



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

Oil Leak Detector NAR300 System High Temperature

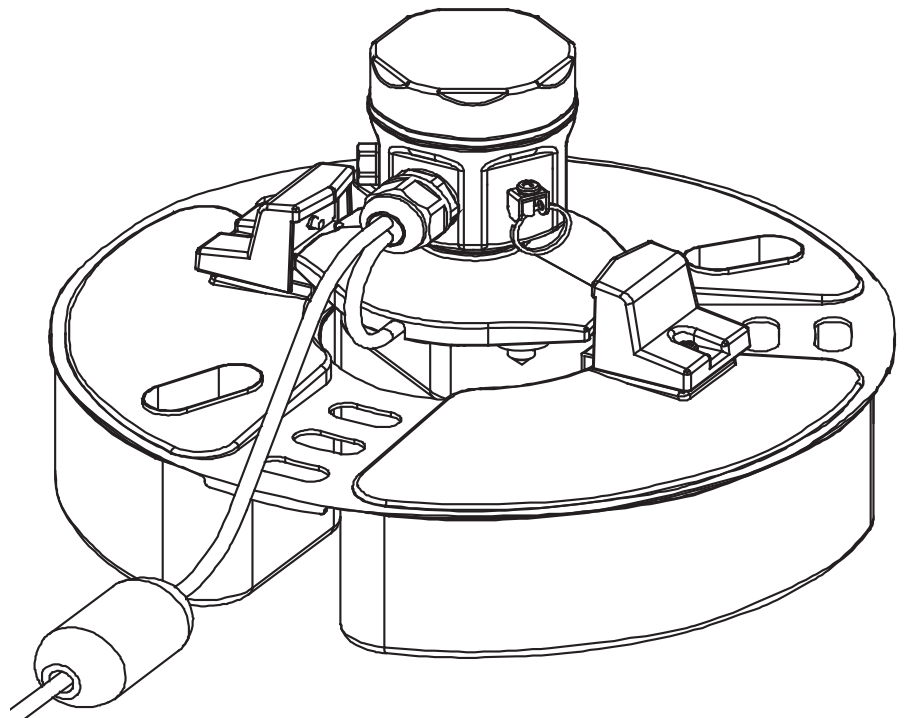


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1 Safety Instructions

1.1 Designated Use

This system exhibited improved performance even in harsh conditions, such as when set up in a pit, dike, plant, or even a sump pit near a pump yard, where it provides the ultimate in leak detection function for petrochemicals or vegetable oils.

This system for high temperature is also suitable for a pit using steam draining conduit for anti freezing and high temperatures ($\leq 100^{\circ}\text{C}$). The accurate and minimal equipment configuration ensures safe operation of the tank yard.

1.2 Installation, Commissioning, and Operation

- Mounting, electrical installation, start-up, and maintenance of the instrument may only be performed by trained personnel authorized by the operator of the facility.
- Personnel must read and understand these installation instructions before performing the procedures.
- The instrument may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual must be observed.
- The installer must make sure that the measuring system is correctly wired according to the wiring diagrams. The measuring system must be grounded.
- Observe all law and regulations applicable and valid for your country and pertaining to the opening and repairing of electrical devices.

1.3 Product Requirements

Power Source

Check the voltage of the power supply before connecting it to the product. It should be the exact voltage required for proper operation of the product.

Connection to Other Devices

It is possible to connect to other devices explained in this instruction. Refer to each operation instruction when connecting to devices.

Ground

Do not remove earth terminal or earth wire when the power is on.

Power Cable

Use a power cable specified by our company. The product should be protectively grounded before it is connected to a measurement object or an external control circuit.

1.4 Operational Safety

Hazardous Area

- Use the explosion proof type for measurement in areas where explosion hazards are present.
- Devices installed in areas having explosion hazards must not be opened when the power is on.
- Strict compliance with installation instructions and - ratings, as directed in this supplementary documentation, is mandatory.
- Device maintenance and repair is restricted to meet explosion proof regulations.
- Tighten the cable gland firmly.
- Devices employed in areas having explosion hazards should be installed and wired in keeping with explosion proof regulations.
- Ensure that all personnel are properly qualified.
- Observe the certification requirements as well as national and local regulations.














Caution!

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.5 Notes on Safety Conventions and Symbols

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding symbol in the margin.

Safety Conventions	
	Warning! A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument
	Caution! Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument
	Note! A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned
Explosion protection	
	Device certified for Use in Explosion Hazardous Area If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area
	Explosion Hazardous Areas Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation “explosion hazardous areas” must conform with the stated type of protection.
	Safe Area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas
Explosion protection	
	Direct Voltage A terminal to which or from which a direct current or voltage may be applied or supplied
	Alternating Voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied
	Grounded Terminal A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system
	Protective Grounding (earth) Terminal A terminal which must be connected to earth ground prior to making any other connection to the equipment
	Equipotential Connection (earth bonding) A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice

2 Identification

2.1 Device Designation

2.1.1 Nameplate

The following technical data are given on the instrument nameplate:

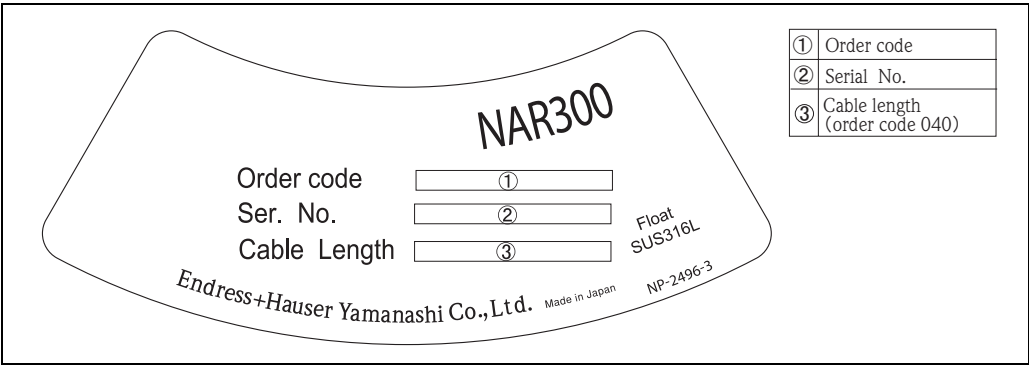


Figure. 1: Float Sensor NAR300




Figure. 2: High Temperature Type (NAR300-16xxxx)

NRR262-2x

NRR262

Endress+Hauser



Order code

Ser. no.

①

②

変換器 / Converter : (Order Code 参照) / (Refer to Order Code)

防爆性能 / Protection class : [Ex ia] IIB

本安回路 / Intrinsically safe circuit :
Uo = 28 V, Io = 93 mA, Po = 0.65 W, Co = 0.083 μF, Lo = 3.05 mH

非本安回路 / non Intrinsically safe circuit :
電源 / Power supply: ③
許容電圧(Um) : AC 250 V 50/60 Hz, DC 250 V

周囲温度 / Ambient temperature : -20 ~ +60 °C


製造日 / Manufacturing date: ④

注意 :

- ・ NRR262は、非危険場所に設置してください。
- ・ 機器内部の部品及び配線の変更、改造等を行わないでください。
- ・ 防爆注意事項説明書 (Ex581-838XJ) を参照してください。

Note :

- ・ NRR262 must be installed in non-hazardous area.
- ・ Do not modify internal parts or circuits.
- ・ Refer to Ex-instruction manual (Ex581-838XJ).

△ → 

IP20

エンドレスハウザー山梨株式会社

Endress+Hauser Yamanashi Co.,Ltd.

Yamanashi 406-0846

Made in Japan

NP - 2573-2


①	Order code
②	Serial No.
③	Power supply
④	Manufacturing date

Figure. 3: Ex [ia] Transmitter, Separate Type (NRR262-2x)

NRR261-3xx

NRR261

Endress+Hauser



Order code

Ser. no.

①

②

変換器 / Converter

防爆型式 / Ex model : NRR261-3 ③

防爆性能 / Protection class : Ex d[ia] IIB T4

本安回路 / Intrinsically safe circuit
Uo = 28 V Io = 93 mA Po = 0.65 W
Co = 0.083 μF Lo = 3.05 mH

非本安回路 / Non Intrinsically safe circuit
電源 : ④
Power supply:
許容電圧 : AC 250 V 50/60 Hz, DC 250 V
Maximum voltage(Um):

周囲温度 / Ambient temperature -20 ~ +60 °C


製造日 / Manufacturing date: ⑤

注意 :

- ・ 機器内部の部品及び配線の変更、改造等を行わないでください。
- ・ 許容温度70℃以上のケーブルを使用してください。
- ・ 容器の開放は、電源遮断後10分以上経過してから行って下さい。
- ・ 防爆注意事項説明書 (Ex581-832XJ) を参照して下さい。

Caution:

- ・ Do not modify internal parts or circuits.
- ・ Use heat-resistant cable 70°C or more.
- ・ Wait 10 minutes after power shut off when opening cover.
- ・ Refer to Ex-instruction manual (Ex581-832XJ).

△ → 

IP67

エンドレスハウザー山梨株式会社

Endress+Hauser Yamanashi Co.,Ltd.

Yamanashi 406-0846

Made in Japan

NP - 2572-2

①	Order code
②	Serial No.
③	Ex-proof model
④	Power supply
⑤	Manufacturing data

Figure. 4: Ex d [ia] Transmitter, Separate Type (NRR261-3xx)

Endress+Hauser

7

2.2 Order Information

2.2.1 NAR300

010	Approval:			
	1	Ex ia IIB T4, TIIS		
	9	Special version, TSP-no. to be spec.		
020	Type:			
	1	Float		
	2	Float, module set (Econounce NRR261 upgrade)		
	4	Float, Ex box (Econounce NRR262 upgrade)		
	5	Float, Ex box (separate type)		
	6	Float, high temperature, Ex box (separate type)		
	9	Special version, TSP-no. to be spec.		
030	Output:			
	A	2-wire current		
	Y	Special version, TSP-no. to be spec.		
040	Signal Cable:			
	A	6 m		
	B	10 m		
	C	15 m		
	D	20 m		
	E	25 m		
	F	30 m		
	Y	Special version, TSP-no. to be spec.		
050	Float Guide:			
	1	Not used		
	2	Guide 304, weight SS400		
	3	Guide 304, weight 304		
	9	Special version, TSP-no. to be spec.		
060	Cable Entry:			
	A	Not needed		
	B	G1/2		
	C	NPT 1/2		
	Y	Special version, TSP-no. to be spec.		
NAR300-				
Complete product designation				

2.2.2 Transmitter NRR261

010	Approval:			
	2	Ex d [ia] IIB T4, TIIS (NAR300)		
	3	TIIS, Ex d [ia] IIB T4 ((NAR300 separate type)		
	9	Special version, TSP-no. to be spec.		
020	Power Supply:			
	A	90-250VAC 50/60Hz		
	B	22-26VDC		
	Y	Special version, TSP-no. to be spec.		
030	Cable Entry:			
	A	G3/4 x 2 (Ex d)		
	B	NPT3/4 x 2 (Ex d)		
	D	M25 x 2 (Ex d)		
	E	G 3/4 x 2 (Ex d) , G 1/2 x 1 (Ex ia)		
	K	G 1/2 x 2 (Ex d) , G 1/2 x 1 (Ex ia)		
	Y	Special version, TSP-no. to be spec.		
NRR261-				
Complete product designation				

2.2.3 Transmitter NRR262

010		Approval:	
	2	Ex	ia IIB T4, TIIS (NAR 300)
	9		Special version, TSP-no. to be spec.
020		Power Supply:	
	A		90-250VAC 50/60Hz
	B		22-26VDC
	Y		Special version, TSP-no. to be spec.
NRR262-			Complete product designation

2.3 Scope of Delivery



Caution!

Refer to "3 Delivery Example of Each Order Code" for details on the unpacking, transportation and storage of measuring instruments.

