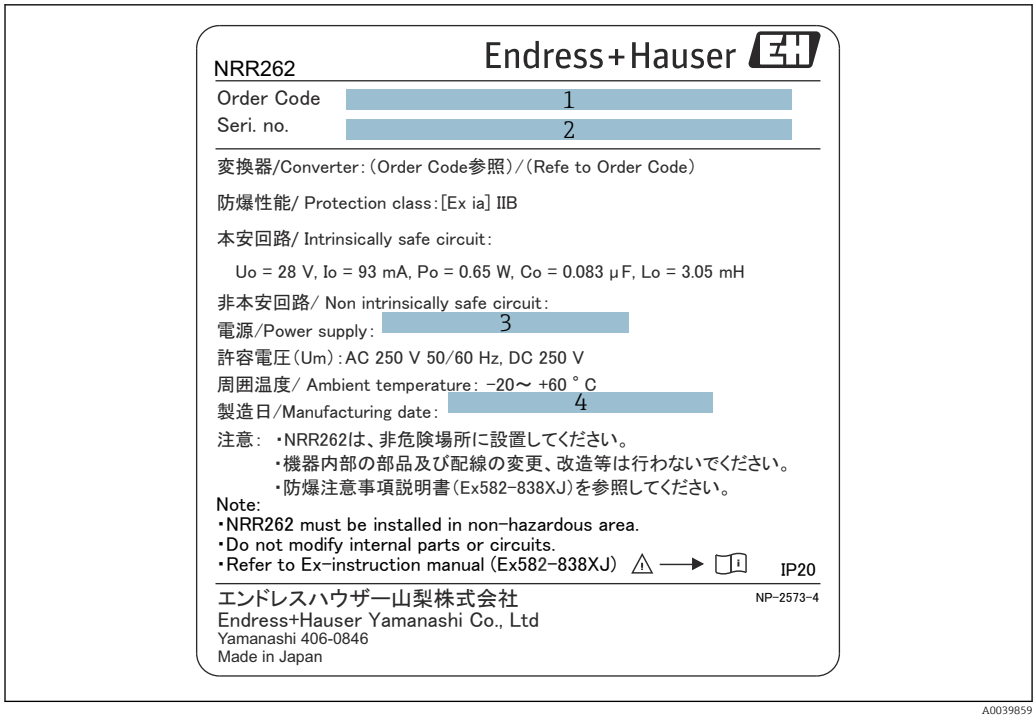
2 *NAR300 model nameplate*

1 *Order code*
2 *Serial number*
3 *Cable length (order code 040)*
4 *Explosion-proof performance (except TIIS specification)*



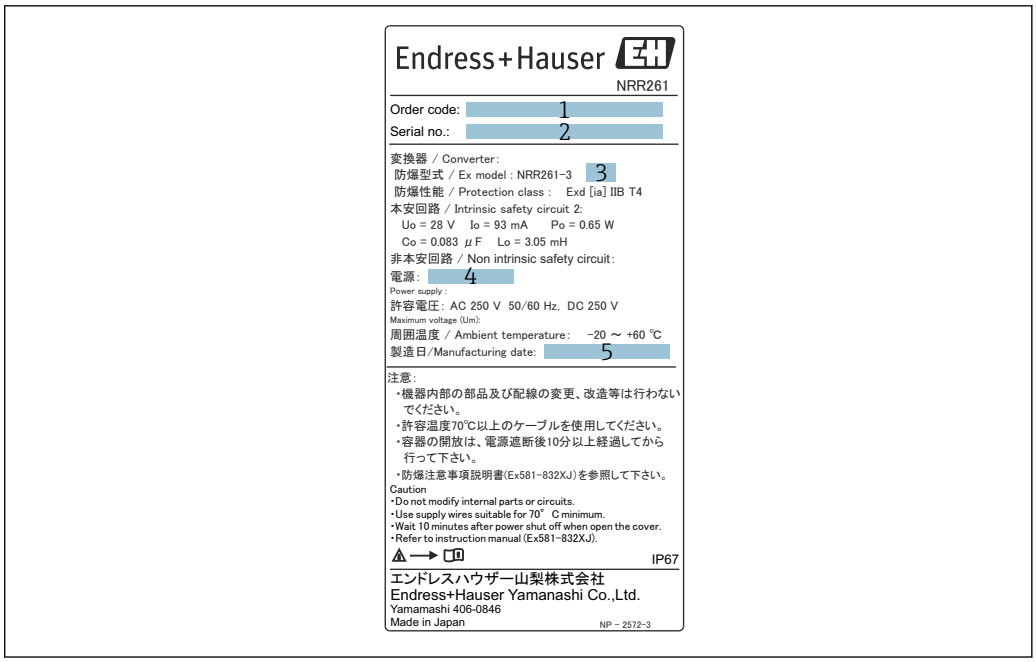
3 Ex [ia] sensor I/F Ex box separate type (NAR300-x6xxxx)

1 Order code
2 Serial number



4 Ex [ia] transmitter separate type (NRR262-xx)

1 Order code
2 Serial number
3 Power-supply voltage
4 Manufacturing date



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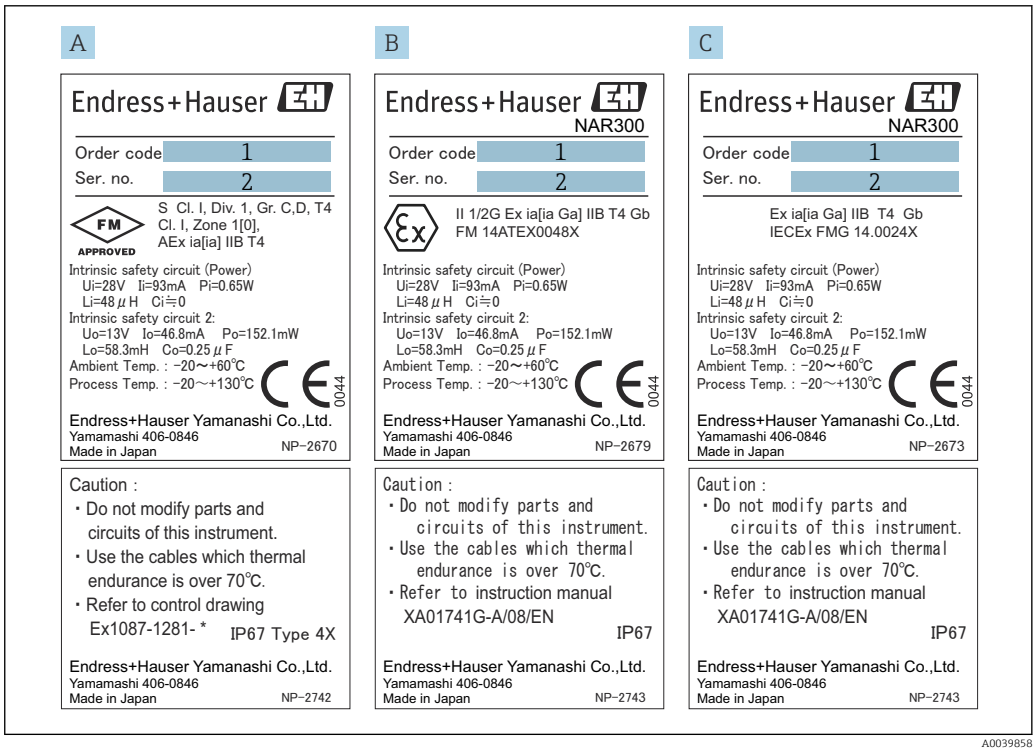
5 *Ex d [ia] transmitter separate type (NRR261-xx)*

1 *Order code*
2 *Serial number*
3 *Explosion-proof model*
4 *Power-supply voltage*
5 *Manufacturing date*



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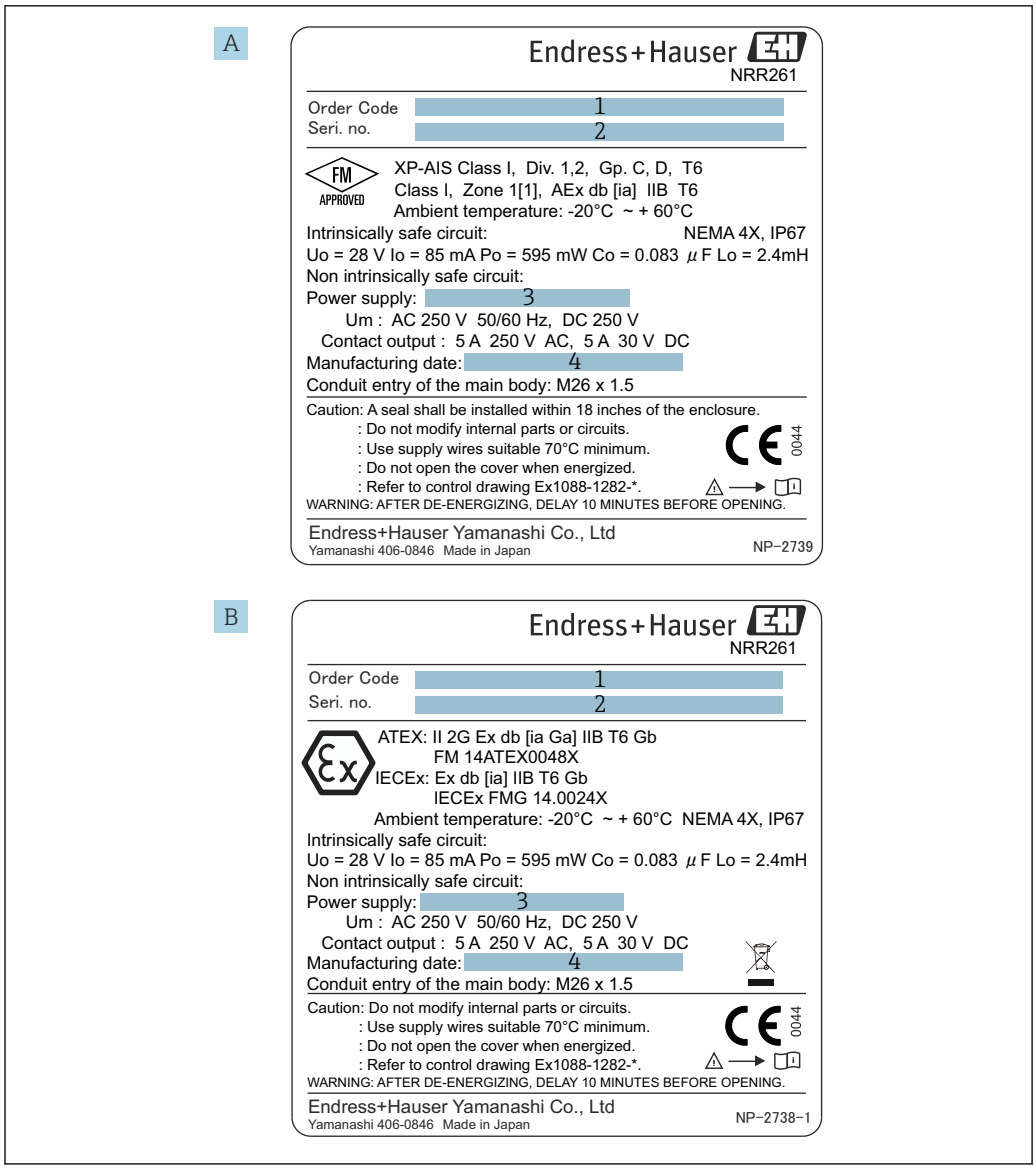
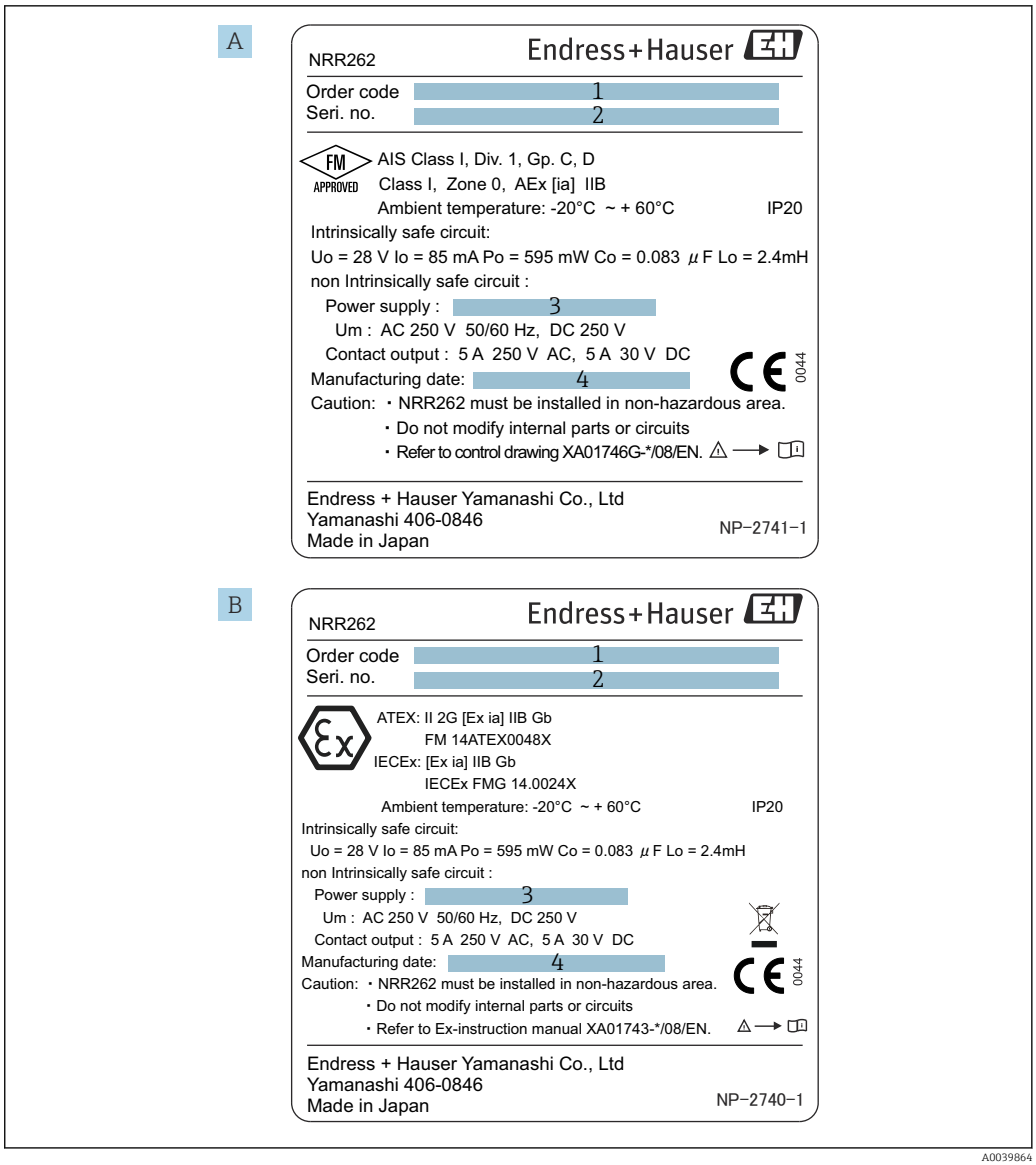
6 *Nameplates for NAR300 FM / NAR300 ATEX / NAR300 IECEx*

