Brief Operating Instructions NAR300 system

Oil leak detector float sensor

KA01577G/00/EN/02.23-00

71614572 2023-05-15



These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation: Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: Endress+Hauser Operations App



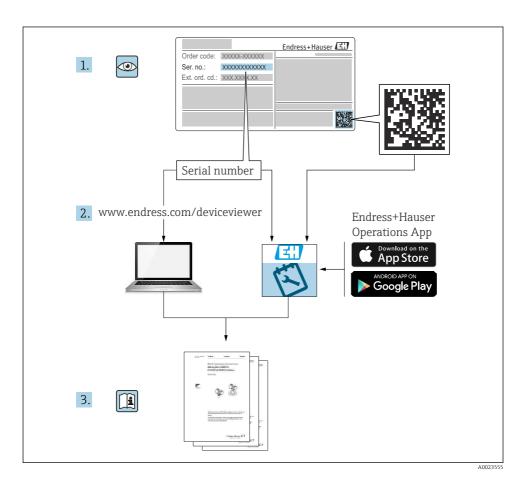


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Document information NAR300 system

1 Document information

1.1 Symbols used

1.1.1 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.

1.1.2 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.

1.1.3 Tool symbols



Phillips head screwdriver



Flat blade screwdriver

NAR300 system Document information



Torx screwdriver



Allen key



Open-ended wrench

1.1.4 Symbols for certain types of information and graphics

✓ Permitted

Procedures, processes or actions that are permitted

✓ ✓ Preferred

Procedures, processes or actions that are preferred

X Forbidden

Procedures, processes or actions that are forbidden

1 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

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

Document information NAR300 system

1.2 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

1.2.1 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.

1.2.2 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.

1.2.3 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.

1.2.4 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.

NAR300 system Basic safety instructions

2 Basic safety instructions

2.1 Basic instructions regarding safety

2.1.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ► Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ► Are authorized by the plant owner/operator.
- ► Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ► Follow instructions and comply with basic conditions.

2.2 Intended use

Application and measured materials

Measuring devices for use in hazardous areas, in hygienic applications or in applications where there is an increased risk due to process pressure are labeled accordingly on the nameplate.

Take the following measures to ensure that the device is used under appropriate conditions while in operation:

- ▶ Only use the measuring device in full compliance with the specifications on the nameplate and the general conditions listed in the operating instructions and supplementary documentation.
- ► Check the nameplate specifications to ensure that the ordered device can be put to its intended use in the approval-related area (e.g. explosion protection, pressure vessel safety).
- ▶ When not using this device at atmospheric temperature, it is important to comply with the basic requirements listed in the relevant documentation for the device.
- ▶ Protect the device permanently against corrosion caused by environmental effects.
- ▶ Observe the limit values in the "Technical Information."

The manufacturer is not liable for damage caused by improper or unintended use.

2.3 Workplace safety

When working with the device:

▶ Wear personal protection gear required by your regional/national regulations.

2.4 Operational safety

Risk of injury!

- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for interference-free operation of the device.

Basic safety instructions NAR300 system

Hazardous area

To eliminate danger to persons or the facility when the device is used in the hazardous area (e.g. explosion protection):

- ► Check the nameplate to verify if the device ordered can be put to its intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these instructions.

2.5 Product safety

The NAR300 system is designed in accordance with GEP (Good Engineering Practice) to meet the latest safety requirements, and it has been tested to ensure that it is ready to be used safely before being shipped from the factory. The NAR300 system meets general safety standards and legal requirements.

2.5.1 CE mark

This measurement system meets the legal requirements of the applicable EU directive. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

NAR300 system Product description

3 Product description

The NAR300 system is installed in a pit inside the oil-retaining wall of 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. Sensors with two different detection principles, a conductive type and a tuning fork type, are used to monitor detection conditions independently. In addition, 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.

NOTICE

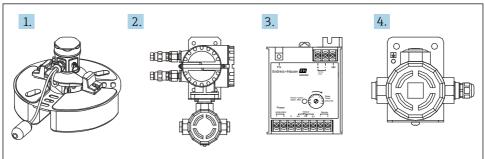
TIIS specifications

These operating instructions are not intended for products with TIIS specifications.

► If you are using a product with TIIS specifications, download and refer to KA01577G/33/JA/01.22-00 or an earlier version from our website (www.endress.com/downloads).

3.1 Product design

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



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- 1 Product design
- 1 Float sensor NAR300
- 2 Ex d [ia] Converter NRR261
- 3 Ex [ia] Converter NRR262
- 4 Ex [ia] sensor I/F Ex box

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods, check the following:

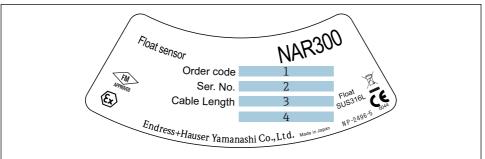
- Are the order codes on the delivery note and the product label identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) enclosed?
- If one or more of these conditions are not satisfied, contact your Endress+Hauser Sales Center or distributor.