The scope of delivery consists of:

- Assembled instrument

Accompanying documentation:

- Operating Instructions (this manual)
- Safety Instructions (XA)

2.4 Registered Trademarks

HART®

Registered trademark of HART Communication Foundation, Austin, USA

3 Delivery Example of Each Order Code

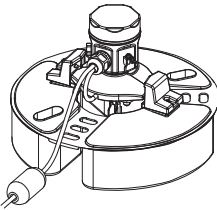

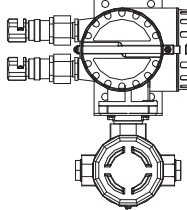
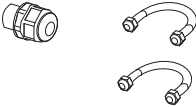
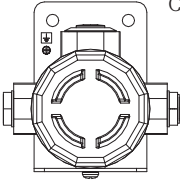
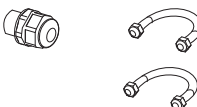
Float Sensor Order Code	Transmitter Order Code
NAR300 - 1 6 x x 2 or 3 x	NRR261 - 3 x x
<div><div>Float Sensor</div><div>Float Guide</div><div>Float Guide Bar (Packed Separately)</div><div>*1 Weight</div><div>*1 This weight packed in the bottom of the box with a transmitter.</div></div>	<div><div>Transmitter</div><div>Cable gland Mounting U Bolt</div><div>*2 Sensor I/F Ex Box</div><div>Cable Gland Mounting U Bolt</div><div>*2 Included in order code NAR300-15xxxx. Ex d[ia] system is used with Transmitter NRR261-3x.</div></div>

Figure 5: Delivery Example 1

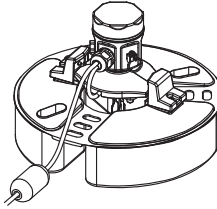
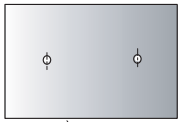
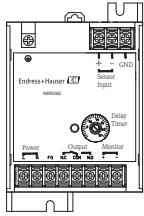
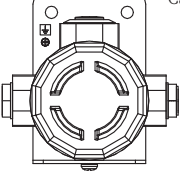
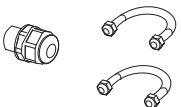
Float Sensor Order Code	Transmitter Order Code
NAR300 - 1 6 x x 2 or 3 x	NAR262 - 2 x
<div><div>Float Sensor</div><div>Float Guide</div><div>Float guide bar (Packed separately)</div><div>*1 Weight</div><div>*1 The weight is packed in the bottom of the box with a transmitter.</div></div>	<div><div>Transmitter</div><div>*2 Sensor I/F Ex Box</div><div>Cable Gland Mounting U Bolt</div><div>*2 Sensor I/F Ex box is included in the order code NAR300-16xxxx. Ex [ia] system is used with transmitter NRR 262-2x.</div></div>

Figure 6: Delivery Example 2

4 Operating Conditions

4.1 Pit Water

Not for Use in Sea Water Pits

Float Sensor NAR300 is not designed for use in sea water. Used in sea water may result in the following malfunction:

- Alarm output failure when overturned by waves
- Salt content may cause a short between float sensor and probe, resulting in alarm delay
- Failure due to sea water corrosion

Pits with Liquids Other than Water

If float sensor is used in certain liquids such as a solvent blend, it may be damaged by corrosion.

Pit Water with High Electrical Resistance

If float sensor is used in water having high electrical resistance, such as in a steam drain or in pure water, an alarm may be triggered. Electric conductivity should be $\geq 10 \mu\text{S/cm}$ and $\leq 100\text{k}\Omega \cdot \text{cm}$.

Example:

Pure water - 1 to $0.1 \mu\text{S/cm}$ (1 to $10\text{M}\Omega \cdot \text{cm}$)

Freezing Pit Water

If ice forms in the pit, the alarm may be triggered (fail-safe function).

Implement countermeasures to prevent freezing.

4.2 Gasolin Application

For using gasolin application, special specification of NAR300 is required. Contact Endress+Hauser representatives for details.

5 Installation

5.1 Incoming Acceptance, Transport, and Storage

5.1.1 Incoming Acceptance

Check the packing and contents for any signs of damage.

Check the shipment, and make sure that nothing is missing and that the items match your order.

5.1.2 Transport



Caution!

Follow the safety instructions and conditions of transportation for instruments in excess of 18kg (40 lbs.).

5.1.3 Storage

Pack the measuring instrument so that it is protected against impacts during storage and transportation.

The original packing material provides the optimum protection for this.

The allowed storage temperature is -20°C to +60°C (-4°F to +140°F).

5.2 Installation

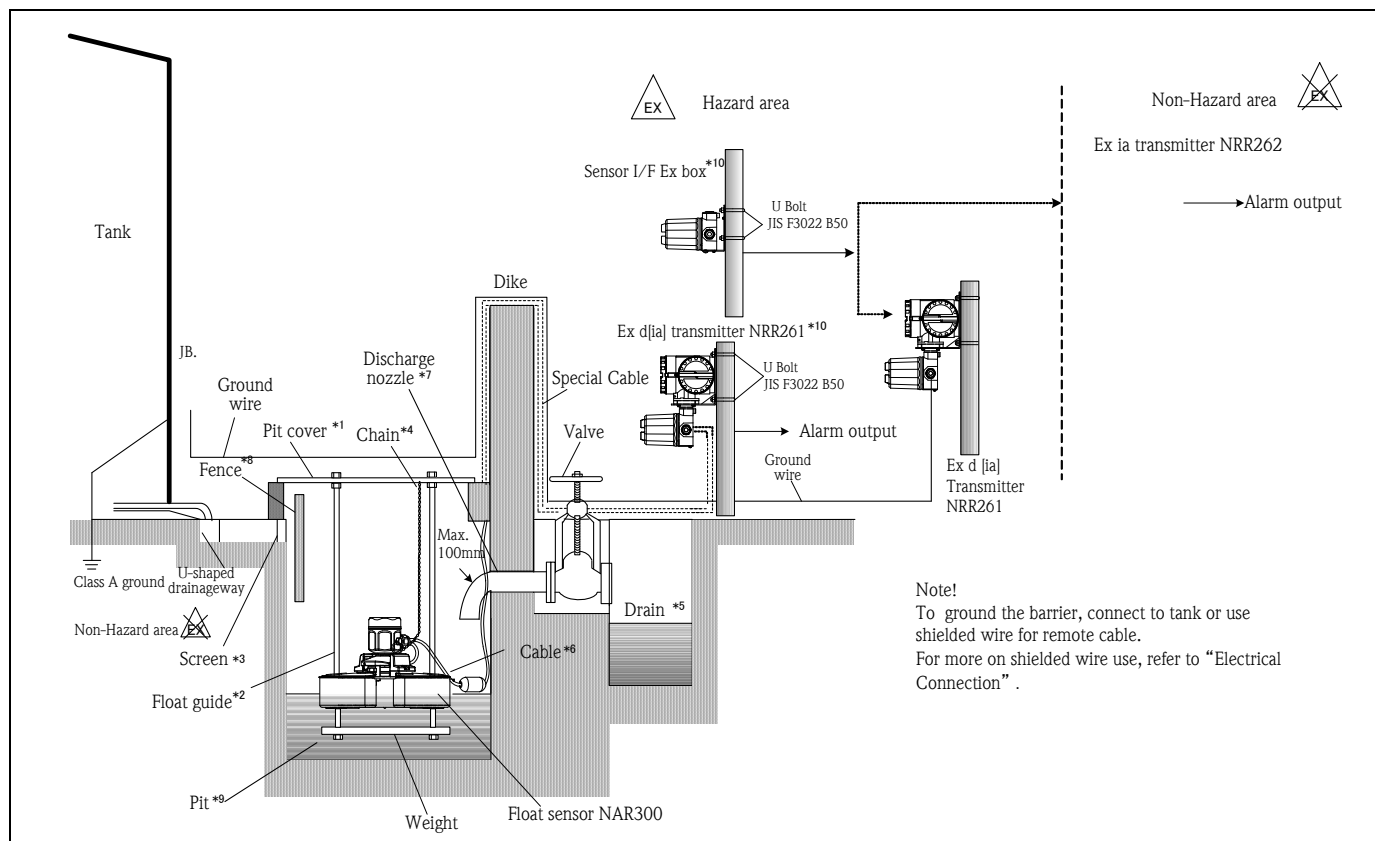


Figure 7: NAR300 + NRR26x

Cautionary Points regarding NAR300 System Installation and Setup

1. To prevent snow and debris from entering the pit, installing a rubbish guard, roof, or other covering is recommended. If snow is allowed to accumulate on float sensor, the draft line will rise 1 mm every 50g of snow accumulation, which reduces oil detection sensitivity. When external temperatures exceed 50 degrees (°C), install a sunshade to block direct sunlight. Mount covering above the top of the pit inlet to avoid submerging NAR300 during heavy rain fall. If the float sensor becomes submerged, it may cause malfunction or failure of NAR300.
2. NAR300 may fail to operate properly if it goes off balance or if NAR300 tips more than 3degrees. Use float guides as directed to keep system horizontally balanced and be sure that chains and cables are not tangled in the float or in the guides.
3. Installing a screen at the water inlet to prevent debris from entering the pit is recommended. Inspect and clean NAR300 system periodically to maintain optimal performance.
4. A lifting chain may be attached to the float sensor head for added inspection convenience. Chain weight should be 50g (grams) or less, exceeding this weight 50g may affect float sensor balance. When using chain to secure NAR300, do not forcibly pull on chain to inspect.
5. When the pit completely fills with water, an oil layer cannot form because it is overflowing from the pit. Drain water in time for an oil layer to form.
6. Do not forcibly pull or grab the sensor signal cable. Doing so may cause sensor to malfunction or cause waterproofing become fault.
7. Bend the top of the discharge nozzle downward 100mm or more so that the oil layer will form when the drain valve is kept open. 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 mentioned above, install a water fence or other such device so that oil will form a layer on the water surface.
8. Install a divider to prevent large waves, crosscurrents, or water from splashing onto the float sensor.
9. Dived the pit by using an oil partition if the pit is too wide. If the volume of oil outflow in proportion to surface area is too small, NAR300 will be unable to detect oil leakage.
10. Install NAR300, NRR261-3xx, and I/F Ex box at a minimum distance of 50cm away from each other.

5.3 Float Sensor NAR300

5.3.1 Handling Precautions



Caution!

Do not carry the float sensor by the cable shown on Figure 10. Be sure to hold NAR300 with both hands while carrying. Do not lift or hold by any of the components shown in the Figure 10 below, and do not lift by the upper portion of the sensor. This may cause cover to break off or other NAR300 malfunction.

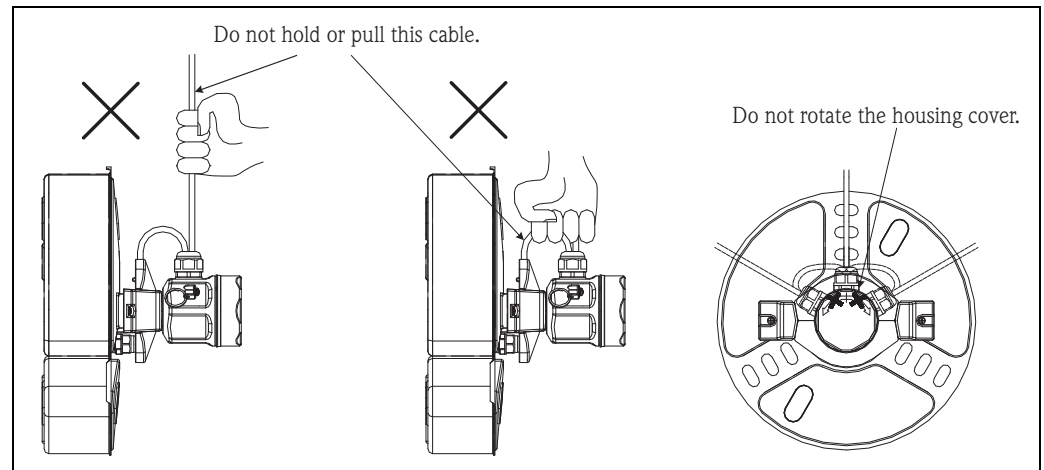


Figure 8: Float Sensor NAR300 Handling

5.3.2 Mounting Float Guide

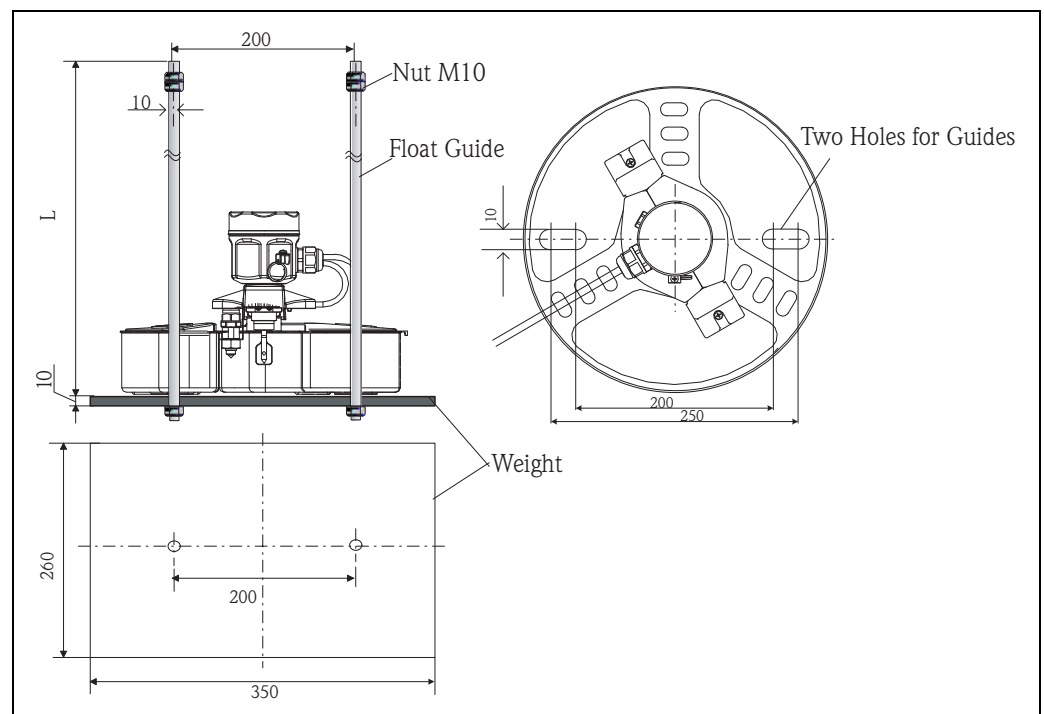


Figure 9: NAR300 and Float Guide



Note!