1 *Order code*
2 *Serial number*



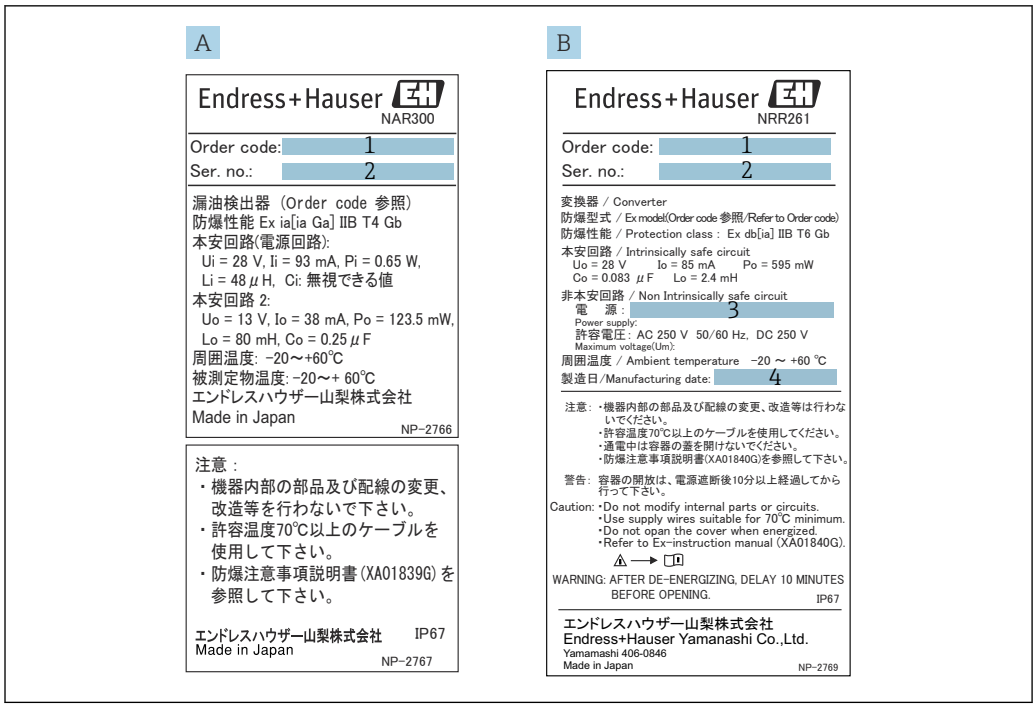
7 *Nameplates for NRR261*

A NRR261 nameplate for FM (NAR300 separate type)
B NRR261 nameplate for ATEX/IECEx (NAR300 separate type)
1 Order code
2 Serial number
3 Power-supply voltage
4 Manufacturing date



8 Nameplates for NRR262

A NRR262 nameplate for FM
B NRR262 nameplate for ATEX/IECEx
1 Order code
2 Serial number
3 Power-supply voltage
4 Manufacturing date



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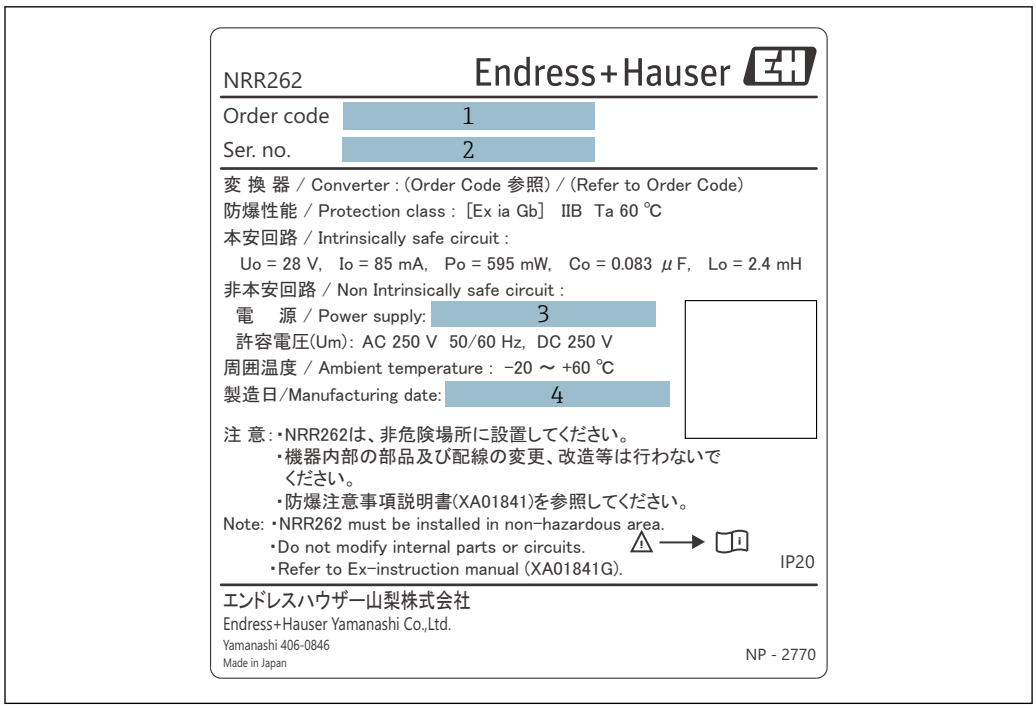
9 Nameplates for JPN Ex

A NAR300 nameplate for JPN Ex
B NRR261 nameplate for JPN Ex (NAR300 separate type)
1 Order code
2 Serial number
3 Power-supply voltage
4 Manufacturing date



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10 NRR262 for JPN Ex

1 Order code
2 Serial number
3 Power-supply voltage
4 Manufacturing date

4.3 Manufacturer contact address

Endress+Hauser Yamanashi Co., Ltd.
406-0846
862-1 Mitsukunugi, Sakaigawa-cho, Fuefuki-shi, Yamanashi

4.4 Storage and transport

4.4.1 Storage conditions

- Storage temperature: −20 to +60 °C (−4 to 140 °F)
- Store the device in its original packaging.

4.4.2 Transportation

NOTICE

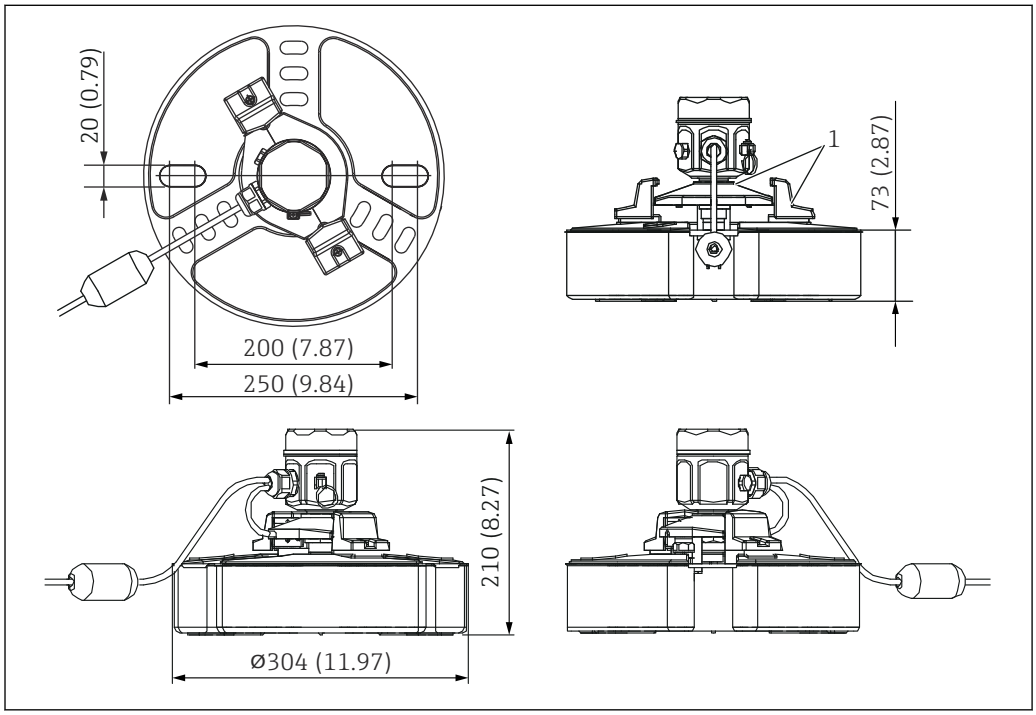
The housing may become damaged or dislodged.
Risk of injury

- ▶ When transporting the device to the measuring point, either use the device's original packaging or hold by the process connector.
- ▶ Secure a hoisting device (such as a hoisting ring or a lifting eye bolt) to the process connector, not to the housing. Pay attention to the device's center of gravity to prevent unexpected tilting.
- ▶ Comply with the safety precautions and transportation conditions for devices that weigh 18 kg (39.6 lbs) or more (IEC61010).