4.2 Product identification

The following options are available for identification of the device:

- Nameplate specifications
- Extended order code on the delivery note (including details of the device specification codes)
- Entering the serial number from the nameplate in W@M Device Viewer (www.endress.com/deviceviewer) will display all the information about the device.
- Note that the information on a nameplate may be changed without notice when credentials and certificates are updated.

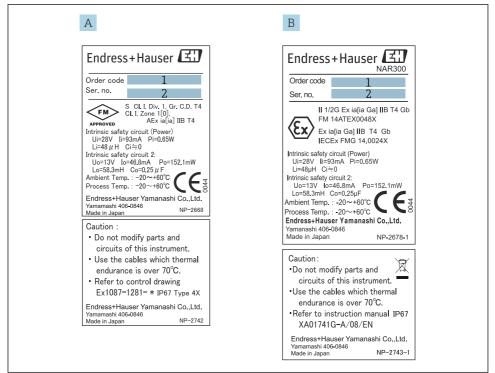
4.2.1 Nameplate specifications



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■ 2 NAR300 model nameplate

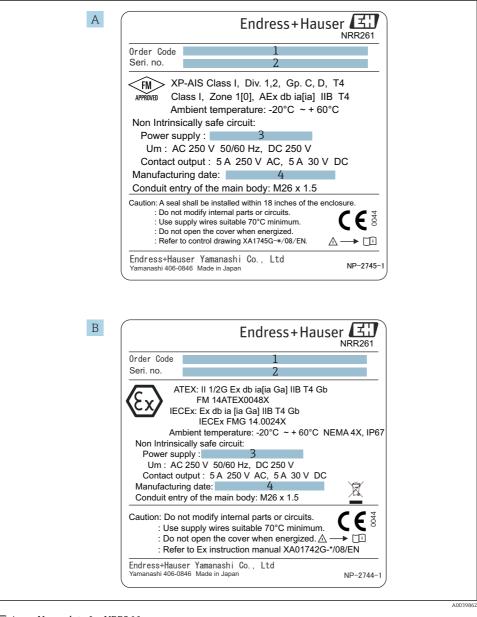
- 1 Order code
- 2 Serial number
- 3 Cable length (order code 040)
- 4 Explosion-proof performance



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■ 3 Nameplate for NAR300

- A NAR300 nameplate for FM
- B NAR300 nameplate for ATEX / IECEx
- 1 Order code
- 2 Serial number



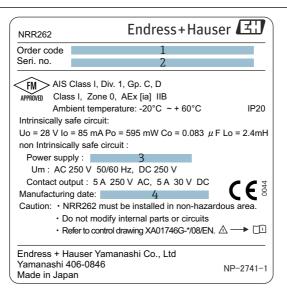
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₩ 4 Nameplate for NRR261

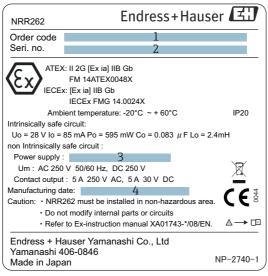
- Α NRR261 nameplate for FM (NAR300 integrated type)
- В NRR261 nameplate for ATEX / IECEx (NAR300 integrated type)
- Order code

- 2 Serial number
- 3 Power supply voltage
- 4 Manufacturing date





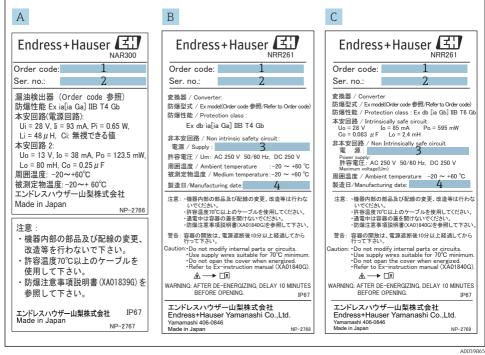
В



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■ 5 Nameplate for NRR262

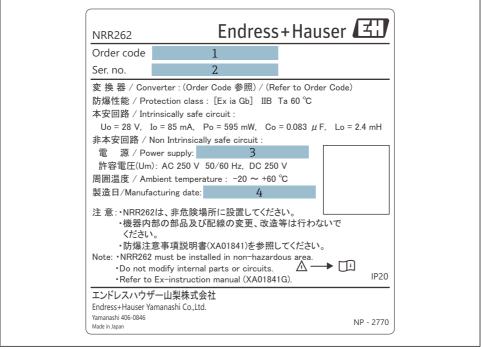
- A NRR262 nameplate for FM
- B NRR262 nameplate for ATEX / IECEx
- 1 Order code
- 2 Serial number
- 3 Power supply voltage
- 4 Manufacturing date