Float guide produced for CFD10, CFD30, UFD10, NAR291, or NAR292 can also be installed in NAR300.

5.4 Transmitter NRR261

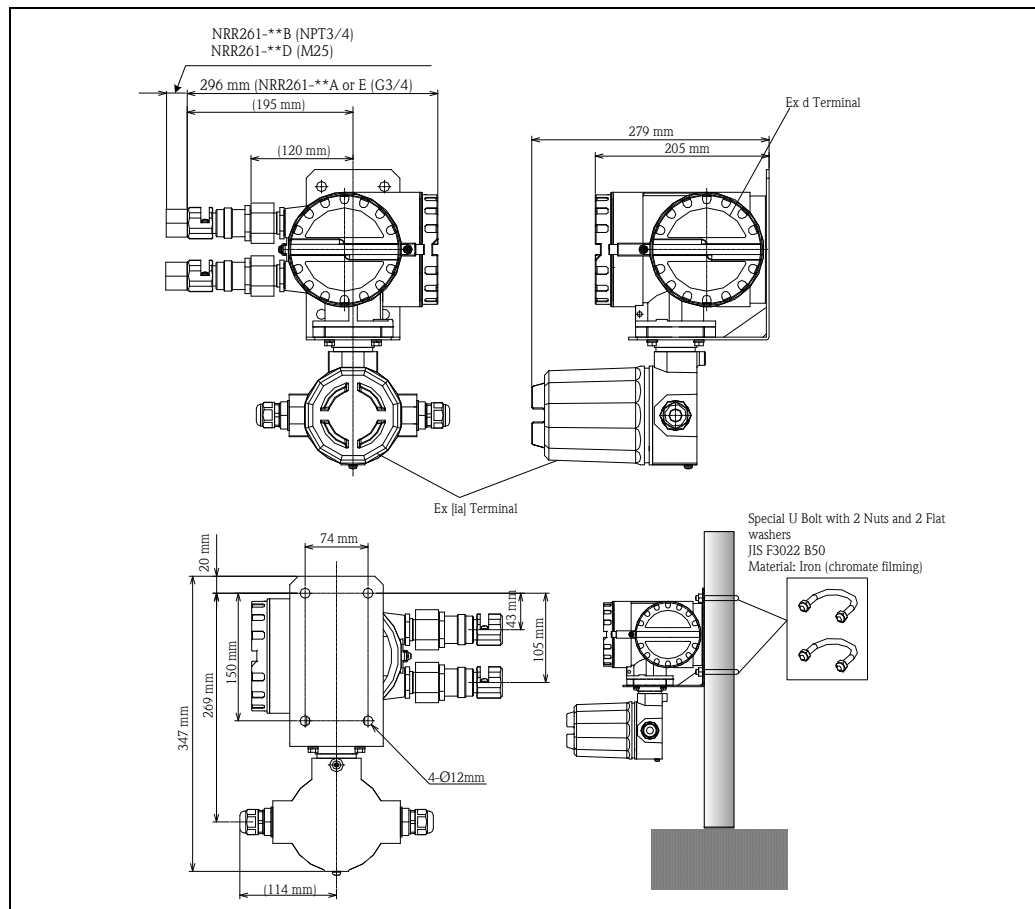


Figure 10: NRR261 External View



Note!

1. Cable gland may only be supplied for TIIS flame-proof specification (proper cable external diameter: Ø12 to 16 mm).
2. Select the NRR261 cable entry (refer to "2.2.2 Transmitter NRR261").

NRR261 is usually mounted to a pipe in the tank yard with a U bolt (JIS F3022 B 50). NRR261 can be also mounted directly onto a wall (mounting holes: 4 x Ø12 mm, M10 bolts, nuts).

5.4.1 NAR300-16xxxx and Sensor I/F Ex Box Wiring

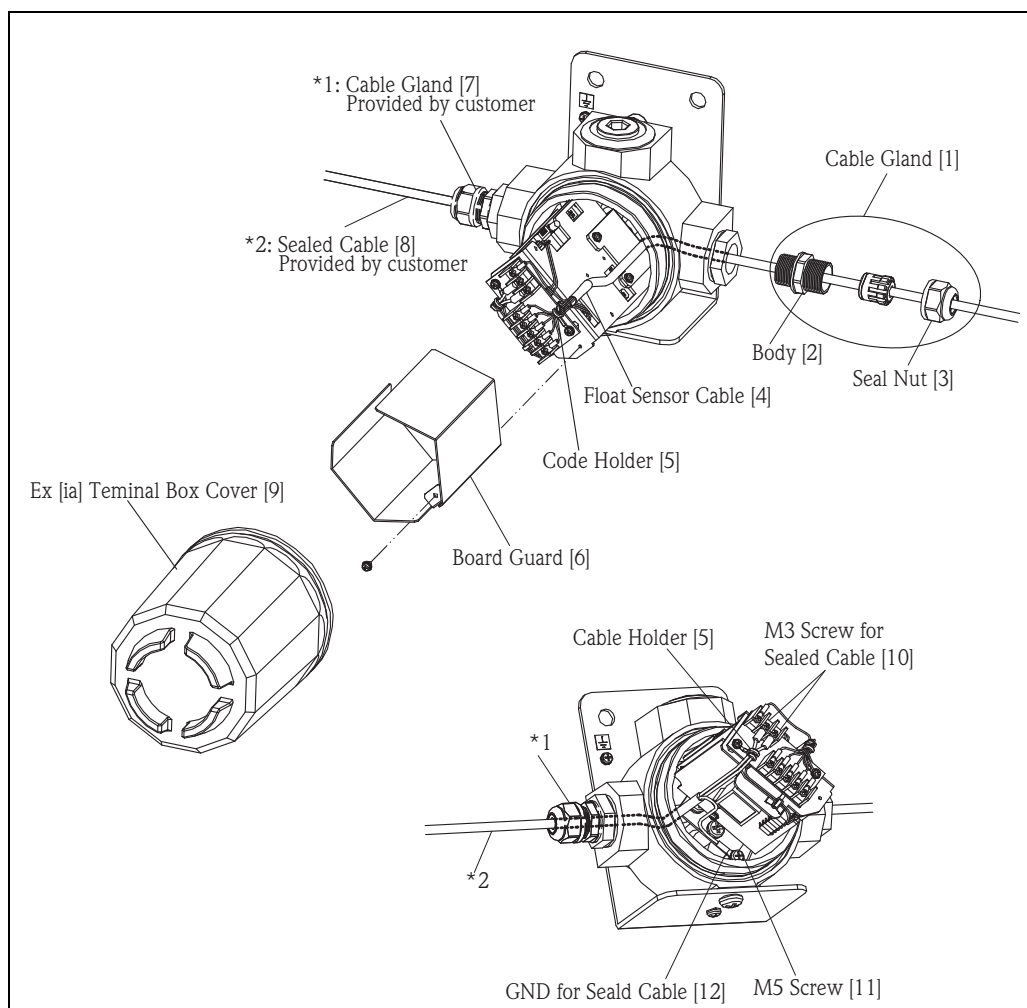


Figure 11: NRR300-15xx and Sensor I/F Ex Box Wiring

Wiring Procedure

1. Remove the EX [ia] terminal box cover [9] and the board guard [6].
2. Insert the float sensor cables [4] into the cable gland [1] entry for EX [ia] terminal box.
3. Connect the cables to the terminal block (refer to "6.3 Transmitter NRR262-2x" and "6.4 Transmitter NRR261-3xx").
4. Tighten the cable gland body [2] and seal nut [3].
 - Tightening Torque (Body and Seal Nut): Approx. 1.96N·m (20kgf·cm)
5. Insert NRR262/NRR261 cables into the cable entry of terminal box and connect them to the terminal block.
6. Fix the cable with the cable holder [5].
7. Mount the board guard [6] and replace the Ex [ia] terminal cover [7].

This completes the wiring procedure.

5.4.2 NRR261-3xx and Transmitter Wiring

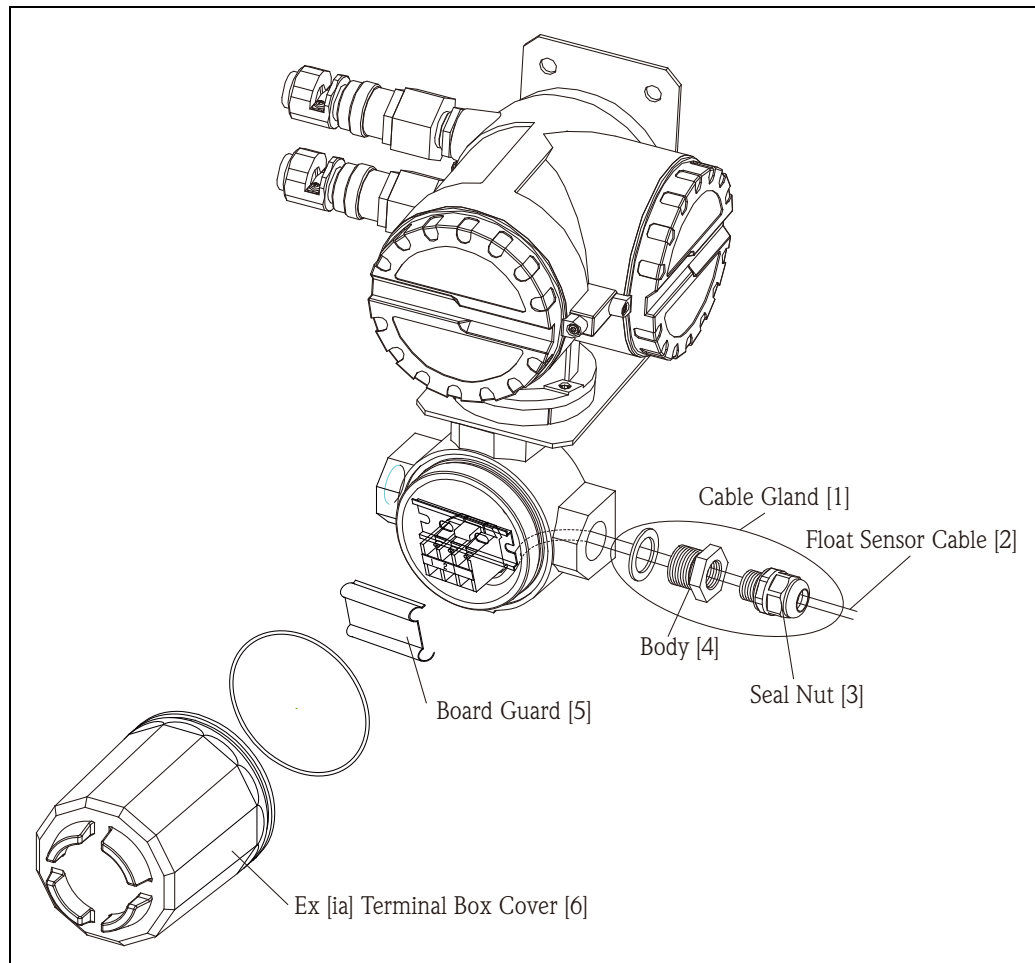


Figure 12: NRR261-3xx and Transmitter Wiring

Wiring Procedure

1. Remove the EX [ia] terminal box cover [6] and the board guard [5].
2. Insert the float sensor cables [2] into the cable gland [1] entry for EX [ia] terminal box.
3. Connect the cables to the terminal block (refer to "6.4 Transmitter NRR261-3xx").
4. Tighten the cable gland body [4] and seal nut [3].
 - Tightening Torque (Body and Seal Nut): Approx. 1.96N·m (20kgf·cm)
5. Fix the cable with the cable holder [5].
6. Mount the board guard [6] and replace the Ex [ia] terminal cover [7].

This completes the wiring procedure.

5.5 Transmitter NRR262

NRR262 designed to be installed indoors, such as in an instrument room and can be repaired easily using two M4 screws. NRR262 may be installed quickly and simply with DIN Rail EN50022, a convenient option (sold separately) for installing additional transmitters or for planning upgrades to multiple transmitter implementation.