5 Installation

5.1 NAR300 system dimensions

5.1.1 Dimensions of NAR300 float sensor



11 Outline of float sensor NAR300

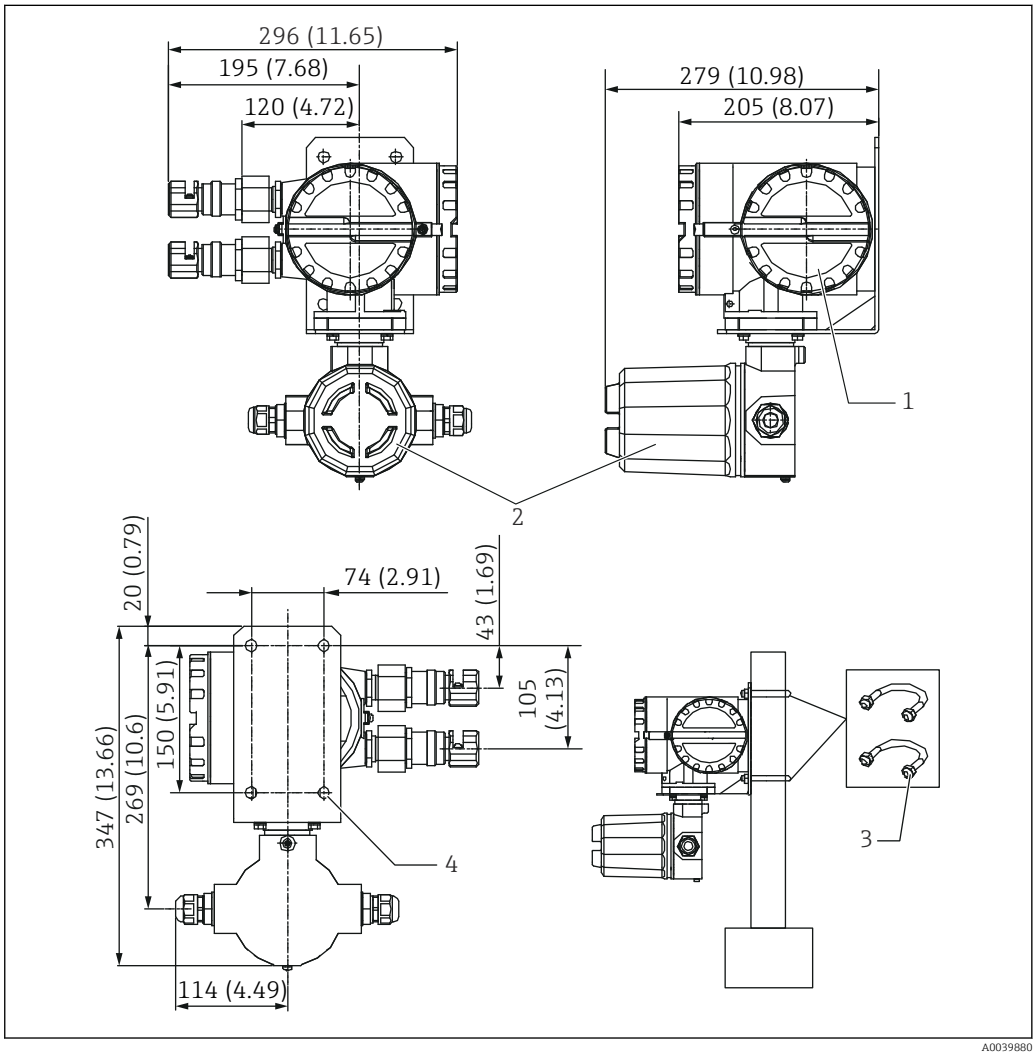
1 Float sensor cover

5.1.2 Dimensions of Ex d [ia] transmitter NRR261

Only NRR261 with TIIS and JPN Ex explosion-proof specifications are delivered with a cable gland (external diameter of compatible cables: φ12 to 16 mm (0.47 to 1.02 in))

Use the order code of Ex d [ia] transmitter NRR261 to specify the electrical conduit connection port.

Normally, Ex d [ia] transmitter NRR261 is mounted on a tank yard's pipe and secured in place with a U-bolt (JIS F 3022 B 50 type). It can also be mounted directly onto wall surfaces (requires 4-φ12 mm (0.47 in) holes and M10 securing nuts and bolts (not included in the delivery)).

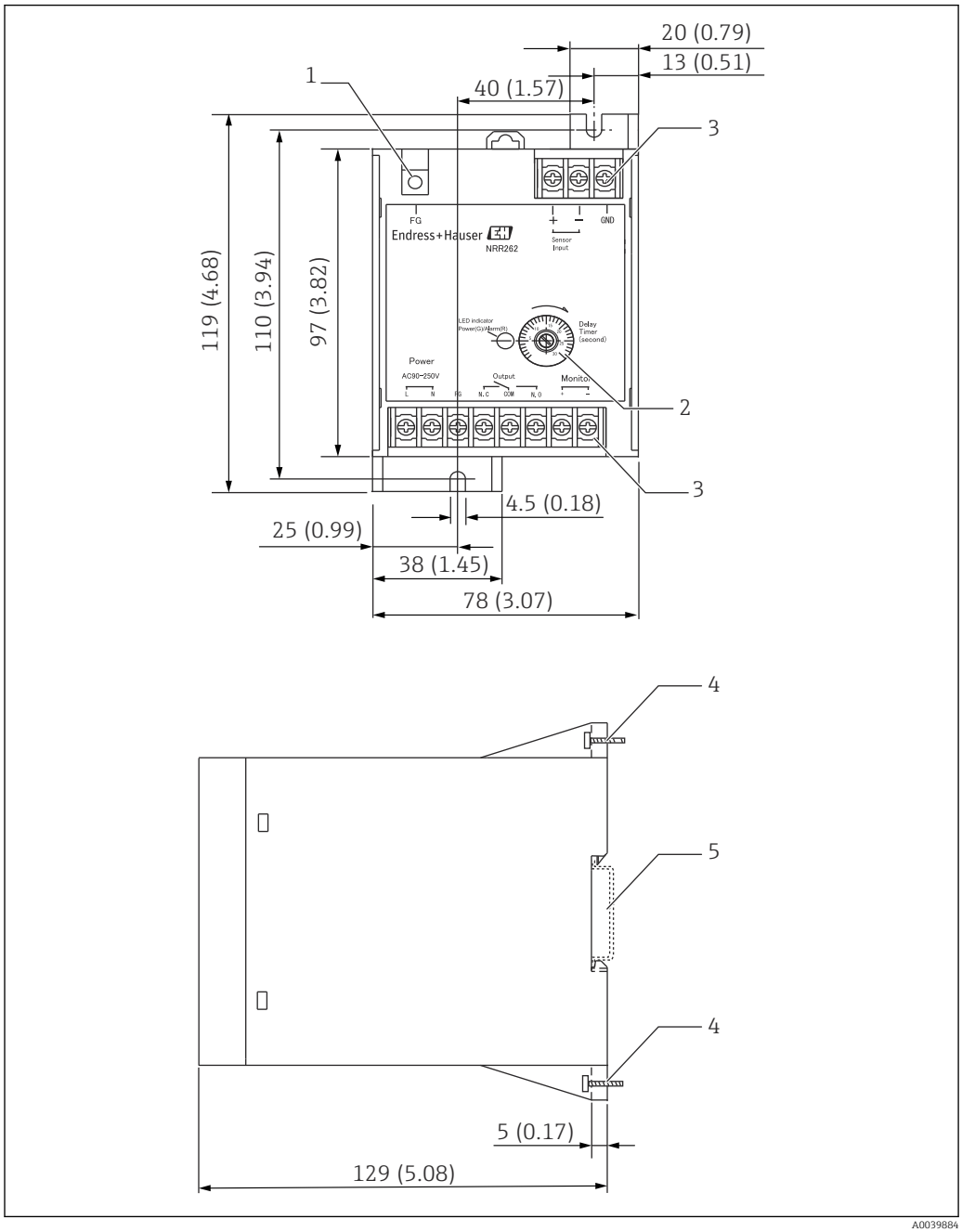


12 Outline of NRR261. Unit of measurement mm (in)

1 *Ex d side terminal*
2 *Ex [ia] side terminal*
3 *U-bolt (JIS F3022 B50 material: Iron (chromate), 2 nuts and 2 flat washers included)*
4 *4-φ12 holes*

5.1.3 Dimensions of Ex [ia] transmitter NRR262

NRR262 is installed indoors, such as in instrument rooms, and it can be mounted easily with two M4 screws. In addition, "one-touch" snap-in mounting is possible using a DIN rail EN50022 (not included in the delivery). This rail-mounted method is beneficial in cases where multiple transmitters are mounted in series, and in cases where installation of additional transmitters is expected in the future.

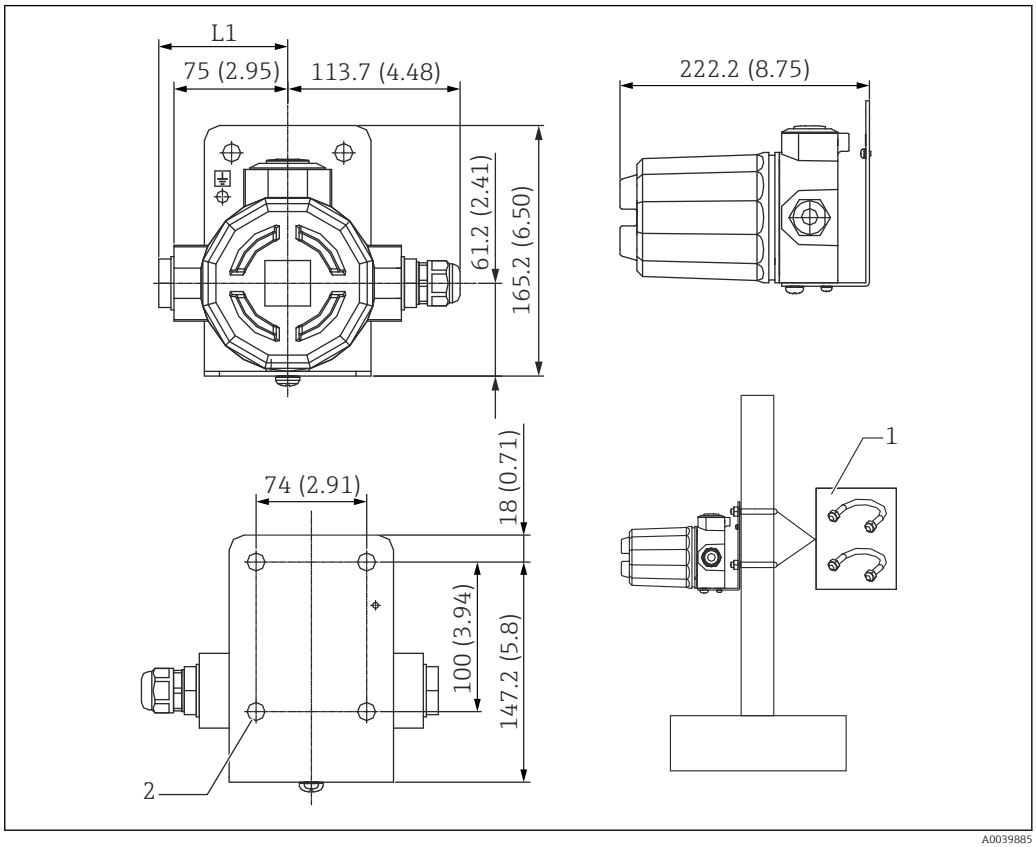


13 Outline of NRR262. Unit of measurement mm (in)

1 *Thread (M4) for intrinsic safety Class A grounding*
2 *Delay trimmer*
3 *Thread (M3)*
4 *Screw (M4)*
5 *DIN rail: EN50022-compliant*

5.1.4 Dimensions of Ex [ia] sensor I/F Ex box

The Ex [ia] sensor I/F Ex box is used in combination with Ex d [ia] transmitter NRR261 or Ex [ia] transmitter NRR262 in order to convert signals from the float sensor into electric current signals. Normally, it is mounted on a tank yard's pipe and secured in place with a U-bolt (JIS F 3022 B 50 type). It can also be mounted directly onto wall surfaces (requires 4-φ12 mm (0.47 in) holes and M10 securing nuts and bolts (not included in the delivery)).