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₩ 6 NAR300/NRR261 nameplates

- NAR300 nameplate for IPN Ex Α
- В NRR261 nameplate for JPN Ex (NAR300 integrated type)
- C NRR261 nameplate for JPN Ex (NAR300 separate type)
- 1 Order code
- 2 Serial number
- 3 Power supply voltage
- Manufacturing date



A0039866

■ 7 NRR262 nameplate for JPN Ex

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

4.3 Manufacturer address

Endress+Hauser Yamanashi Co., Ltd.

406-0846

862-1 Mitsukunugi, Sakaigawa-cho, Fuefuki-shi, Yamanashi

4.4 Storage and transport

4.4.1 Transport

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).

Installation NAR300 system

5 Installation

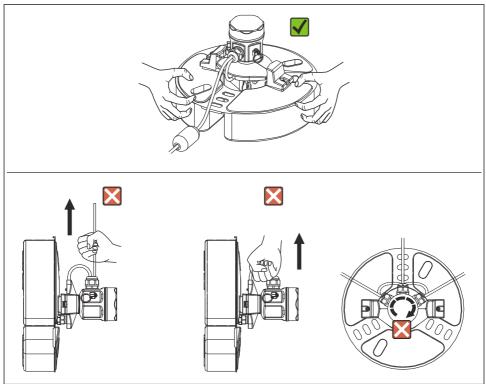
5.1 Mounting the NAR300 system

5.1.1 Handling precautions

№ 8

Handling the NAR300

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 float sensor. In addition, do not rotate the housing. Doing so may cause device failure.



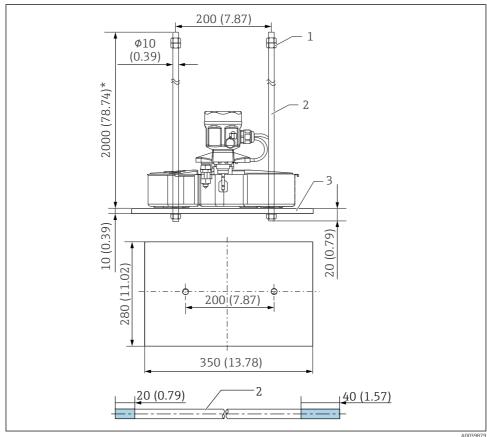
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NAR300 system Installation

5.1.2 Float guide mounting

NAR300 may be mounted on a float quide 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 nearest Endress +Hauser Sales Center or distributor.



- ₩ 9 NAR300 / float guide. Unit of measurement mm (in)
- 1 Nut (M10)
- 2 Float guide
- 3 Weight
- The 20 mm (0.73 in) and 40 mm (1.57 in) of the float guide in the diagram represent lengths of the thread grooves.

Installation NAR300 system

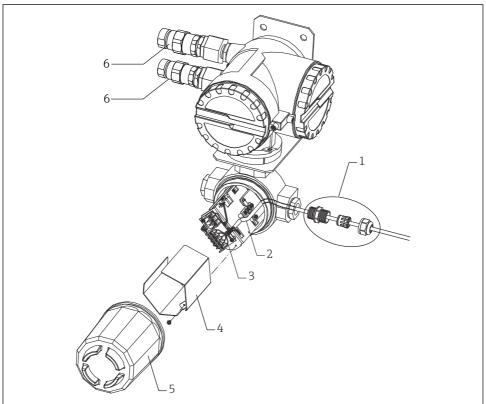
5.1.3 NRR261-4xx (integrated type) cable mounting

Mounting procedure

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

This completes the mounting procedure.

NAR300 system Installation



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■ 10 NRR261-4xx cable mounting

- 1 Cable gland mounting example
- 2 Float sensor cable
- 3 Cable holder
- 4 Circuit board guard
- 5 Intrinsically safe terminal box cover
- 6 Cable gland (Ex d) (supplied with JPN Ex specifications only)

Since the cable gland [1] shown in the diagram is not supplied with products that do not have JPN Ex specifications, a water-proof cable gland that is IP67 or higher must be procured separately.