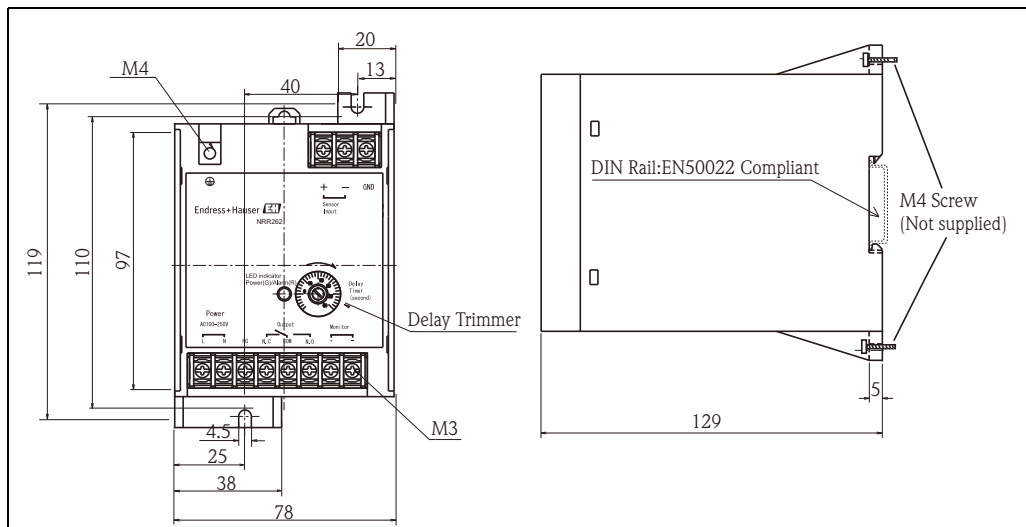


Figure 13: Transmitter NRR262 Dimensions

5.6 Sensor I/F Ex Box

Sensor I/F Ex box is employed in conjunction with transmitter NRR262 to convert float sensor signals to electric current signals. Ex box is usually mounted to a pipe in the tank yard and secured with U bolts (JIS f 3022 B50). Ex box can be also mounted directly onto a wall (mounting holes: 4 x Ø12 mm, M10 Bolts and Nuts).

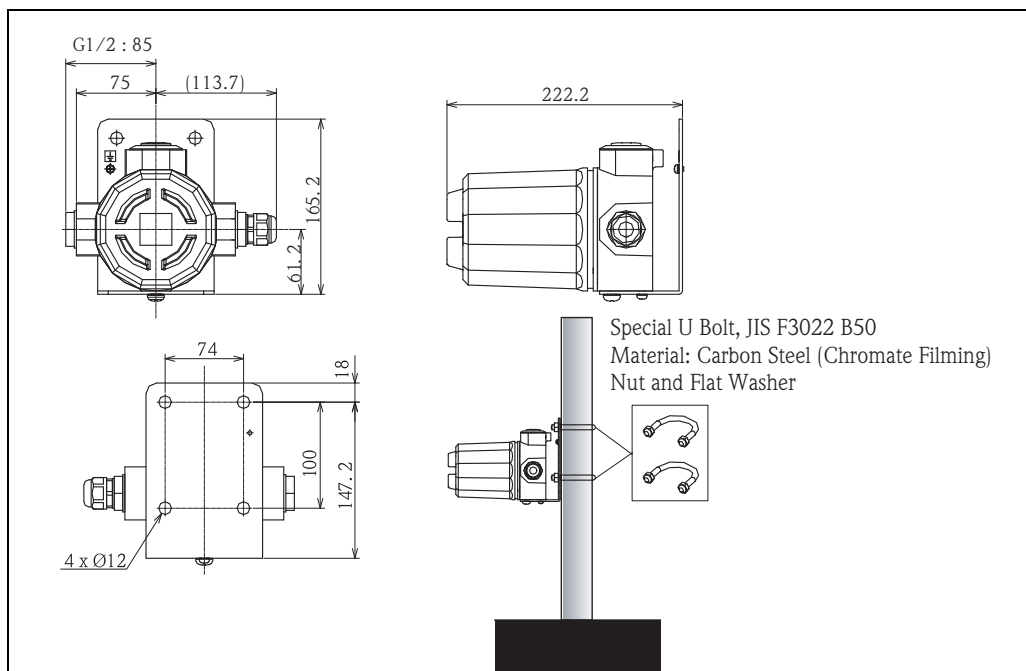


Figure 14: Sensor I/F Ex Box Dimensions



Note!

Select the cable entry of sensor I/F Ex box in NAR300 order information (refer to "2.2.1 NAR300"). When installing NAR300-15xx, specify NAR300-15AxxB due to G1/2 cable entry.

6 Electrical Connection

When float sensor NAR300 Ex [ia] is used in combination with NRR261 Ex d [ia], the safety barrier installed in NRR266 must be grounded as follows.



Note!

- The safety barrier grounding cable should be connected independent of any other devices or functions, as per class A grounding standards.
- Use a conductive grounding wire with cross-sectional dimensions of 2mm or more. In an instrumentation room, a field device with Class A grounding may be connected in common to the communication cable shield.

Class A Ground General Description

Ground Resistance Value	10 Ω
Grounding Cable	Tensile Strength: 1.04kN or more, metallic wire or copper wire (2.6mm or more in diameter)

6.1 Grounding Cable

If class A grounding is implemented from an IS terminal instead of from an explosion proof terminal, refer to the following figure.