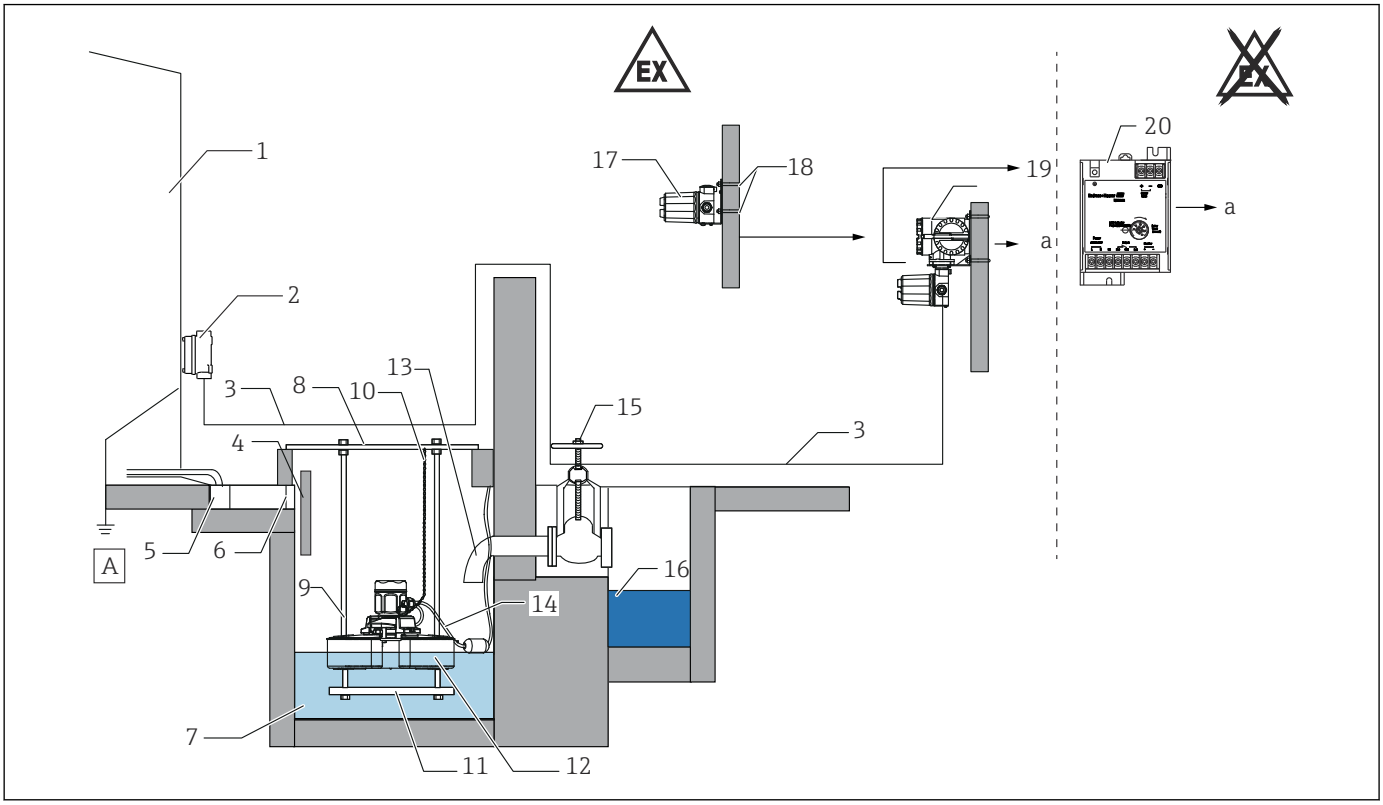


14 *Outline of Ex [ia] sensor I/F Ex box. Unit of measurement mm (in)*

L1 For G1/2, NPT1/2: 85 mm (3.35 in), for M25: 107 mm (4.21 in)
1 U-bolt (JIS F3022 B50 material: Iron (chromate), 2 nuts and 2 flat washers included)
2 4-φ12 mm (0.47 in) holes

Use the order code of float sensor NAR300 to specify the conduit connection port. When installing NAR300-16Axxx, however, specify NAR300-16AxxB since the electrical conduit connection port will be G1/2.

5.2 Installation conditions



A0039906

15 NAR300 + NRR26x

A Class A grounding work (TIIS specification only)
a Alarm output
1 Tank
2 Junction box
3 Ground line (TIIS specification only)
4 Divider
5 U-shaped groove
6 Screen
7 Pit
8 Pit cover
9 Float guide
10 Chain
11 Weight
12 Float sensor NAR300
13 Dispensing nozzle (100 mm (3.94 in) or above)
14 Dedicated cable (included with NAR300)
15 Valve
16 Drainage groove
17 Ex [ia] sensor I/F Ex box
18 U-bolts (JIS F 3022 B50)
19 NRR261 (Ex d [ia] transmitter)
20 NRR262 (Ex [ia] transmitter]

To ground the barrier, connect to the tank or use the remote cable's shield. For more on using the remote cable's shield, refer to "Electrical connection."

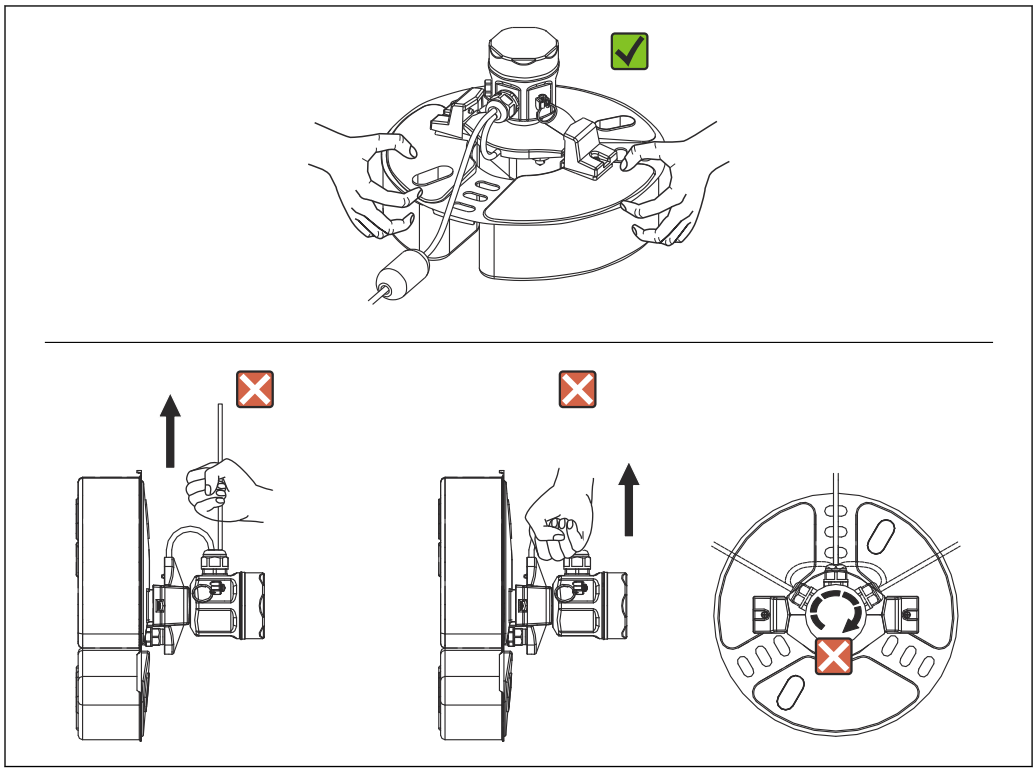
5.2.1 Installation/mounting-related precautions

1. Installation of debris protection, a roof or a cover is recommended to prevent debris or snow from entering the pit. If there is snow accumulation on the float sensor, each 50 g of snow accumulation will cause an increase in draft by 1 mm (0.04 in), resulting in reduced sensitivity. If there is a risk of ambient temperature exceeding 50 ℃ (122 ℉), install a sun shade to protect the float sensor from direct sunlight. Mount a covering above the top of the pit inlet to avoid submerging the float sensor housing if the pit water overflows due to heavy rainfall, etc. If the float sensor becomes submerged, a malfunction or damage may result.
2. If the float sensor becomes off balance (tilted by approximately 3 ° or more), it may cause a malfunction or delayed alarm. To prevent this, use a float guide as much as possible and arrange the cables and chains strategically.
3. Install a screen at the pit inlet so that debris can be removed. Periodically inspect and clean the sensor and the pit as clogging caused by debris and foreign matter may result in a malfunction.
4. Attaching a chain to the side ring on the float sensor head ahead of time will improve convenience. However, each 50 g of increased load on the float will increase the draft by 1 mm (0.04 in), resulting in reduced sensitivity. Also, if a chain is used to prevent the float sensor from flowing out, do not yank on the chain during inspection, etc.
5. When the pit is completely filled with water, an oil layer will not be formed inside the pit even if oil spills out. Ensure that the water is drained as necessary so that an oil layer can be formed.
6. Do not yank on the cables or carry the device by holding on to the cables as this may cause a malfunction and/or poor waterproofing.
7. If the valve is constantly open, ensure that an oil layer can be formed such as by bending the tip of the discharge nozzle downwards by at least 100 mm (3.94 in). Failure to do so may cause oil to discharge from the pit before it can form a detectable layer on the water surface, resulting in a delayed alarm or detection failure. For pits without a discharge nozzle as shown above, install an oil-water divider so that an oil layer can be formed.
8. Install a divider to prevent large waves, cross-currents or water from splashing onto the float when liquid flows in.
9. If the pit is too large, divide the pit with an oil separator. Oil leakage cannot be detected unless there is significant outflow of oil in proportion to the surface area.
10. Install NAR300, NRR261 and a sensor I/F Ex box at least 50 cm (1.64 ft) apart from each other.

5.3 Mounting the NAR300 system

5.3.1 Handling precautions

Always use both hands to hold the float when carrying NAR300. Do not lift or hold by any of the components shown in the figure below, and do not lift by the upper portion of the sensor. In addition, do not rotate the housing. Doing so may cause device failure.

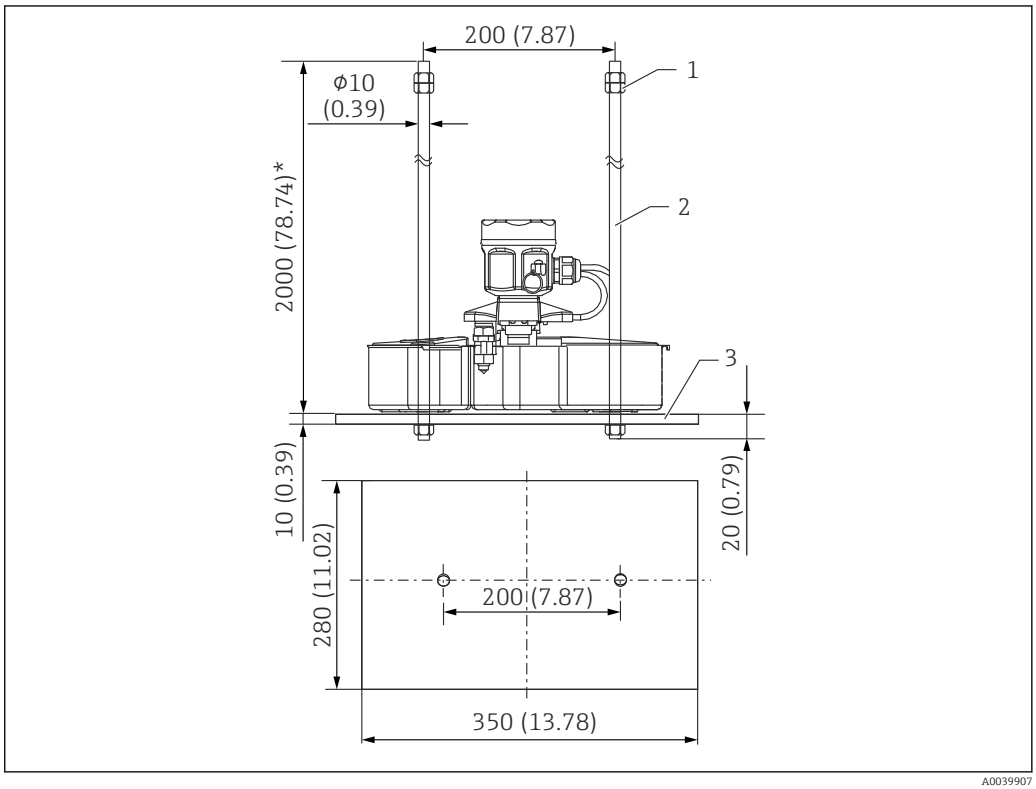


16 *Handling the NAR300*

5.3.2 Float guide mounting

NAR300 may be mounted on a float guide that has been installed for existing products (CFD10, CFD30, UFD10, NAR291, NAR292).

If the float guide is shorter than 2 000 mm (78.74 in), either cut and use it or follow the protocol for when it is 2 000 mm (78.74 in) or longer and contact your Endress+Hauser Sales Center.