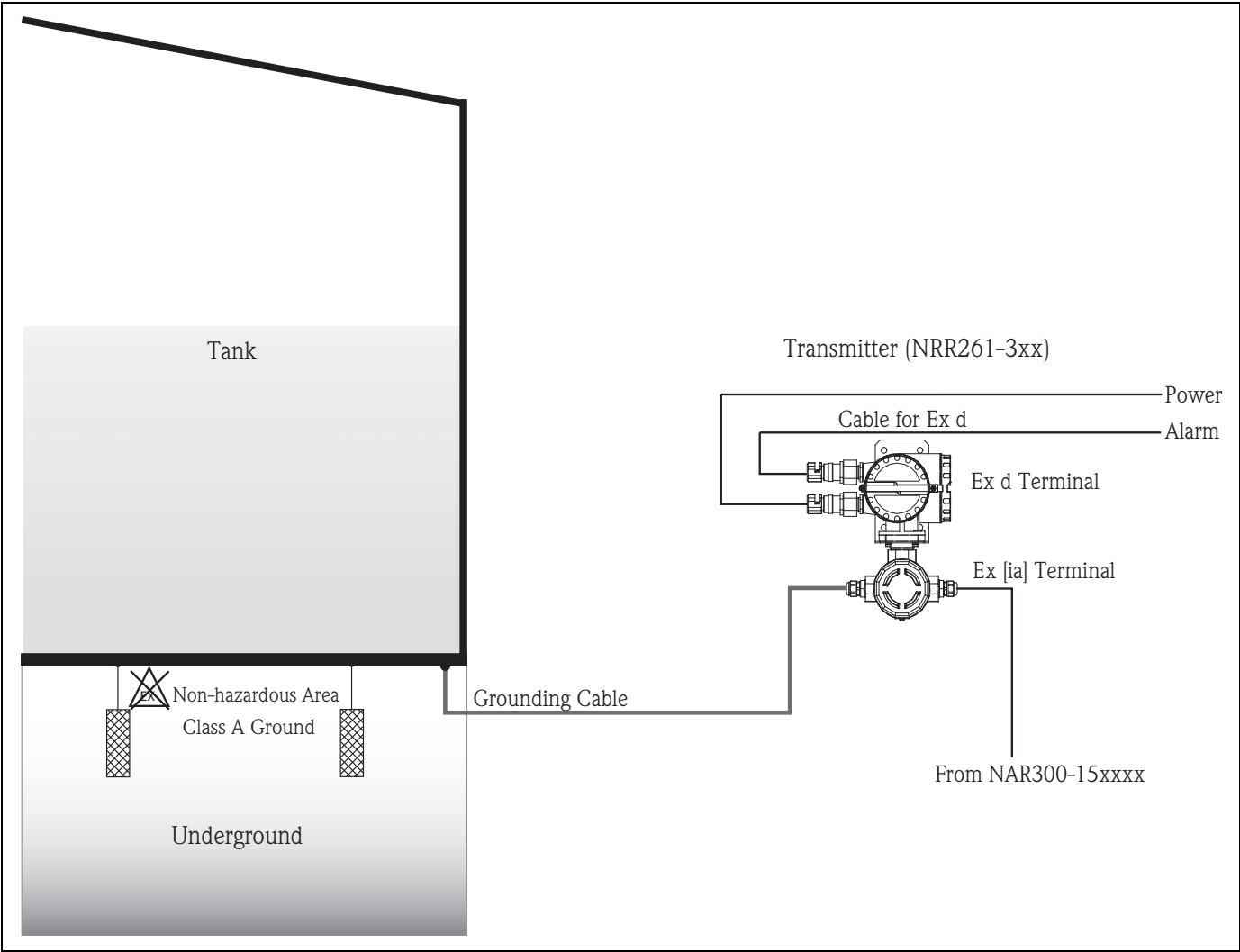


Figure 15: Grounding Cable

6.2 Transmitter NRR262-2x

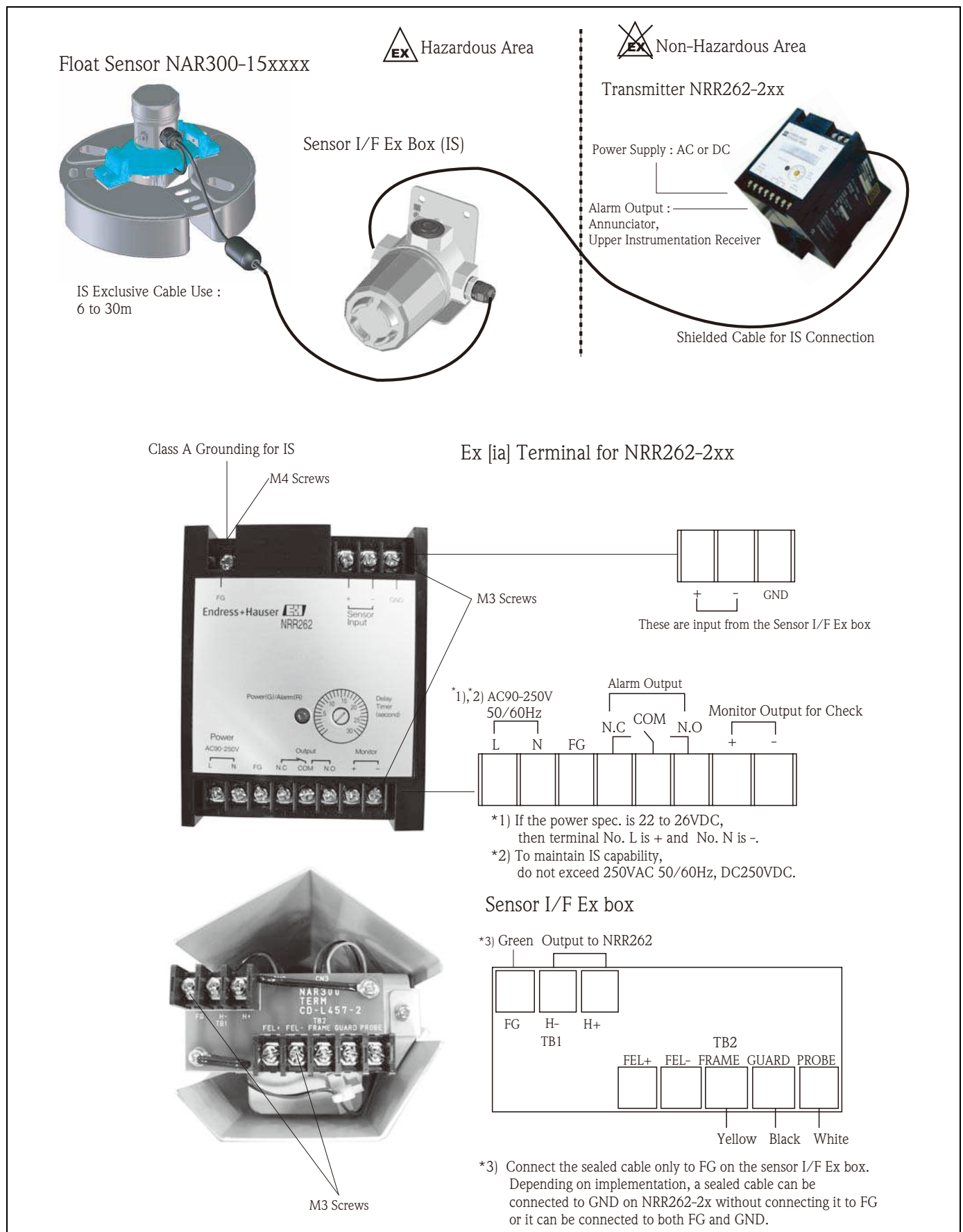


Figure 16: NRR262-2xx

 EX Hazardous Area



6.4 Connection Diagram

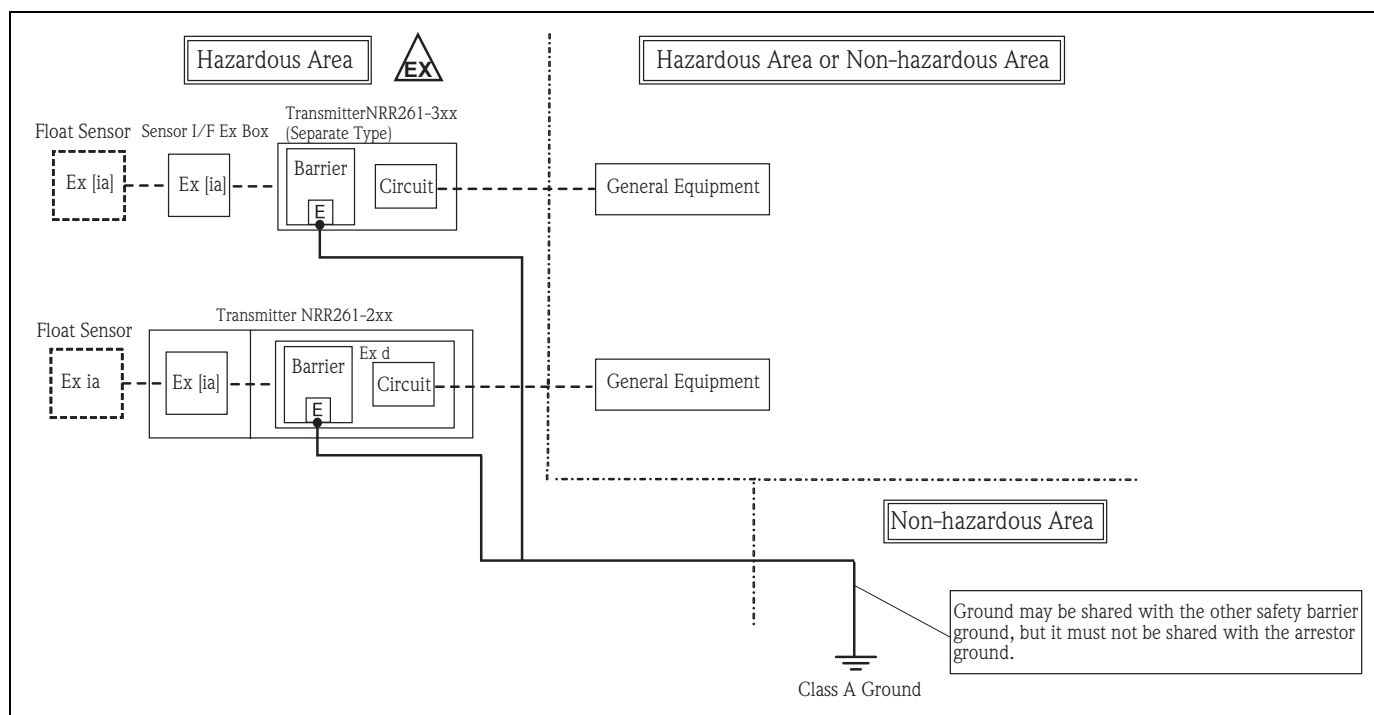


Figure 18: Connection Diagram

6.5 Principle of Alarm Operation

The oil leak detection signal on NAR300 is converted into 8mA (alarm OFF), 16mA (alarm ON) at the output circuit in the transmitter or sensor I/F Ex box, then connected to the current detection circuit via IS safety barrier.

In the current detection circuit, the presence or absence of an oil leak alarm signal is determined by the electrical current value and the alarm output relay is turned on or off by the operation delay circuit.

The operation delay circuit features a delay time setting trimmer which allows the delay time to be set in a range of approx. 1 to 30 sec. (added to the default 6 sec. delay). A fail-safe function is available in the relay contacts output (refer to the following table).

Alarm Output Operating Table

Terminal	NRR262 N.C. to COM	NRR262 N.O. to COM
	NRR261 N.C. to COM Terminal 11, 13	NRR261 N.O. to COM Terminal 13, 15
Condition		
Oil Leak Alarm	Contact Close	Contact Open
Power OFF	Contact Close	Contact Open
Liquid Freezing	Contact Close	Contact Open
Non-alarm	Contact Open	Contact Close

7 Adjustment

7.1 Detection Sensitivity Check for Oil



Note!

When lower layer is water and upper layer is oil

When the electrode tip is pulled from the bottom layer of water in instances of increased oil layer thickness, remnants of water may still cling to the electrode, even though the sensor floats in the oil. This may affect oil detection sensitivity by 1 to 2mm. When absolute precision is required, coating the electrode with a mild detergent is recommended in order to keep water from clinging to it.



Note!

Confirming oil layer thickness with a clear container

When checking oil layer thickness with a clear container, be cautious of erroneous readings due to surface tension or liquid adhering to container.

7.2 Alarm Output Delay Adjustment

The delay time (ON delay) is set using the time setting trimmer. In the delay process, continuous alarm status is detected over a certain period of time, and is interpreted as an alarm. When processed within the time setting, it is not interpreted as an alarm. This function is to prevent false alarm.



Note!

Delay time added via the trimmer is always in addition to the default 6 seconds of delay time.



Caution!

Open the NRR261 unit cover after the power has been turned off for 10 minutes.

7.2.1 Transmitter NRR261 Alarm Output

Upon opening the cover, the trimmer can be seen as in Figure 23. The delay time can be set in a range of 1 to 30 seconds (in addition the default 6 seconds delay).

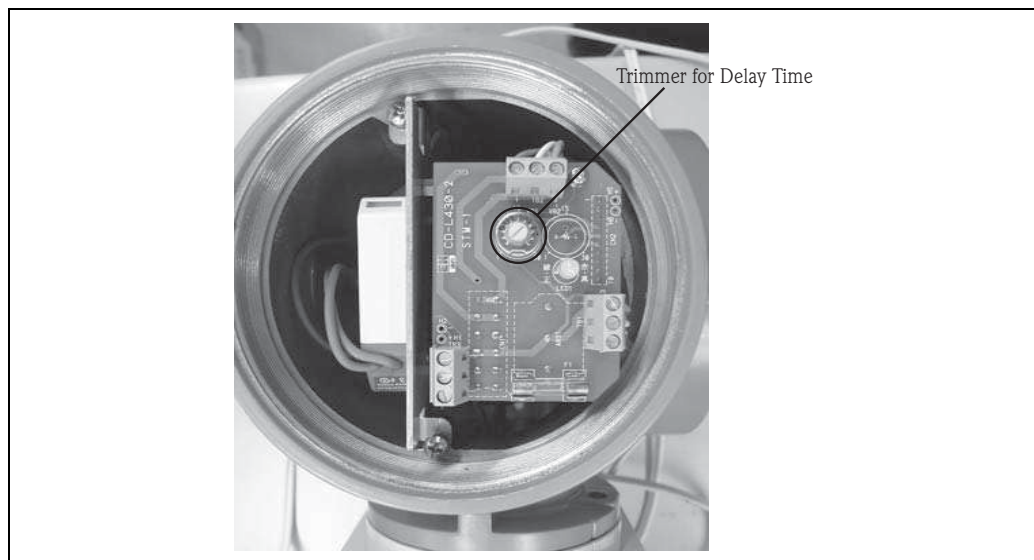


Figure 19: Trimmer for Delay Time Adjustment

7.2.2 Alarm Output of Transmitter NRR262

The trimmer for delay time adjustment can be seen as in Figure 24. Align the trimmer to the indicator which shows required delay time. The delay time can be set in a range of 1 to 30 seconds (in addition the default 6 seconds delay).

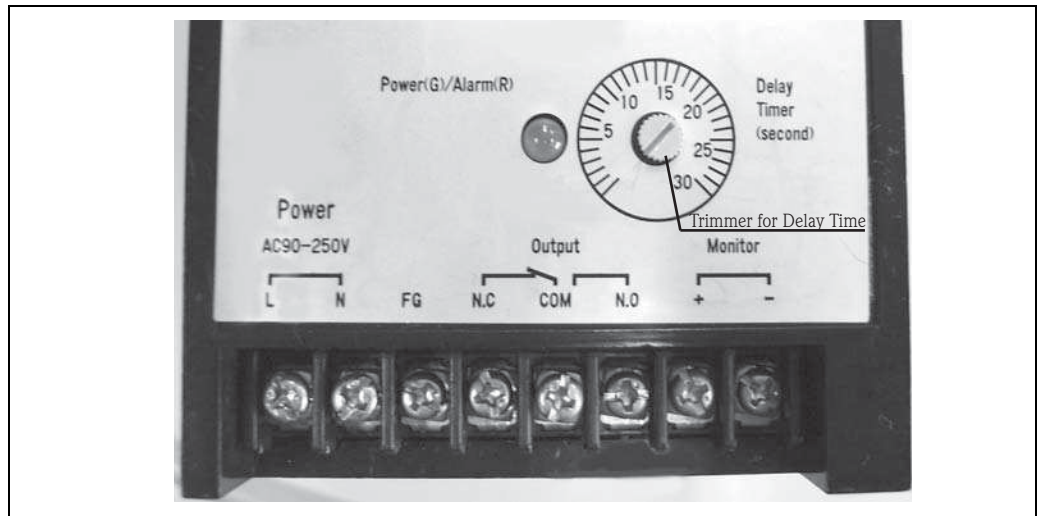


Figure 20: Trimmer for Delay Time Adjustment

8 Maintenance

Conduct overall periodic inspections semi-annually (at most) or annually (at least) along with an operation check as follows.

Periodic Inspections Items

- 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.

9 Accessory

9.1 Float Guide



Note!

Install the float guide weight horizontally. Remove any debris and stones from the bottom of the pit so that the sensor can be mounted horizontally.
The length of a standard float guide is 2m (meter). When ordering a length other than 2m, contact Endress+Hauser representatives.

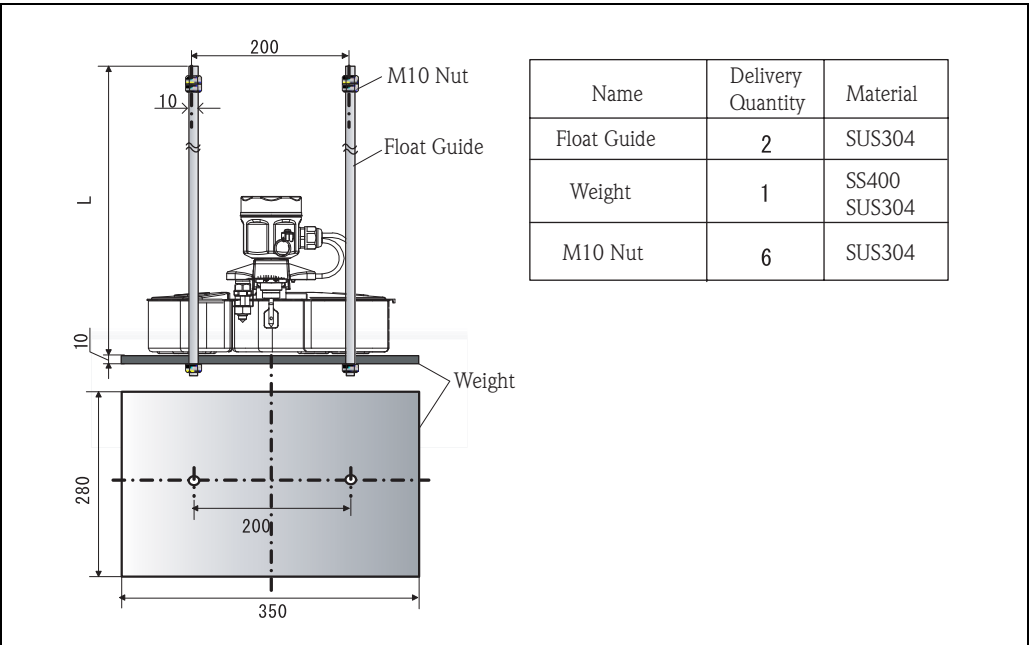


Figure 21: Float Guide

9.2 U Bolts and Cable Gland

U bolts (JIS F3022 B50) are used to install transmitter. Use a guide pipe; 50A, 2B, Ø60.5 mm. Tighten and secure the cable gland after inserting the cable from NAR300.

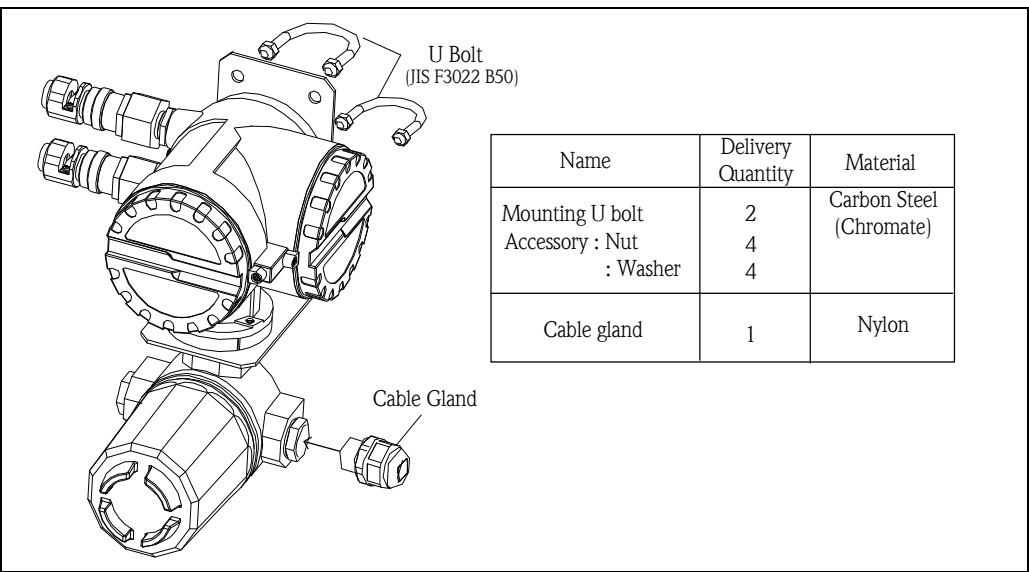


Figure 22: U Bolts and Cable

10 Troubleshooting

10.1 Fail Safe (Alert when No Oil Leak Arises)

Alarm may emit for the following reasons, even when no oil leaks.

Conditions	Descriptions
Float sensor tilted	As the conductivity sensor floats on the pit and sticks out of the water enough to tilt, the sensor interprets it as an insulator (air).
Empty pit	The conductivity sensor always detects insulator (air).
Sensor buried in mud	When the float sensor becomes buried in mud, and the mud dries out, becoming hard, the conductivity sensor detects an insulator (air) layer of air, the died mud.
Essentially pure water in pit	If water in pit has a high electrical resistance, such as in drain water, the conductivity sensor detects an insulator.

10.2 Alert Delay (No Alert when Oil Leaks)

Alarm may not fail to emit for the following reasons, even when the oil leaks.

Conditions	Description
Waves and warm air circulation in liquid level	When the oil leakage surface is strongly ruffled and water/oil layers in pit are unstable due to strong wind, the conductivity sensor detects water in pit.
Float sensor tilt	When the float sensor tilts most of the way to one side due to snow, animal on the float sensor or cable/chain becoming tangled, the conductivity sensor detects the water under oil layer.
Sunk float sensor	If the float sensor sinks under the weight of snow, debris or an animal on the float, the conductivity sensor detects the water under oil layer.
Water contains debris.	When water, containing debris or algae, gets between the conductivity sensor and ground, the conductivity sensor detects the water and does not issue an alert.
Oil leak during snowfall	When snow is floating on oil layer surface, the conductivity sensor detects the water from snow melt.

10.3 Operation Confirmation Flow Chart



Note!

Refer to Figures 30 for voltage measurement.

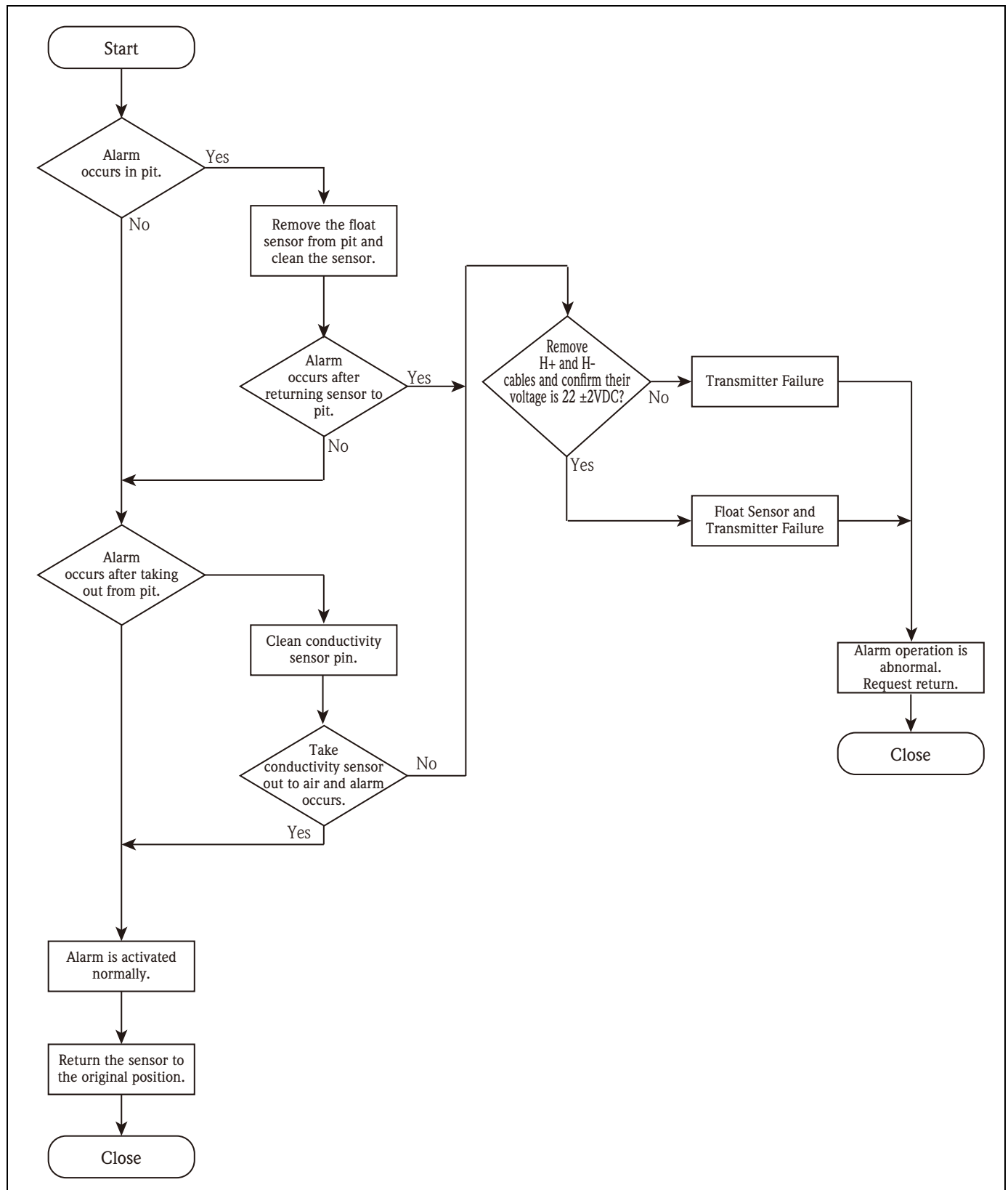



Figure 23: Operation Flow Chart

 **Note!** Prior to alarm confirmation, be sure that the alarm system will not be affected, should an oil leak alarm arise. Refer to "10.3.1 Operation Confirmation Flow Chart" for operation confirmation. The following shows voltage check points which is described on the flow chart.

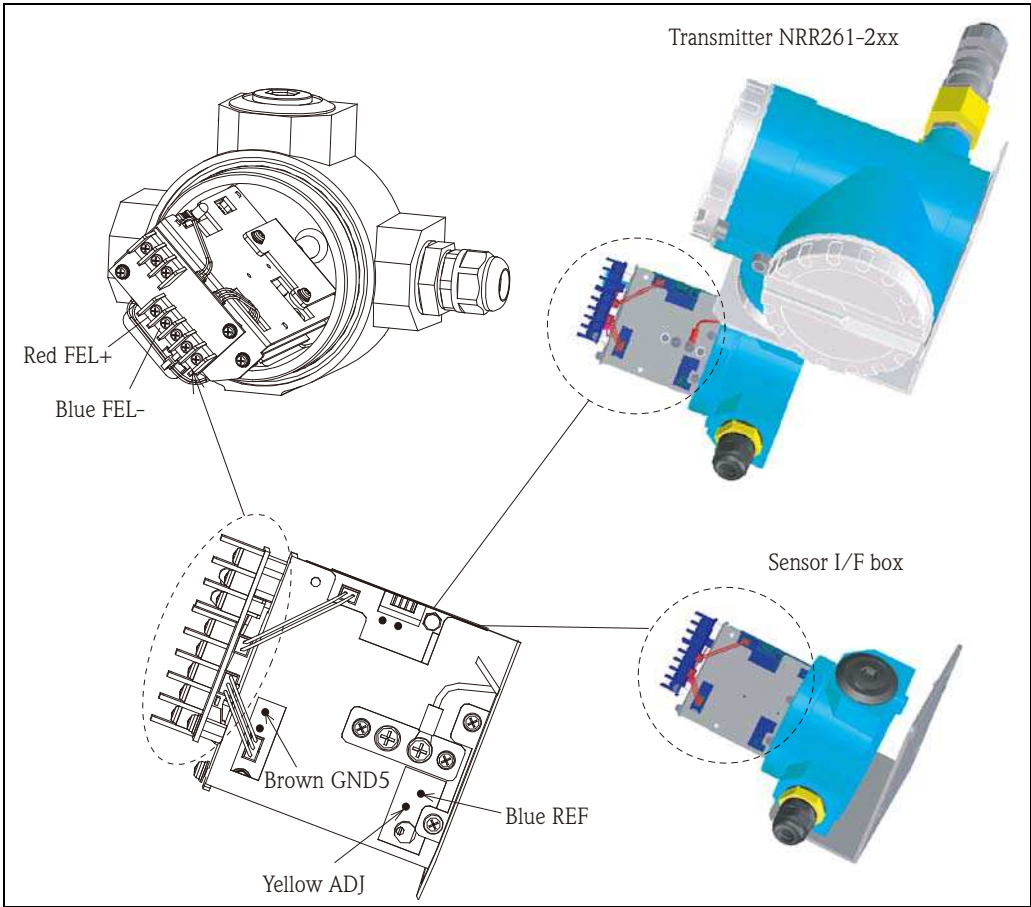


Figure 24: Detailed View of Terminal Box

10.3.1 Problem between Transmitter and Alarm System

Condition	Countermeasure
LED illuminates red: normal alarm	Alarm emits when voltage from sensor is not detected, if no wiring problems between transmitter and sensor I/F box are found, replace transmitter.
LED illuminates green: no alarm signal from sensor	When alarm emitted in this circumstance, check resistance from the alarm output terminals on the transmitter using the following method. 1. Turn off the alarm system 2. Remove alarm output wire from the transmitter. 3. Confirm that LED is still lit (green). 4. Measure resistance between NO (or NC) and COM, If resistance is 0Ω (short) or more (open), transmitter is normal. Otherwise, replace the transmitter.
LED no lit: No power to transmitter	If there is regular voltage between terminal L and N on the transmitter, replace the transmitter. If regular voltage can not be measured between the terminals, check the transmitter power supply and power cable.

10.4 Cleaning Conductivity Sensor

10.4.1 Tools to Be Prepared

- Waste cloth
- Mild detergent

10.4.2 Cleaning Procedure

1. Remove the NAR300 sensor from the pit.
2. Clean conductivity sensor components from electrode tip to electrode holder with a waste cloth to remove adhering moss, algae, or other contaminants.
3. Clean entire electrode using a mild detergent, appropriately diluted.

This completes the cleaning procedure.



Note!

NAR300 is usually checked for conductivity between the electrode and the float body. NAR300 conductivity, indicates that there is water. NAR300 conductivity, indicates oil or air in the pit.

Since the electrode holder are conductive. This causes improper operation without an alarm. Clean the point between electrode tip and holder periodically to maintain non-conductivity.