17 *NAR300/float guide*

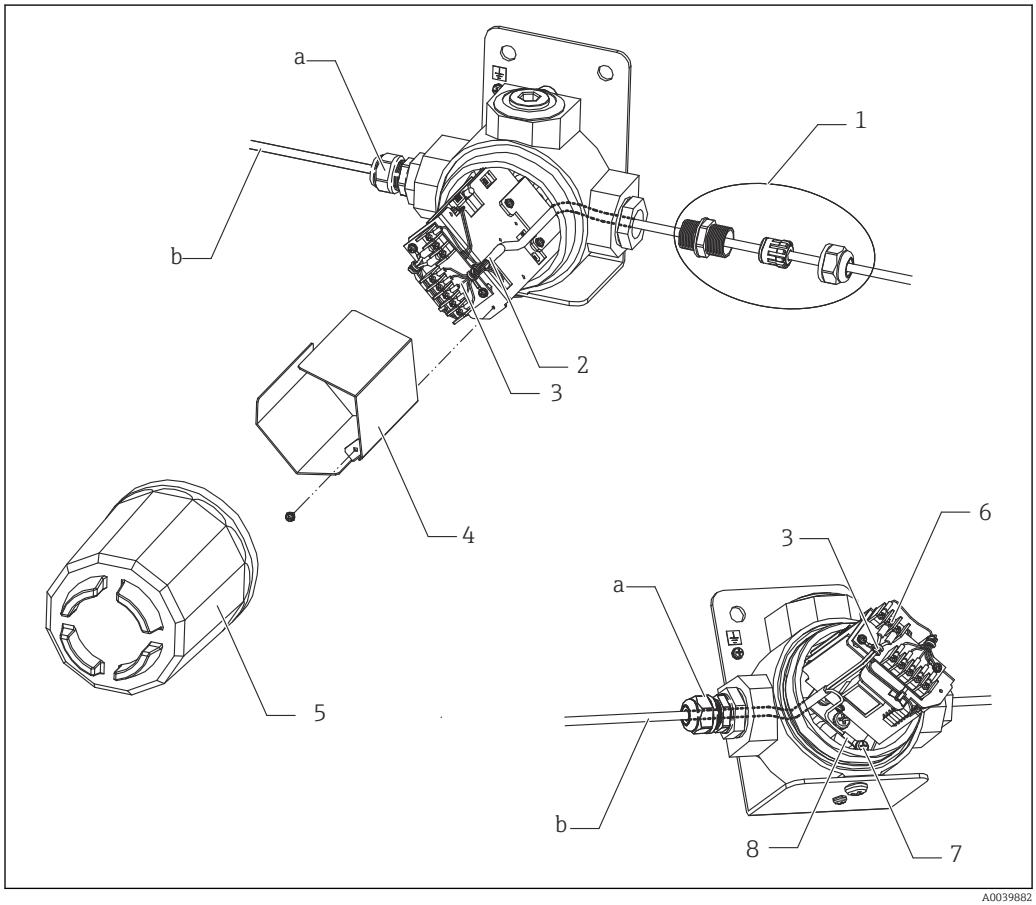
1 Nut (M10)
2 Float guide
3 Weight

5.3.3 NAR300-x6xxxx and sensor I/F Ex box cable mounting

Mounting procedure

1. Remove the intrinsically safe terminal box cover [5] and the circuit board guard [4].
2. Insert the float sensor cable [2] into the cable gland [1] and cable entry of the intrinsically safe terminal box.
3. Connect the cable to the terminal block (see "Electrical connection").
4. Tighten the main unit of the cable gland and the seal nut.
   ↳ Tightening torque (main unit and seal nut): approx. 1.96 N·m (20 kgf ·cm)
5. Insert the NRR262/NRR261 connection cable into the cable entry of the terminal box, and connect it to the terminal block.
6. Secure the cable in place with a cable holder [3].
7. Install the circuit board guard and close the cover of the intrinsically safe terminal box.

This completes the mounting procedure.



18 *NAR300-15xxxx and sensor I/F Ex box cable mounting*

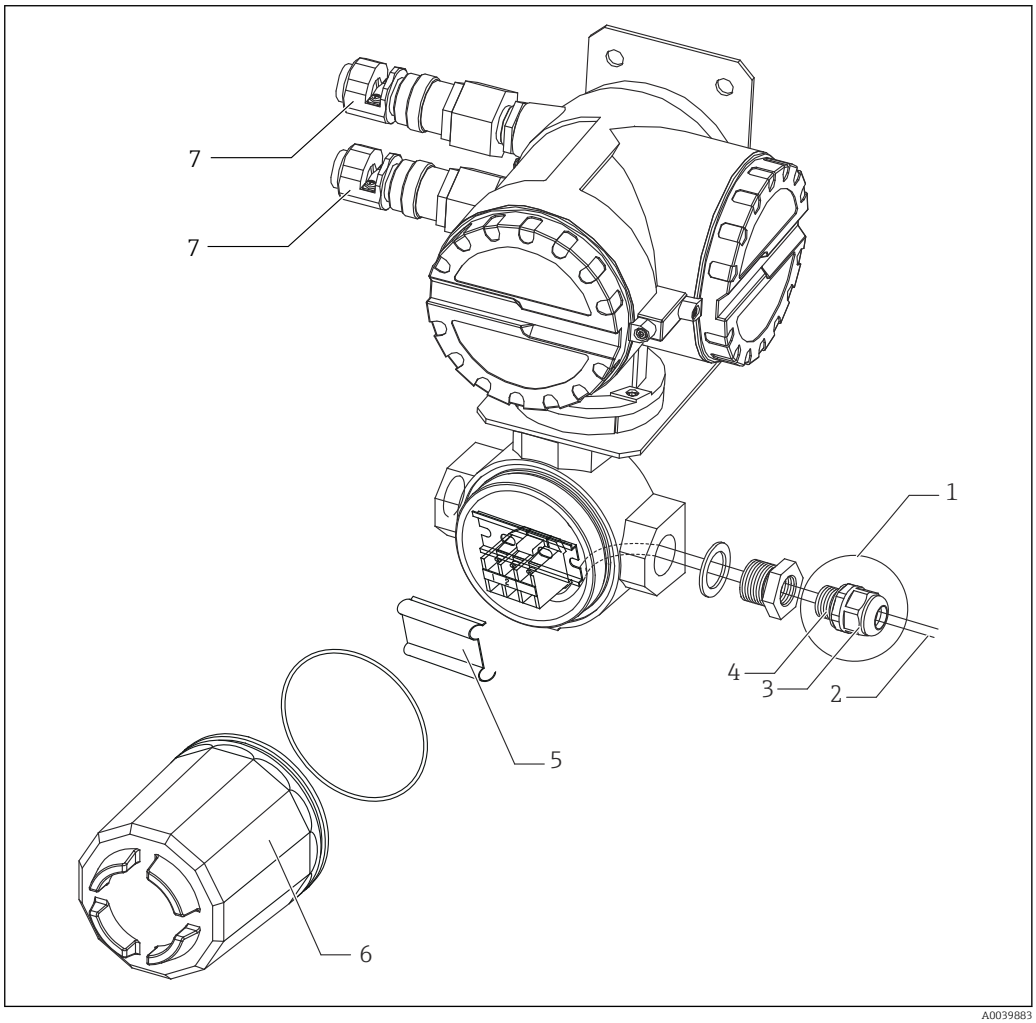
a Cable gland (must be procured separately)
b Shielded cable for NRR261/262 (must be procured separately)
1 Cable gland
2 Float sensor cable
3 Cable holder
4 Circuit board guard
5 Intrinsically safe terminal box cover
6 Shielded cable thread (M3)
7 Thread (M5)
8 Shielded cable gland

5.3.4 NRR261-3/5xx cable mounting

Mounting procedure

1. Remove the intrinsically safe terminal box cover [6] and the terminal block cover [5].
2. Insert the float sensor cable [2] into the cable gland [1] and cable entry of the intrinsically safe terminal box.
3. Connect the cable to the terminal block (see "Electrical connection").
4. Tighten the main unit of cable gland [4] and the seal nut [3].
   ↳ Tightening torque (main unit and seal nut): approx. 1.96 N·m (20 kgf cm)
5. Secure the cable in place with the cable holder.
6. Install the terminal block cover and close the intrinsically safe terminal box cover.

This completes the mounting procedure.



19 *NRR261-3xx cable mounting*

1 *Cable gland (supplied for TIIS/JPN Ex specifications only)*
2 *Float sensor cable*
3 *Seal nut*
4 *Cable gland main unit*
5 *Terminal block cover*
6 *Intrinsically safe terminal box cover*
7 *Cable gland (Ex d) (supplied for TIIS/JPN Ex specifications only)*

5.4 Adjustment

5.4.1 Verification of detection sensitivity in actual liquid

Verification of detection sensitivity when the lower layer is water and the upper layer is oil

If the electrode tip is pulled out of the lower-layer water due to increased thickness of the oil layer, water may cling onto the electrode tip like an icicle even if the electrode tip is in oil. In this case, detection sensitivity may increase by 1 to 2 mm. When an accurate detection check is required, apply a small amount of neutral detergent to the electrode tip to keep water from clinging to the electrode.

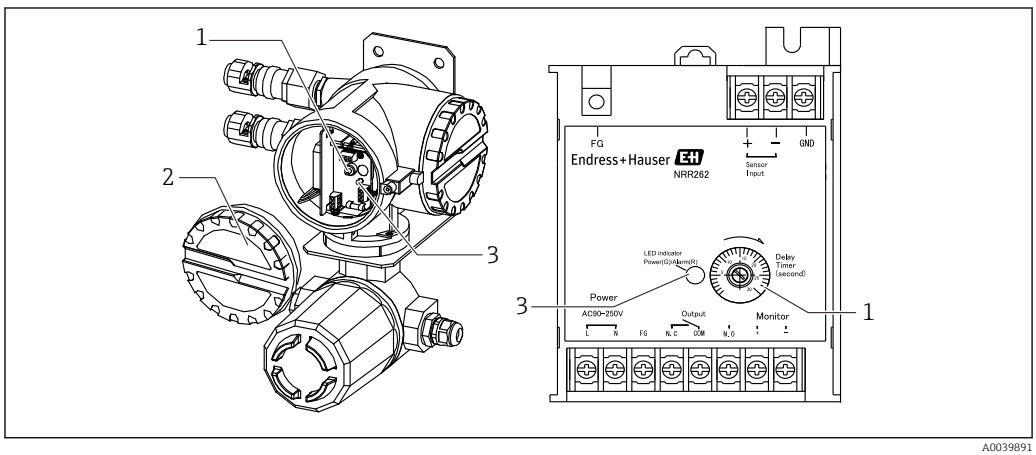
Verification of the oil layer thickness in a transparent container

Exercise caution as a reading error may occur due to the liquid's surface tension, liquid adhesion to the container wall, and for other reasons.

5.4.2 Alarm output adjustment

The only adjustment that can be made on the transmitter is the delayed activation time (ON delay) setting for the alarm output relay. Time is set on the delay trimmer. In NRR261, the delay trimmer can be found by turning off the power and opening the main unit's cover. In NRR262, the delay trimmer is found on the case surface. Match the setting to the necessary delay time in units of seconds. Delayed activation is used to prevent a false alarm by recognizing an alarm condition that continues over a certain period of time as an alarm while not outputting an alarm when the alarm condition stops within the delay time setting. This can be set to 30 seconds for the TIIS specification, and up to a maximum of 15 seconds for all other specifications.

- A response delay time in the detection circuit of approximately 6 seconds is always added to the delay time of the delay trimmer.
- Open the NRR261 main unit cover after the power has been turned off for at least 10 minutes.



20 *Alarm output relay*

1 *Delay trimmer*
2 *Cover*
3 *LED power (green) / Alarm (red)*

6 Electrical connection

Connect the external grounding terminal according to the "Class A grounding" standards (≤ 10 Ω) in the shortest implementable distance.

When using Ex [ia] float sensor NAR300 and Ex d [ia] transmitter NRR261, it is necessary to ground the NRR261 to a built-in safety barrier by following the procedure below (TIIS specifications only).