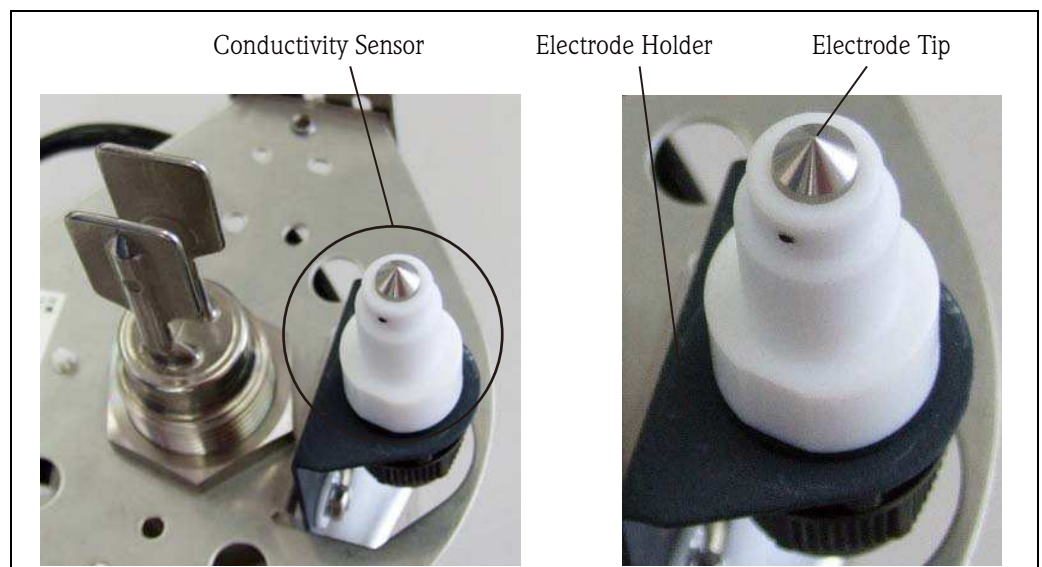


Figure 25: Sensor Cleaning

10.5 Spare Parts

Spare parts are contained in kits. Spare parts for NAR300 system which can be ordered from Endress+Hauser are shown with their order numbers in the diagram below. Contact Endress+Hauser service representatives for further assistance.

10.5.1 Float Sensor NAR300

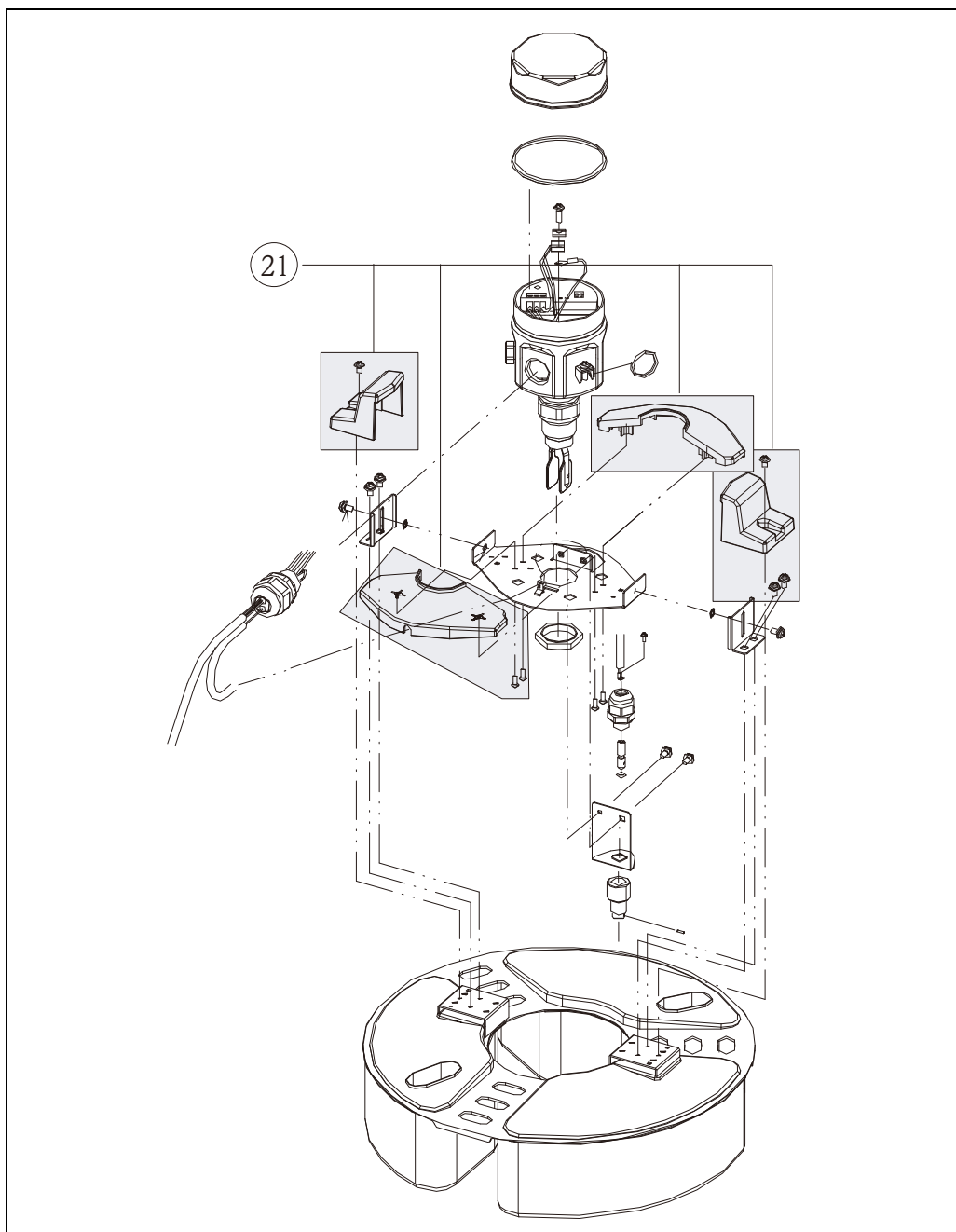


Figure 26: NAR300 Spare Parts

No.	Specification
21	
56004365	Float sensor cover, Plastic, NAR300

10.5.2 Transmitter NRR261

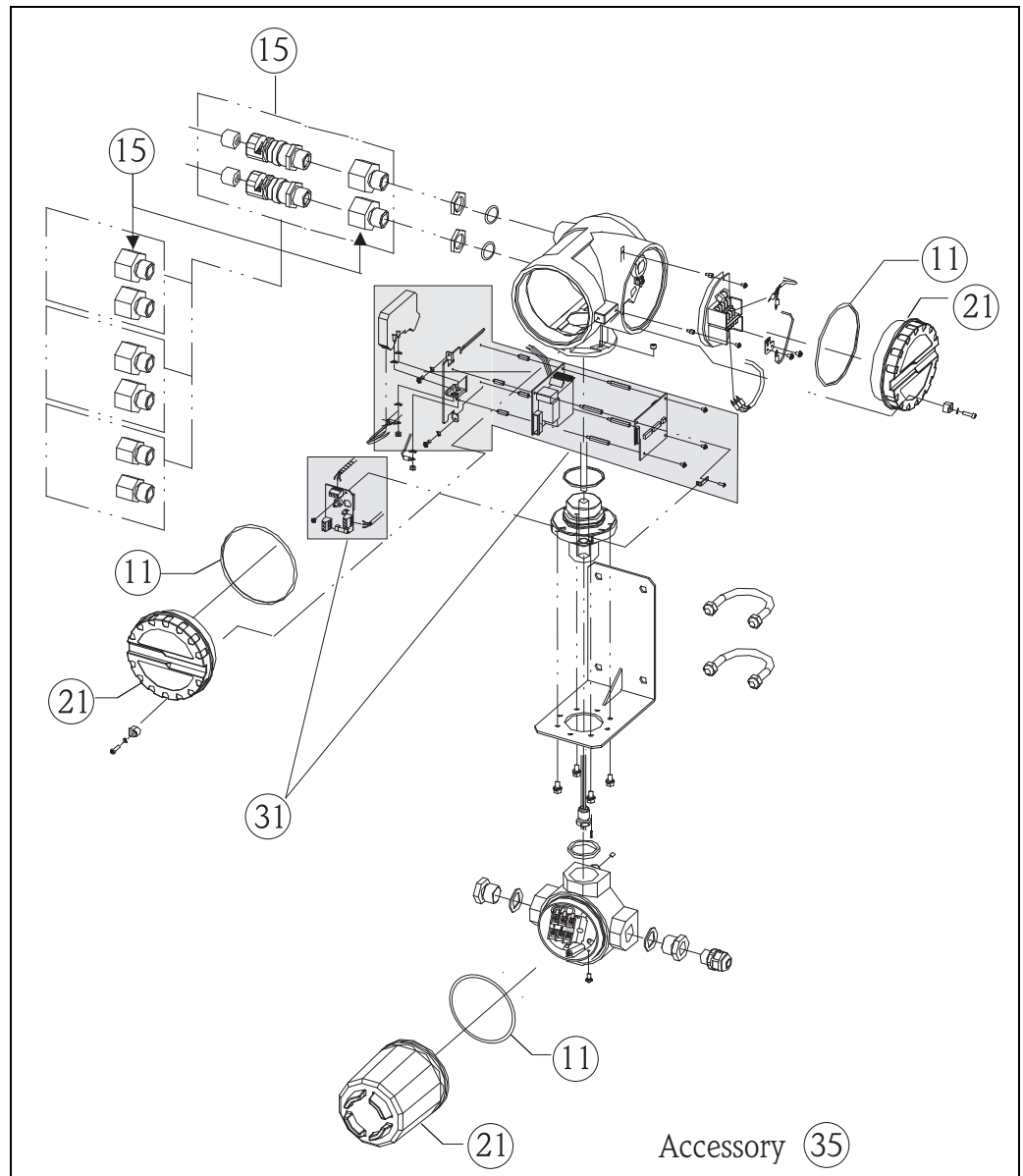


Figure 27: Spare Parts NRR261

No.	Specification	No.	Specification
11		21	
017880-5026	O-ring, D196-d7 CR	56004306	Cover
017803-0030	O-ring, display cover, NBR	017801-0133	Cover terminal compartment, Alu, NRF
15		31	
56004294	Cable gland	56004436	Internal assembly NRR261
56004480	Reducer 1, G3/4	71084410	NRR261 Internal assembly 22-26VDC
56004481	Reducer 2, NPT3/4	35	
56004482	Reducer 3, PG16	71134076	2x, U-bolts, 304, for panel support
56004483	Reducer 4, M25		

10.5.3 Transmitter NRR262

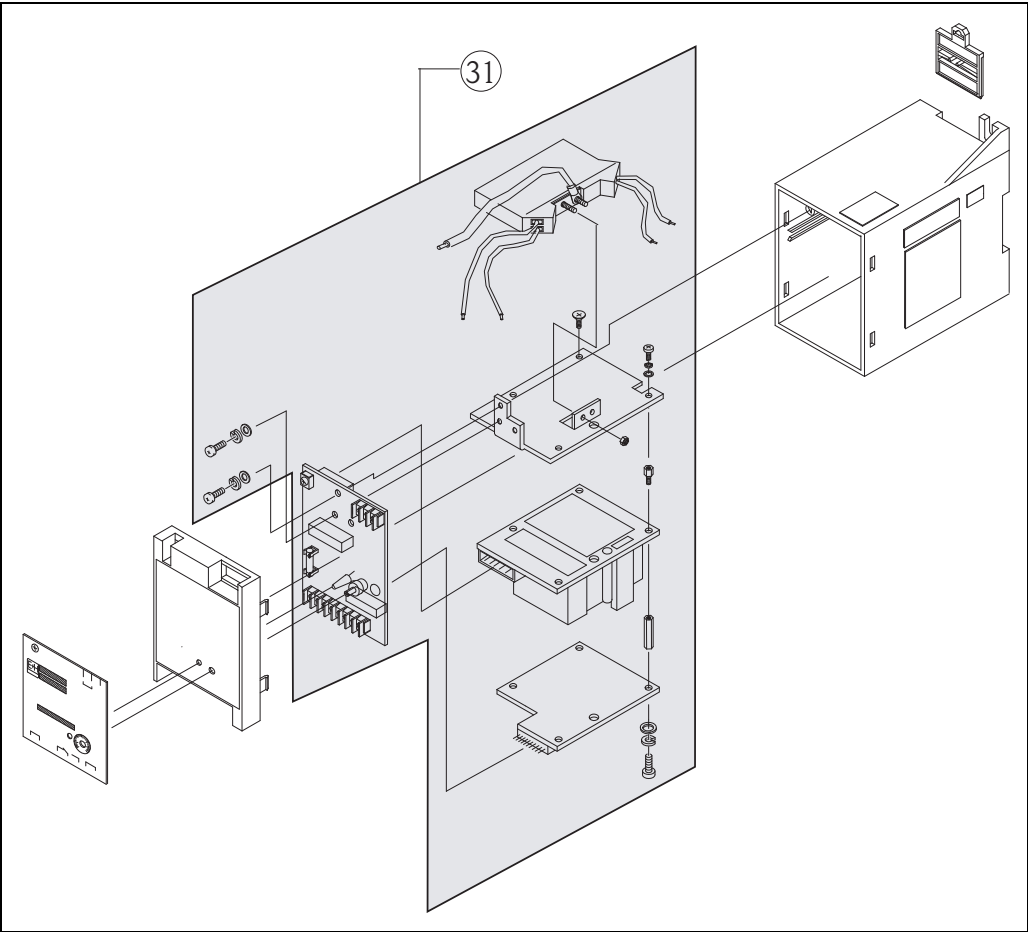


Figure 28: Spare Parts NRR262

No.	Specification
31	
56004437	Internal assembly NRR262 AC power
71086629	Internal assembly NRR262 22-26VDC