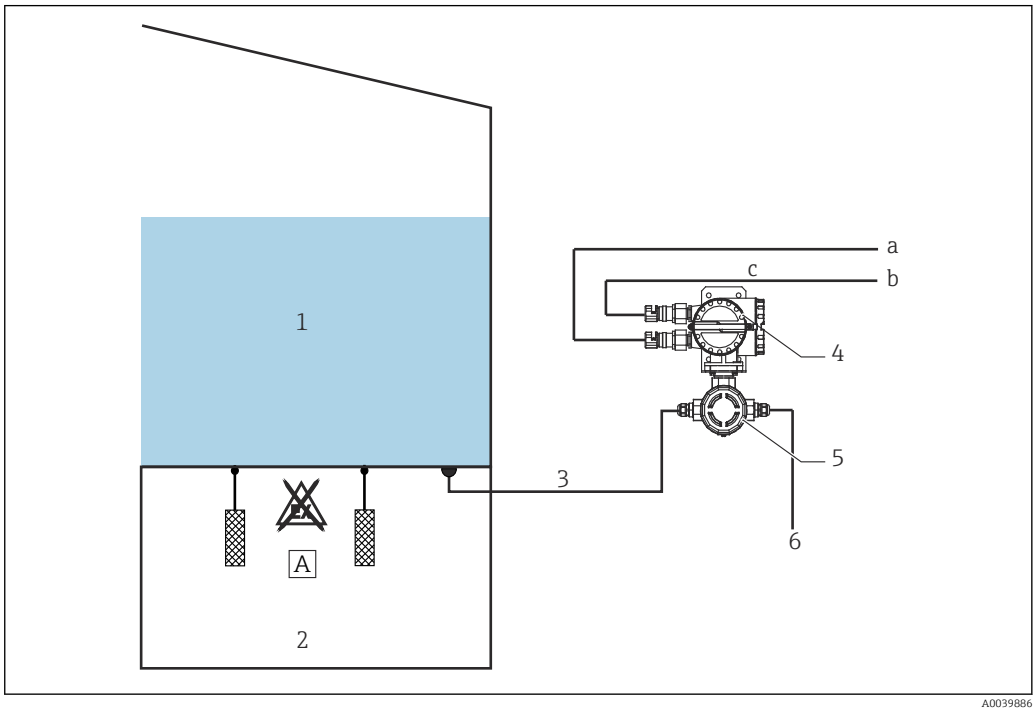
- The grounding cable for the safety barrier should be connected independently from grounding cables that are used for other purposes (lightning arrester), and it must be connected to a grounding point in accordance with "Class A grounding" standards in non-hazardous locations.
- Use a conductive grounding cable with a cross-sectional area of at least 2 mm^2. The communication cable shied of field devices with Class A grounding in an instrument room may also be used.

Class A grounding overview

Grounding resistance value	10 Ω
Grounding cable type	Metal cable with a tensile strength of at least 1.04 kN or an annealed copper cable with a diameter of at least 2.6 mm (0.1 in)

6.1 Procedure for wiring grounding cables

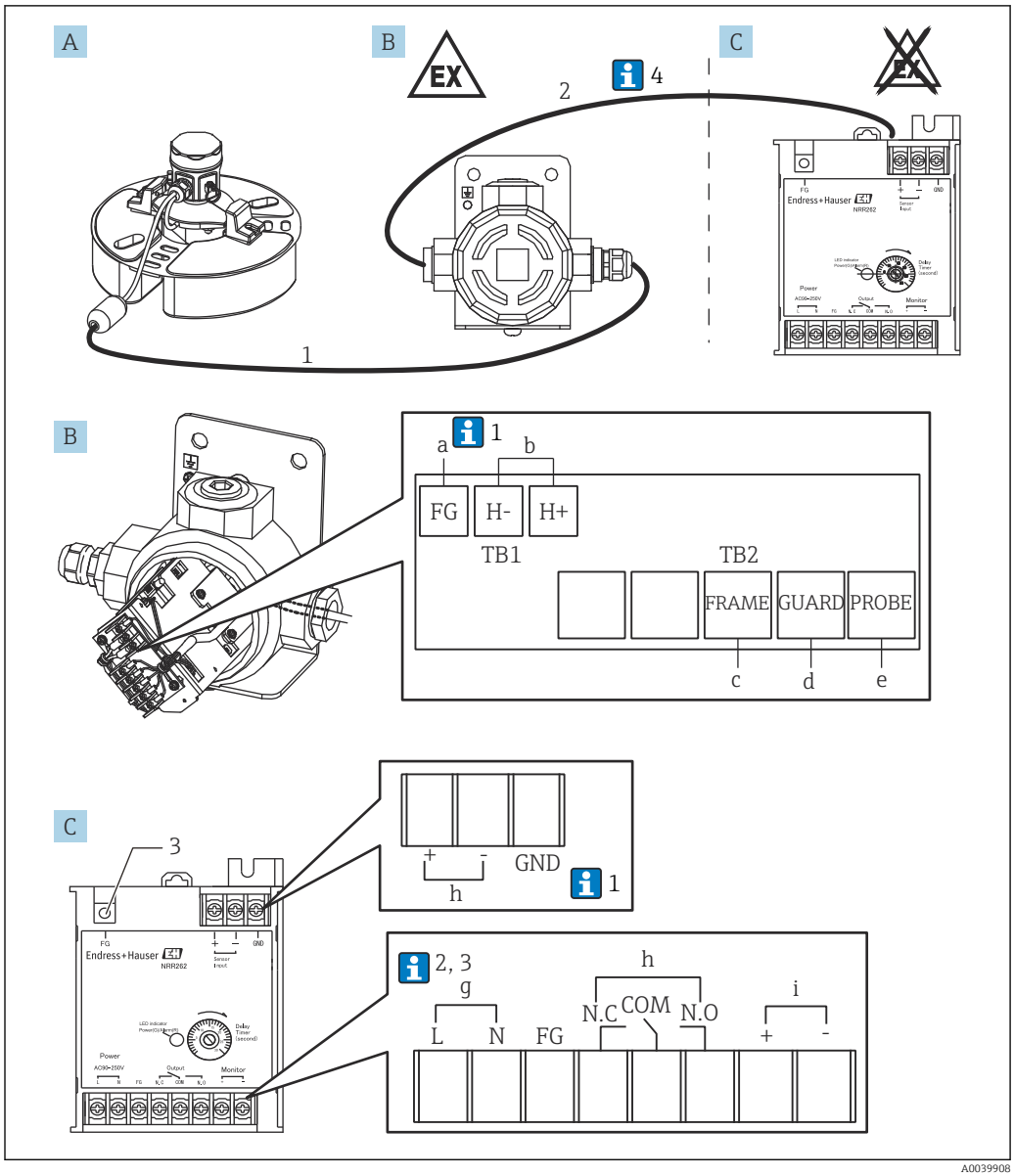
If performing Class A grounding from an Ex [ia] terminal instead of performing Class A grounding from an Ex d terminal, refer to the figure below.



21 Example of grounding transmitter NRR261

A Non-hazardous locations Class A grounding work (TIIS specification only)
a Power supply
b Alarm output
c Ex d line
1 Tank
2 Underground
3 Grounding cable (TIIS specification only)
4 Ex d side terminal
5 Ex [ia] side terminal
6 From float sensor NAR300

6.2 NRR262-2/4/A/B/C wiring



22 *Wiring of Ex [ia] transmitter NRR262-2/A/B/C*

A *Float sensor NAR300-x6xxxx (sensor I/F Ex box is also included in the code)*
B *Sensor I/F Ex box*
C *Ex [ia] transmitter NRR262*
a *Green/Thread (M3) (see 1 below)*
b *Output to NRR262/Thread (M3)*
c *Yellow/Thread (M3)*
d *Black/Thread (M3)*
e *White/Thread (M3)*
f *Input from sensor I/F Ex box/Thread (M3)*
g *90 to 250 V_{AC}50/60 Hz/Thread (M3)*
h *Alarm output/Thread (M3)*
i *Check monitor output/Thread (M3)*

1 *Ex [ia]-dedicated connection cable used (6 to 30 m (19.69 to 98.43 ft): Attached to the product depending on the option code)*
2 *Sensor I/F Ex box and NRR262 cable (must be prepared by the customer)*
3 *For Class A grounding for intrinsic safety/Thread (M4)*

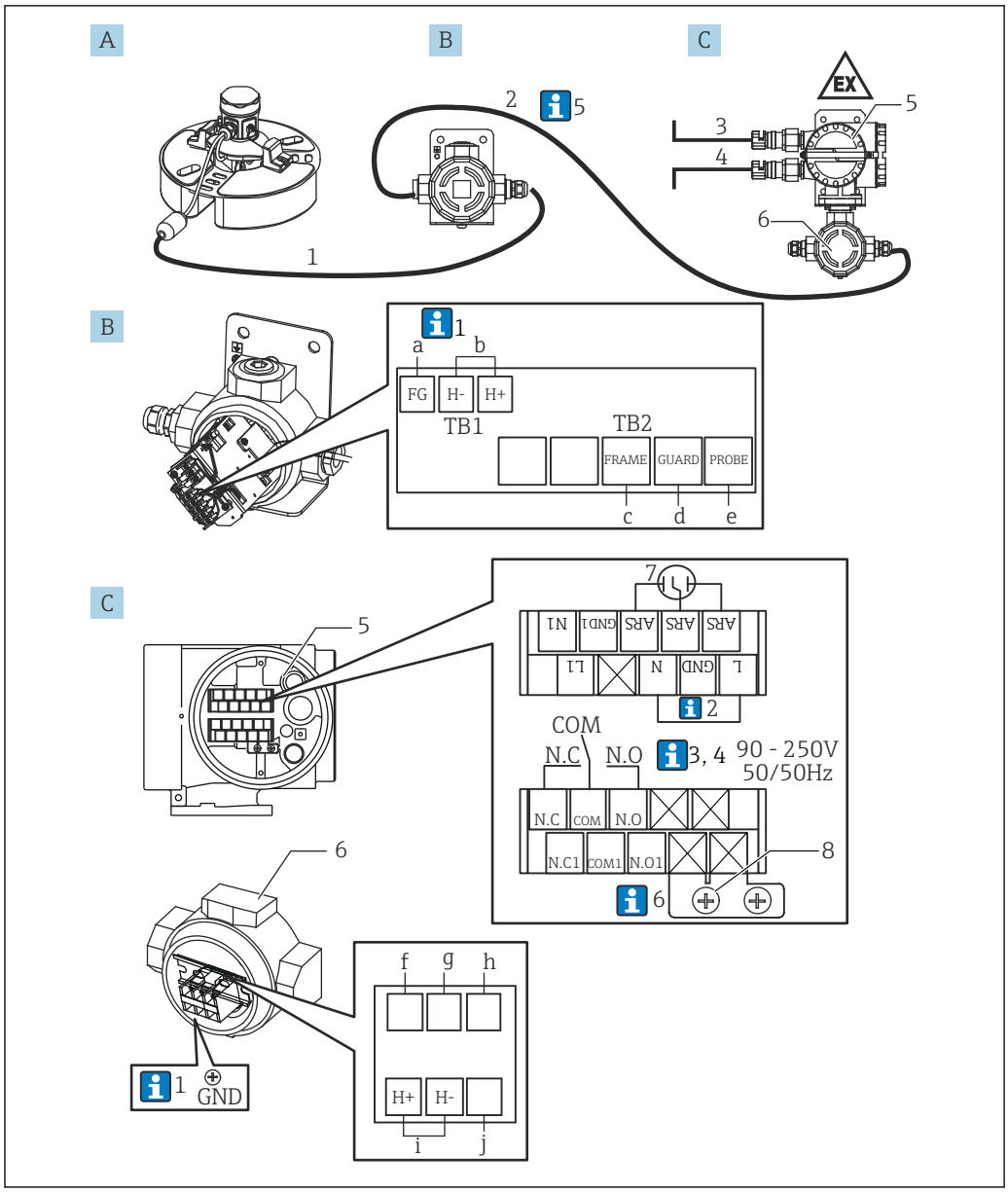
1. Normally, only the FG of a sensor I/F Ex box is shielded; however, depending on the installation environment, either the GND of NRR262 alone or both the FG of the sensor I/F Ex box and the GND of NRR262 are connected.

2. When using a 22 to 26 V_{DC} power supply, terminal number L is + (positive) and N is - (negative).

3. In order to maintain the Ex [ia] performance, ensure that the power supply voltage does not exceed 250 V_{AC} 50/60 Hz and 250 V_{DC} during normal time and abnormal time, respectively.

4. Although cable (1) that connects NAR300 and a sensor I/F Ex box is included with the device, a cable (2) that connects a sensor I/F Ex box and NRR262 is not included, and it must be prepared by the customer. For detailed information on the connection cables, see the "Process conditions" section.

6.3 NRR261-3/5 wiring



23 *Wiring of Ex d [ia] transmitter NRR261-3*

A *Float sensor NAR300-x6xxxx (sensor I/F Ex box is also included in the code)*
B *Sensor I/F Ex box*
C *Ex d [ia] transmitter NRR261 (separate type)*
a *Green/Thread (M3) (see 1 below)*
b *Output to NRR261-3xx/Thread (M3)*
c *Yellow/Thread (M3)*
d *Black/Thread (M3)*
e *White/Thread (M3)*
f *Blue 2/Thread (M4) (connected at the time of shipping)*
g *Blue 3/Thread (M4) (connected at the time of shipping)*
h *Blue 4/Thread (M4) (connected at the time of shipping) (TIIS specification only)*
i *Input from sensor I/F Ex box/Thread (M4)*
j *Class A grounding connection terminal (TIIS specification only)/Thread (M4)*
1 *Ex [ia]-dedicated connection cable used (6 to 30 m (19.69 to 98.43 ft): Attached to the product depending on the option code)*
2 *Sensor I/F Ex box and NRR261 cable (must be prepared by the customer)*
3 *Power supply: AC/DC*
4 *Alarm output: Alarm/PLC/DCS, etc.*
5 *Ex d terminal*

6 Intrinsically safe terminal
7 Power supply arrester (installed)/Thread (M3)
8 Green-yellow: FG safety barrier GND (for Class A grounding/TIIS specification only)/Thread (M4) (see 6 below)

1. Normally, only the FG of a sensor I/F Ex box is shielded; however, depending on the installation environment, either the GND of NRR262 alone or both the FG of the sensor I/F Ex box and the GND of NRR262 are connected.

2. It is connected when an FG-equipped AC cable is used.

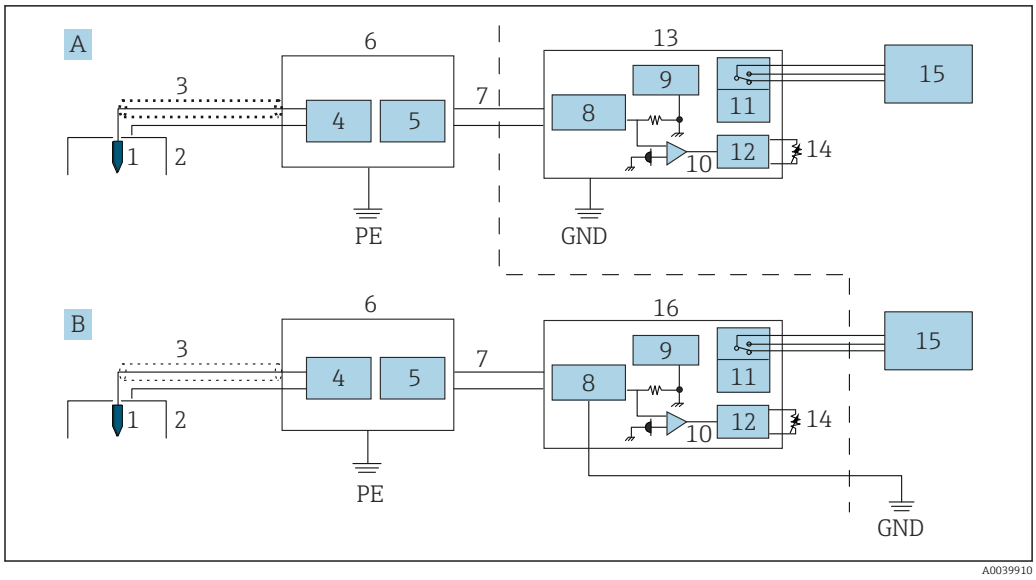
3. When using a 22 to 26 V_{DC} power supply, terminal number L is + (positive) and N is - (negative).

4. In order to maintain the Ex [ia] performance, ensure that the power supply voltage does not exceed 250 V_{AC} 50/60 Hz and 250 V_{DC} during normal time and abnormal time, respectively.

5. The cable (1) for connecting NAR300 and sensor I/F Ex box is included with NAR300. The cable (5) connecting the sensor I/F Ex box to the NRR261, the alarm output cable (2) from the NRR261, as well as the power cable (3) to the NRR261 are not included and must be prepared by the customer. For detailed information on the connection cables, see the "Process conditions" section.

6. Perform Class A grounding work at a non-hazardous location using one of the FG safety barrier GNDs on terminal number 8 or i (TIIS specification only).

6.4 Wiring diagram



24 *Wiring diagram*

A Ex d-type transmitter system (integrated type)
B Intrinsically safe-type transmitter system (separate type)
PE Protection earth (protective grounding)
GND Class A grounding (TIIS specifications only)
1 Conductivity detection electrode (sensor)
2 Conductivity detection electrode (float)
3 Dedicated cable
4 Conductivity detection circuit
5 Current output circuit
6 Sensor I/F Ex box
7 Current signal
8 Safety barrier
9 Power supply circuit
10 Current sensor
11 Relay
12 Delay circuit
13 Transmitter NRR262
14 Delay trimmer
15 Alarm
16 Transmitter NRR261 (separate type)

Although a Class A grounding cable can be shared with grounding of other safety barriers, it cannot be shared with grounding of a lightning arrester.

6.5 Operating principles of alarm activation

The oil leak detection signal detected by the NAR300 float sensor is converted to a power signal in the transmitter or the sensor I/F Ex box. After this, it is connected to the current detection circuit via the Ex [ia] safety barrier in the transmitter. In the current detection circuit, the presence or absence of an oil leak alarm signal is determined by the magnitude of electrical current values, and the alarm output relay is turned on or off by the operation delay circuit.

The delay time can be set, and there is a trimmer for setting the delay time in the alarm delay circuit. A fail-safe function is available in the relay contact output (refer to the following table).

Between terminals	**NRR262 between NC and COM**	**NRR262 between NO and COM**
Condition	**NRR261 between NC and COM terminal No. 11, 13**	**NRR261 between NO and COM terminal No. 13, 15**
Non-alarm	Contact point is open	Contact point is closed
Oil leak alarm	Contact point is closed	Contact point is open
Power OFF		
Frozen liquid		

The high-temperature sensor is exclusively for use in the presence of water; an alarm will be activated in an empty pit.

NAR300 current value	
Non-alarm	12 mA
Oil leak alarm	16 mA
Other trouble	< 10 mA or 14 mA <

7 Troubleshooting

7.1 Fail-safe (alarm is output when there is no oil leak)

There is a risk of an alarm being output due to the following causes even if there is no actual oil leak.

Item	Description
Frozen pit water	An alarm is activated when the pit water freezes and the conductive sensor recognizes it as an insulator.
Tilted float sensor	When the conductive sensor is tilted so much that it is no longer submerged in water while it is floating on pit water, an alarm is activated because it recognizes insulating air.
Empty pit	An alarm will always be activated in an empty pit.
Sensor buried in mud	When the float sensor becomes buried in mud and the mud dries out and hardens, an alarm is activated.
Essentially pure water in pit	In pit water with a large electrical resistance value, such as drain water, the conductive sensor detects it as an insulator, thereby activating an alarm.

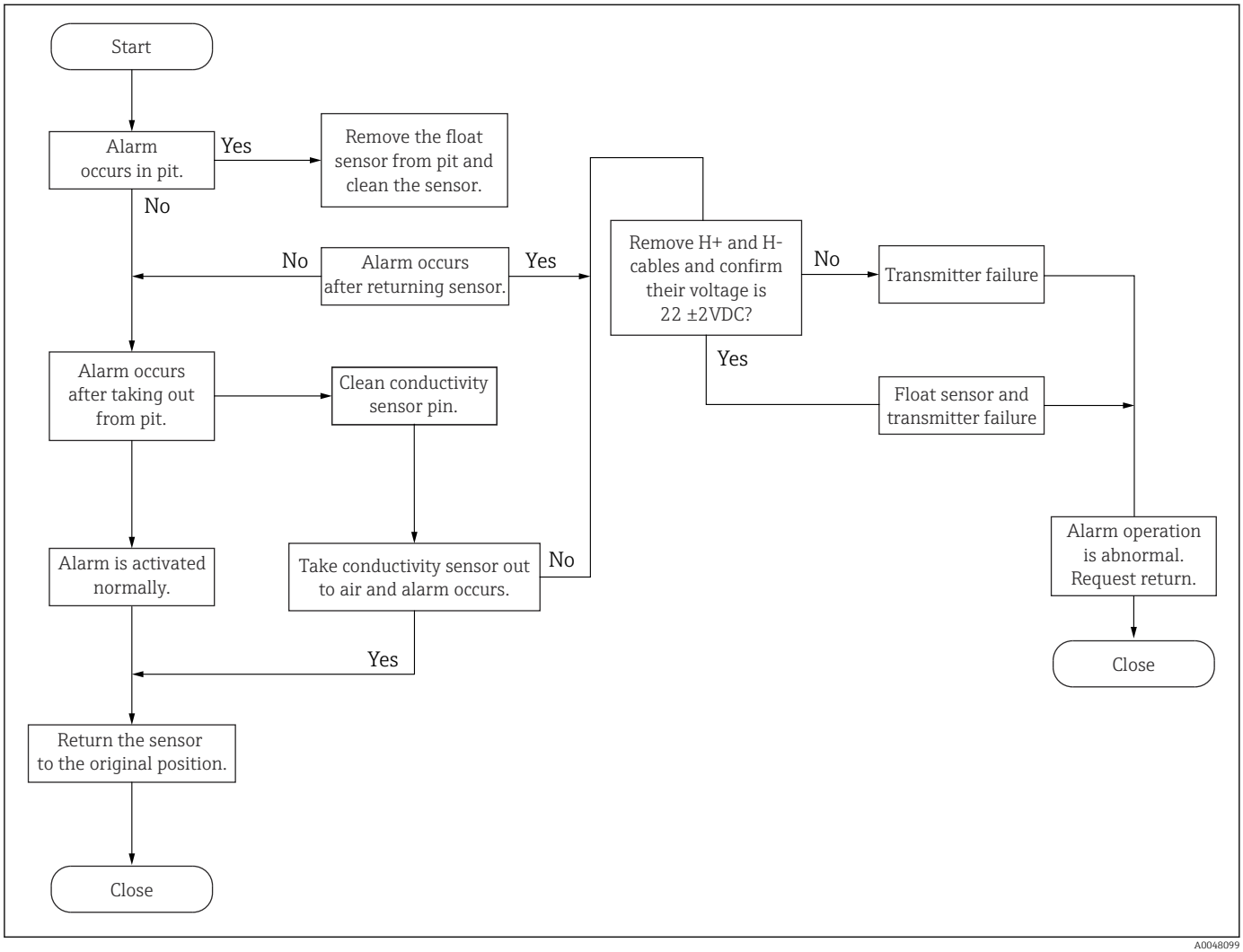
7.2 Delayed alarm (alarm is not output when there is an oil leak)

There is a risk of an alarm not being output due to the following causes even if there is an oil leak.

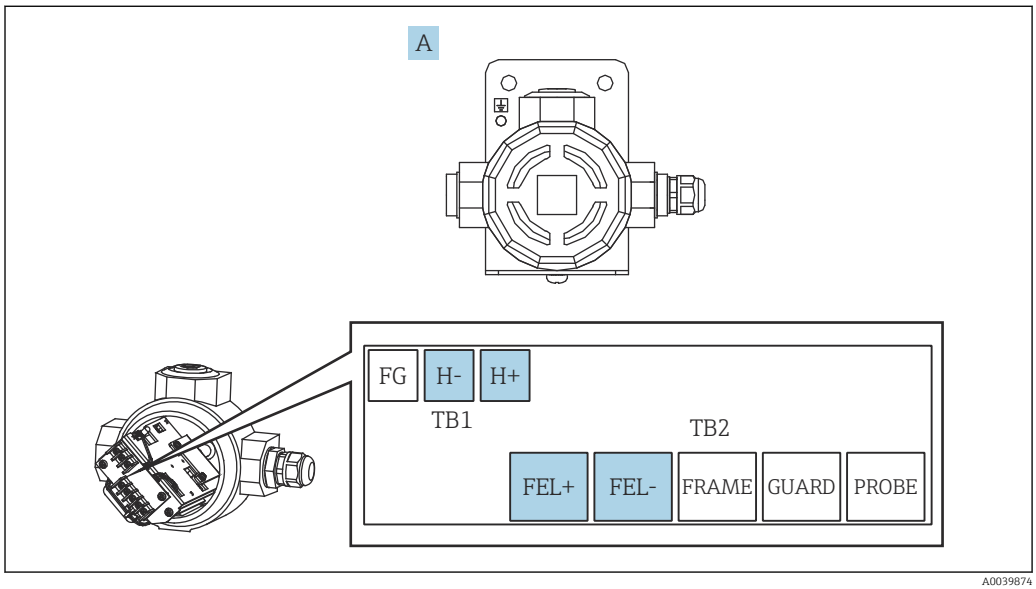
Item	Description
Waves and cross-currents on the liquid surface	If the oil layer and the pit water are not stable due to strong waves on the surface of leaked oil caused by wind, etc., the conductive sensor will detect the pit water and therefore will not activate the alarm.
Tilted float sensor	When the float sensor tilts most of the way to one side due to snow, an animal on the float sensor, or a cable/chain becoming tangled, the conductive sensor detects the pit water under the oil layer and no alarm is issued.
Sunk float sensor	If snow, garbage or an animal lands on the float, the float will sink and the conductive sensor will detect the pit water under the oil layer, and no alarm will be activated.
Moist garbage, etc.	If moist garbage or algae comes in contact between the conductive sensor and the earth (such as the float's main unit or the ground) and generates conductivity, an alarm will not be activated.
Oil leak during snowfall	If there is snow floating on the oil layer surface, the water from melted snow will be recognized as water by the conductive sensor, and an alarm will not be activated.
Oil leak during snowfall	If there is snow floating on the oil layer surface, the water from melted snow will be recognized as water by the conductive sensor, and an alarm will not be activated.