10.5.4 Sensor I/F Ex Box

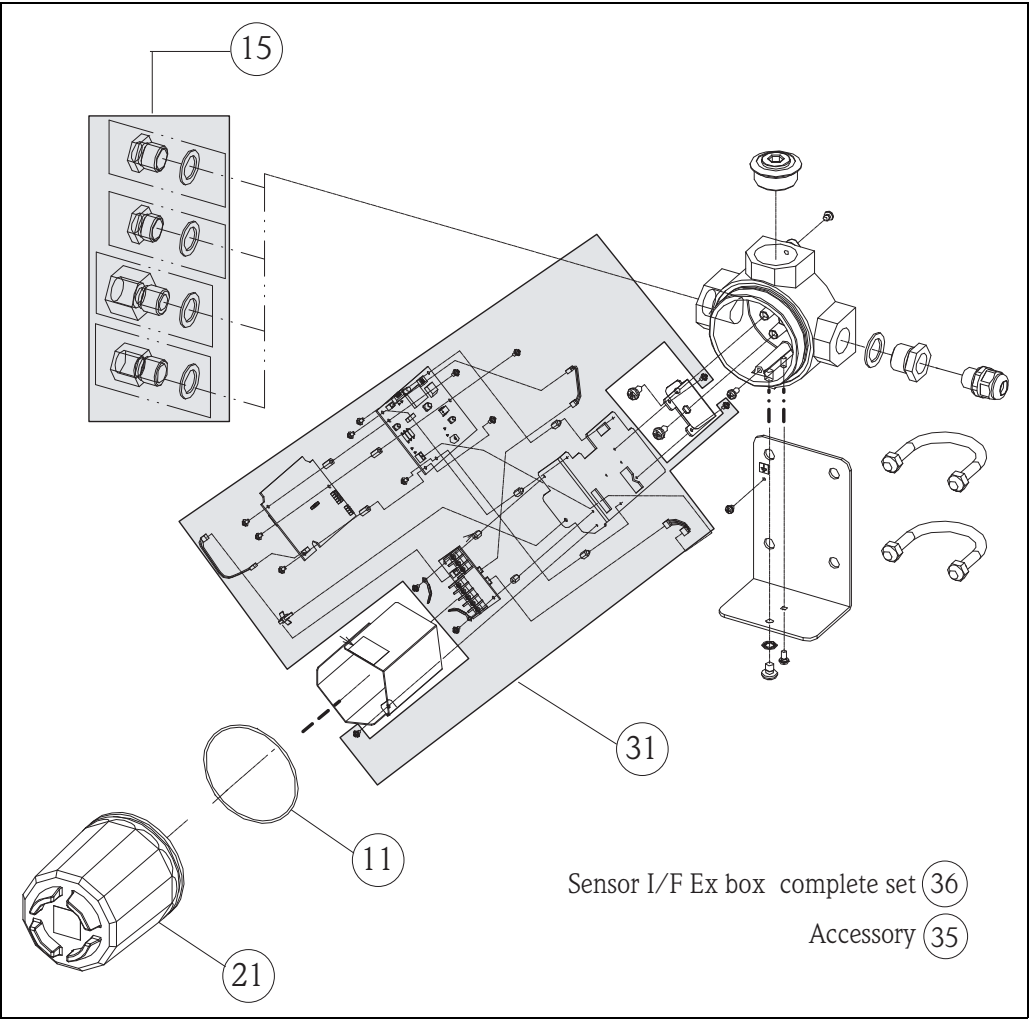


Figure 29: Spare Parts Sensor I/F Ex Box

No.	Specification	No.	Specification
11		31	
017880-5026	O-ring, D196-d7 CR	56004438	Internal assembly Sensor I/F Ex box
15		35	
56004480	Reducer 1, G3/4	71134076	2x, U-bolts, 304, for panel support
56004481	Reducer 2, NPT3/4	36	
56004482	Reducer 3, PG16	70106497	Complete product Sensor I/F Ex box 22-26VDC
56004483	Reducer 4, M25		
21			
56004306	Cover		

10.6 Return

1. The following procedure must be performed before returning NAR300 to Endress+Hauser e.g. for repair or calibration.
- Remove all residue. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is corrosive, poisonous, carcinogenic, radioactive, or otherwise hazardous.
 - Always enclose a duly completed "Declaration of Hazardous Material and De-contamination" form. Only then can Endress+Hauser transport, examine, and repair a returned device.
 - Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.
2. Additionally specify:
- An exact description of the application
 - The chemical and physical characteristics of the instrument
 - A short description of the error that occurred (specify the error code where possible)
 - Operating time of the device



Note!
A copy of the “Declaration of Contamination” is included at the end of this operating manual.



- Caution!**
- Hazardous materials may be attached to damaged parts of NAR300 or its plastic material. Unless hazardous materials are completely removed from NAR300, no repair request is accepted.
 - Incomplete cleaning of the instrument may result in waste disposal or cause harm to personnel (burns, etc.). Any costs arising from this will be charged to the operator of the instrument.

10.7 Disposal

In case of disposal, separate the various components according to their materials.

10.8 Software History

Software Version/Date	Software Changes	Documentation Changes
OILEYE CI/ST V. 1.40/11.03	Original Software	

10.9 Contact Addresses of Endress+Hauser

The addresses of Endress+Hauser are given on the back cover of this operating manual. If you have any questions, do not hesitate to contact Endress+Hauser representatives.

11 Process Condition

11.1 Float Sensor NAR300

Detective Object	<p>Relative density larger than 0.7g/cm^3 and less than 1.0g/cm^3 When relative density is larger than 0.9g/cm^3, dynamic viscosity must be larger than $1\text{mPa}\cdot\text{s}$. Water is approximately $1\text{mPa}\cdot\text{s}$.</p> <p>Not soluble in water</p> <p>Non-conductivity</p> <p>Flowing</p>
Operating Temperature	<p>Ambient: -20 to $+60\text{ }^{\circ}\text{C}$ (-4 to $+140\text{ }^{\circ}\text{F}$) Measured liquid: 0 to $+60\text{ }^{\circ}\text{C}$ ($+32$ to $+140\text{ }^{\circ}\text{F}$)</p>
Water in Pit	<p>Relative density larger than 1.0g/cm^3 and less than 1.13g/cm^3. (when kinematic viscosity equals $1\text{mm}^2/\text{sec}$) ^{*1}</p> <p>Not frozen</p> <p>Conductivity is larger than $10\mu\text{S/cm}$ and less than $100\text{k}\Omega\cdot\text{cm}$. (larger than $1\mu\text{S/cm}$ if float sensor is normally floating on the water)</p> <p>Not salt-water</p>
Other	<p>Clean off any debris that sticks to the sensor.</p> <p>Do not let mud cake on the float sensor.</p> <p>Avoid pit conditions that cause the float sensor to tilt off-balance or change the draft-line.</p> <p>Install measures to avoid cross-currents, standing waves.</p>

^{*1} Sensitivity of sensor at the bottom of the water density may vary depending of the factory setting environment such as using antifreeze liquid.

11.2 Connecting Cable

11.2.1 Sensor I/F Ex Box

Connecting Cable	Maximum inductance 3mH, maximum capacitance 83nF e.g. KPEV (instrumentation cable) $C=65\text{nF/km}$, $L=0.65\text{mH/km}$ $CW/C=0.83\mu\text{F}/65\text{mH}=1.276\text{km}$ [1] $LW/L=3\text{mH}/0.65\text{mH}=4.615$ [2] Maximum cable length = 1.27km * The smaller of [1] or [2] is the maximum usable cable length.
Operating Temperature	Ambient: -20 to +60 °C (- 4 to +140 °F)

11.2.2 Transmitter NRR261

Connecting Cable	Maximum inductance 3mH, maximum capacitance 83nF e.g. KPEV (instrumentation cable) $C=65\text{nF/km}$, $L=0.65\text{mH/km}$ $CW/C=0.83\mu\text{F}/65\text{mH}=1.276\text{km}$ [1] $LW/L=3\text{mH}/0.65\text{mH}=4.615$ [2] Maximum cable length = 1.27km * The smaller of [1] or [2] is the maximum usable cable length..
Operating Temperature	Ambient: -20 to +60 °C (- 4 to +140 °F)

11.2.3 Transmitter NRR262

Connecting Cable	Maximum inductance 3mH, maximum capacitance 83nF e.g. KPEV (instrumentation cable) $C=65\text{nF/km}$, $L=0.65\text{mH/km}$ $CW/C=0.83\mu\text{F}/65\text{mH}=1.276\text{km}$ [1] $LW/L=3\text{mH}/0.65\text{mH}=4.615$ [2] Maximum cable length = 1.27km * The smaller of [1] or [2] is the maximum usable cable length..
Operating Temperature	Ambient: -20 to +60 °C (- 4 to +140 °F)

12 Technical Data

12.1 Float Sensor NAR300

Protection Class	IP67 (outdoor installation)
Power Supply	Supplied by transmitter
Wetted Material	Float : SUS316L Conductive sensor: SUS316 and PTFE Tuning fork sensor: SUS316
Detection Sensitivity* ¹	Water-filled pit: 10 +/- 1mm, alarm setting prior to delivery with heating oil Empty pit: 50 +/- 5mm, alarm setting prior to delivery with heating oil
I/O Cable	Exclusive PVC shield cable, including cable float (6m standard)
Weight	Approx. 2.5kg (including 6m (PVC) cable).

*1: Heating oil (relative density approx. 0.8 g/cm³), on water (relative density approx. 1.0 g/cm³), static level condition, no surface tension.

12.2 Sensor I/F Ex box

Protection Class	IP67 (for outside installation)
Power Supply	NRR262 or NRR262
Output Signal	Approximately 7 to 16mA
Cable Entry	NAR300 (Float sensor): G1/2 with a cable gland x1 NRR261 or NRR262 (Transmitter): G1/2 thread x1
Weight	Approximately 3.2kg

12.3 Transmitter NRR261

Protection Class	IP67 (for outside installation)
Power Supply	90 to 250VAC, 50/60Hz 22 to 26VDC
Power Consumption	20VA/2W
Input	Approximately 7 to 16mA from NAR300 / Sensor I/F Ex box
Output	Contact output :1SPDT contact rate: 250VAC, 1A, 100VA, 100VDC: 1A, 25W Delay setting: 1 to 30 seconds (add 6 seconds as base delay) Failsafe function: available if power fail, frozen sensor (see "alarm output" table)
Cable Entry	Ex d side: G 3/4 x 2, TIIS Ex specified cable glands model SXBM Exi side: G 1/2 x 1, with cable gland
Arrester	built-into power supply
Weight	Approximately 10 kg

12.4 Transmitter NRR262

Protection Class	IP20 (for outside installation)
Power Supply	90 to 250VAC, 50/60Hz 22 to 26VDC
Power Consumption	20VA/2W
Input	Approximately 7 to 16mA from NAR300/Sensor I/F Ex box
Output	Contact output:1SPDT contact rate: 250VAC, 1A, 100VA, 100VDC: 1A, 25W Delay setting: 1 to 30 seconds (add 6 seconds as base delay) Failsafe function: available if power fail, frozen sensor (see"alarm output" table)
Arrester	built-into power supply
Weight	Approximately 0.6 kg

Declaration of Hazardous Material and De-Contamination

Erklärung zur Kontamination und Reinigung

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor

Geräte-/Sensortyp _____

Serial number

Seriennummer _____

☐ **Used as SIL device in a Safety Instrumented System / Einsatz als SIL Gerät in Schutzeinrichtungen**
Process data/Prozessdaten

Temperature / Temperatur _____ [°F] _____ [°C]

Pressure / Druck _____ [psi] _____ [Pa]

Conductivity / Leitfähigkeit _____ [µS/cm]

Viscosity / Viskosität _____ [cp] _____ [mm²/s]

Medium and warnings

Warnhinweise zum Medium



	Medium /concentration Medium /Konzentration	Identification CAS No.	flammable entzündlich	toxic giftig	corrosive ätzend	harmful/ irritant gesundheitsschädlich/ reizend	other * sonstiges*	harmless unbedenklich
Process medium								
Medium im Prozess								
Medium for process cleaning								
Medium zur Prozessreinigung								
Returned part cleaned with								
Medium zur Endreinigung								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive

* explosive; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / Fehlerbeschreibung _____

Company data / Angaben zum Absender

Company /Firma _____	Phone number of contact person /Telefon-Nr. Ansprechpartner: _____
Address / Adresse _____	Fax / E-Mail _____
_____	Your order No. / Ihre Auftragsnr. _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

(place, date / Ort, Datum)

Name, dept./Abt. (please print /bitte Druckschrift)

Signature / Unterschrift

WWW.endress.com/worldwide

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

Phone: ++81 55 266 4964
Fax: ++81 55 266 4969

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People for Process Automation