7.3 Operation check

7.3.1 Operation check flow diagram



Prior to performing an alarm operation check, take preemptive measures to ensure that the alarm system will not be impacted even if an oil leak alarm is activated. Refer to the previous section "Operation check flow diagram" for how to perform an operation check. The following diagram shows the voltage check point that was described in the flow diagram.



25 *Intrinsically safe terminal box*

A Sensor I/F Ex box
H- Blue
H+ Blue
FEL+ Red
FEL- Blue

7.3.2 Transmitter/alarm system problems

Item	Description
LED is lit red: Normal alarm activation	An alarm is activated even if the sensor voltage has not been detected. Replace the transmitter if there is no problem with the wiring between the transmitter and the sensor I/F Ex box.
LED is lit green: There is no alarm signal from the sensor	If an alarm has been activated under this condition, investigate the resistance values of the transmitter's alarm output terminal in the following order: 1. Turn off the power supply to the alarm activation system. 2. Disconnect the alarm output wire from the transmitter. 3. Check to ensure that the LED is continuously lit green. 4. Measure the resistance between 1: COM and NO and 2: COM and NC. The transmitter is normal if 1: 0 Ω (short) and 2: several MΩ or higher (open). Otherwise, replace the transmitter.
LED is not lit: The transmitter is not turned on	If there is rated voltage between terminal L and N on the transmitter, replace the transmitter. If the voltage cannot be measured between the L and N terminals, check the power supply or the power cable.

7.3.3 Cleaning the conductive sensor unit

Normally, NAR300 checks the conductivity state between the tip of the electrode and the main unit of the float. With conductivity, it determines that there is "water" and without conductivity, it determines that there is "oil or air." Since the electrode holder is connected to the main unit of the float, if the holder becomes conductive, it determines that "water" is present, thereby preventing the alarm from being activated and causing erroneous operation. Clean the space between the tip of the electrode and the holder periodically to maintain non-conductivity.

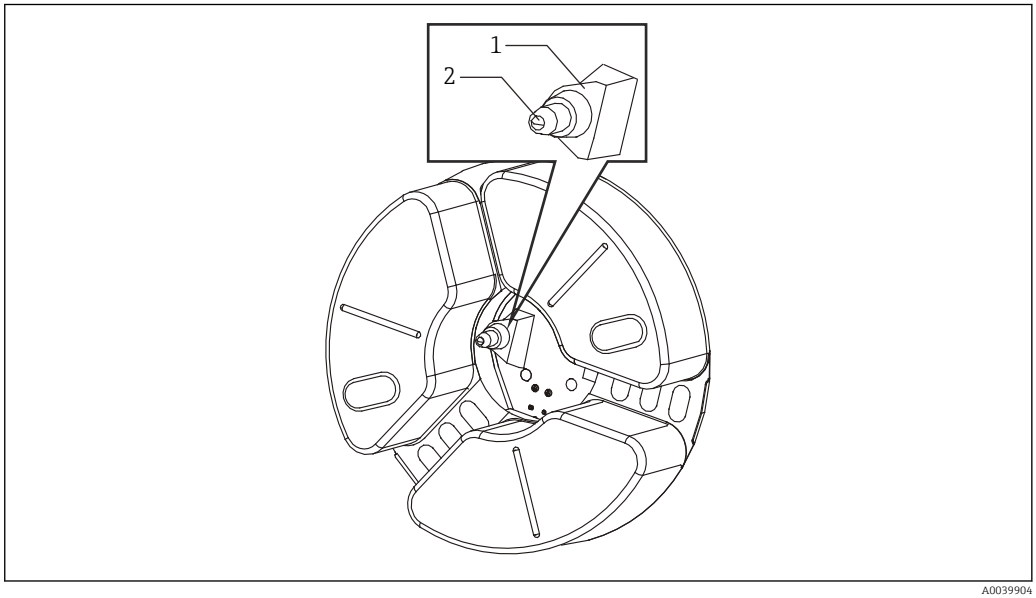
Items to prepare

- Rag
- Mild detergent

Cleaning procedure

1. Remove the NAR300 sensor from the pit.
2. Clean from the tip of the conductive sensor's electrode (metal portion) to the electrode holder (metal portion), and remove any moss, algae or dust.
3. Clean the entire electrode using a mild detergent that has been diluted to a suitable concentration.

This completes the cleaning procedure.



26 Sensor cleaning

1 Electrode holder
2 Electrode tip

7.4 Firmware history

Date	Software version	Changes	Documentation		
			Specifications	Operating instructions	Technical information
11.2003	V1.40	Initial software	Standard	BA027N/08/ja/02.04	TI045N/08/ja/01.05
04.2015	V1.50	SIL2 obtained	High-temperature	BA00403G08JA06.16	TI00457G08JA04.16

8 Maintenance

8.1 Maintenance work

No special maintenance work is required.

8.1.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the seals.

8.1.2 Periodic inspections

While the NAR300 float sensor is not easily affected by deposits or adhered material, conduct overall periodic inspections of the cable and wiring, etc., semi-annually along with an operation check as follows.

- A clogged sensor or debris, foreign substances, moss, etc. in the pit may cause faulty operation. Inspect and clean periodically. Cleaning sensor using a soft, damp cloth.
- Periodically remove debris, sand, or snow that has accumulated on the float sensor. These substances may lower the draft line, which hampers sensitivity.
- Confirm that NAR300 functions normally after inspecting cable and wiring for damage.

8.2 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

Your Endress+Hauser Sales Center can provide detailed information on the services.

9 Repair

9.1 General information on repairs

9.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser Service Department or specially trained customers.

Spare parts are contained in suitable kits. They also come with relevant replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

9.1.2 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, Safety Instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry out the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

9.2 Spare parts

Some interchangeable device components are listed on an overview sign in the connection compartment cover.

The spare part overview sign contains the following information:
- A list of the most important spare parts for the device, including their ordering information
- The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer):
  All the spare parts for the device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

9.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

Your Endress+Hauser Sales Center can provide detailed information on the services.

9.4 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the website for more information:
   http://www.endress.com/support/return-material
2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

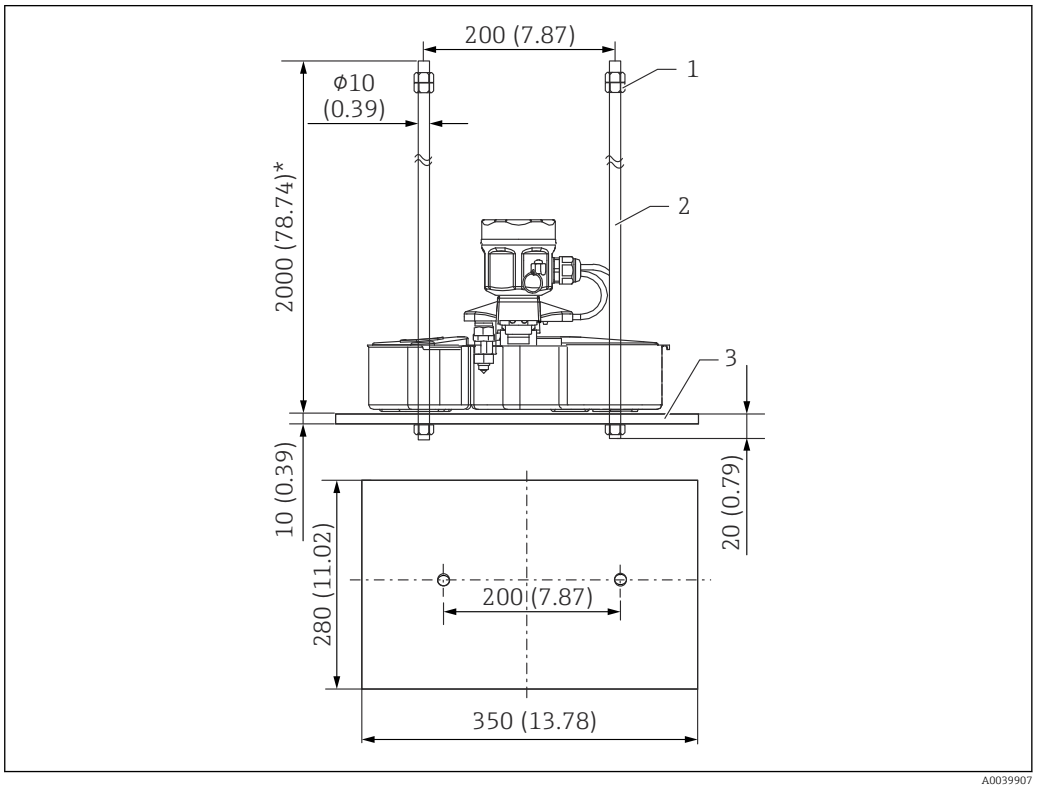
9.5 Disposal

Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

10 Accessories

10.1 Float guide

If you ordered a device that is equipped with a float guide, install the float horizontally. Remove any debris or stones so that the float sensor can land horizontally. The standard length of a float guide is 2 m (6.57 in); however, if you need a different length, contact your Endress+Hauser Sales Center.



27 Float guide

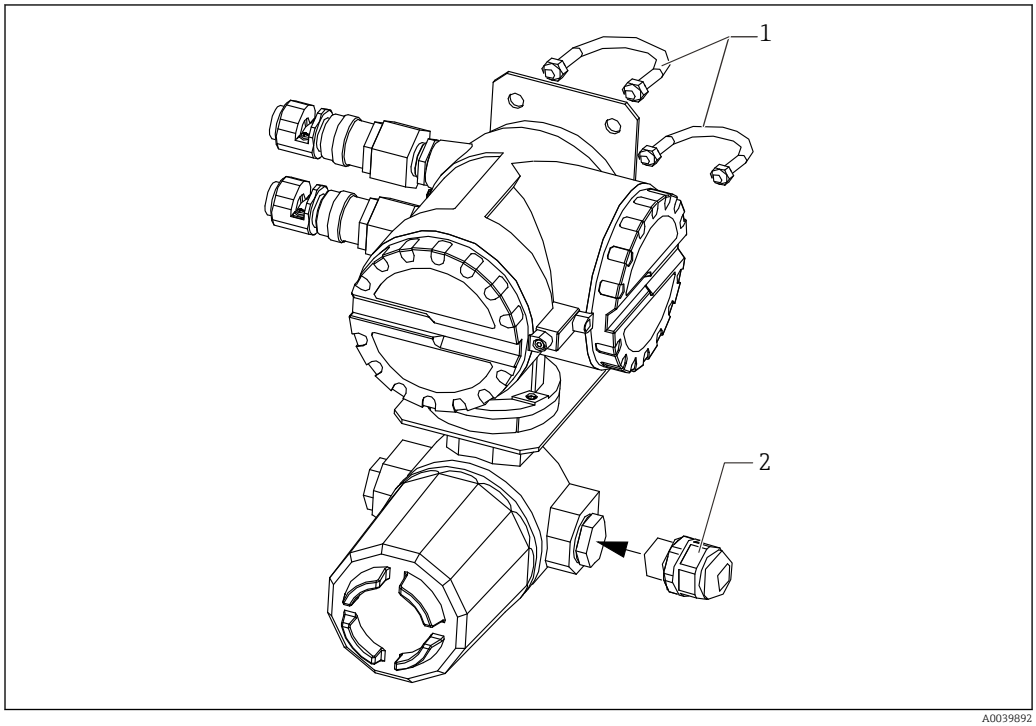
1 Nut (M10)
2 Float guide
3 Weight

Name	Delivered quantity	Materials
Float guide	2	SUS304
Weight	1	Selectable as options from SS400 or SUS304
Nut (M10)	6	SUS304

10.2 U-bolt/cable gland (waterproof connection)

The U-bolt (JIS F3022 B50) is used when mounting a transmitter. Have a spare 50A (2B φ60.5 mm (198.5 in)) pipe ready. Tighten and secure the cable gland after inserting the cable from NAR300.

The pressure-resistant packing cable gland is supplied for the TIIS/JPN Ex specification only. Always use this cable gland.



28 U-bolt/cable gland

1 U-bolts (JIS F 3022 B50)
2 Cable gland (waterproof connection)

Name		Delivered quantity	Materials
U-bolt		2	Iron (chromate)
U-bolt accessory	Nut	4	
	Flat washer	4	
Cable gland (waterproof connection)		1	Nylon

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