Installation NAR300 system

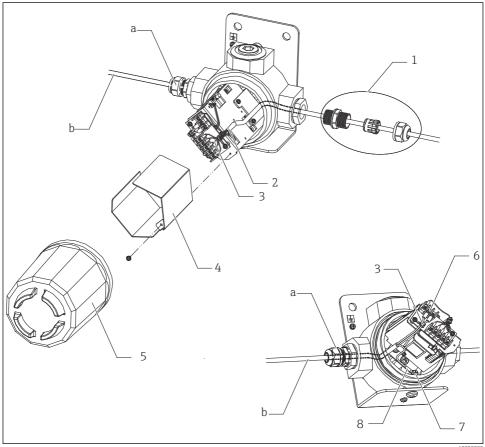
5.1.4 NAR300-x5xxxx and sensor I/F Ex box cable mounting

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 for the intrinsically safe terminal box.
- 3. Connect the cable to the terminal block (refer to "Electrical connection").
- 4. Tighten the main unit of the cable gland [1] 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 quard and close the cover of the intrinsically safe terminal box.

This completes the mounting procedure.

NAR300 system Installation



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■ 11 NAR300-x5xxxx and sensor I/F Ex box cable mounting

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

Since the cable gland a shown in the diagram is not supplied with products that do not have JPN Ex specifications, a water-proof cable gland that is IP67 or higher must be procured separately.

Installation NAR300 system

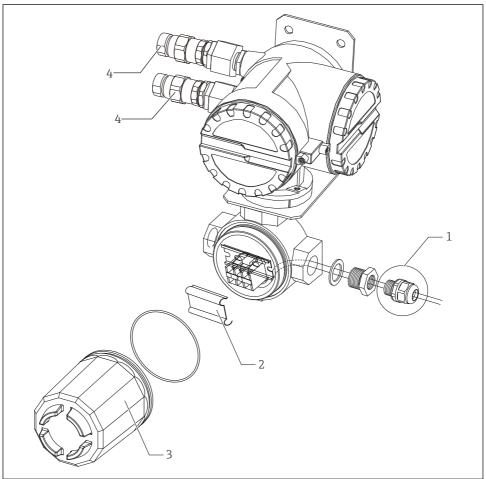
5.1.5 NRR261-5xx cable mounting

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 for the intrinsically safe terminal box.
- 3. Connect the cable to the terminal block (refer to "Electrical connection").
- 4. Mount the cable gland [1] according to the operating instructions.
- 5. Secure the cable in place with the cable holder.
- 6. Install the terminal block cover and close the cover of the intrinsically safe terminal box.

This completes the mounting procedure.

NAR300 system Installation



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■ 12 NRR261-5xx cable mounting

- 1 Cable gland mounting example
- 2 Terminal block cover
- 3 Intrinsically safe terminal box cover
- 4 Cable gland (Ex d) (supplied with JPN Ex specifications only)

Since the cable gland [1] shown in the diagram is not supplied with products that do not have JPN Ex specifications, a water-proof cable gland that is IP67 or higher must be procured separately.

Installation NAR300 system

5.2 Adjustment

5.2.1 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 clinqing 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.

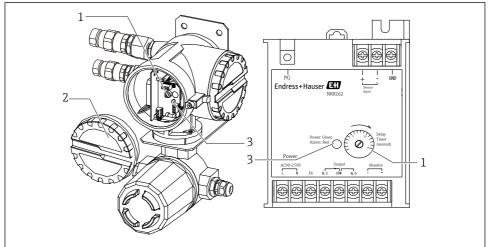
5.2.2 Alarm output adjustment

The only adjustment that can be made on the converter 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 up to a maximum of 15 seconds for SIL 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.

NAR300 system Installation



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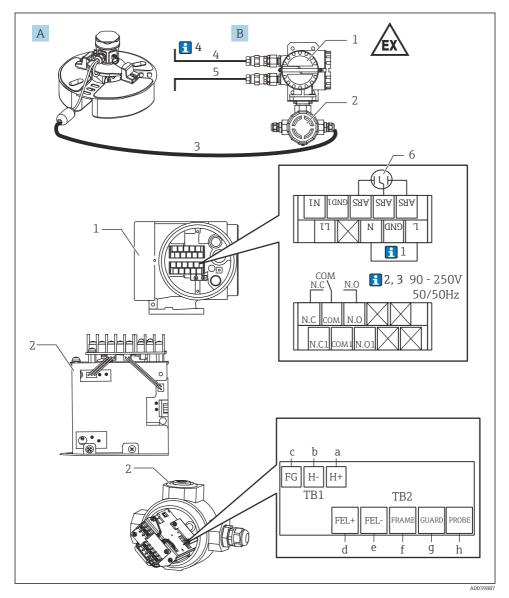
■ 13 Alarm output relay

- 1 Delay trimmer
- 2 Cover
- 3 LED power (green) / alarm (red)

Electrical connection NAR300 system

6 Electrical connection

6.1 NRR261-4/A/B/C wiring



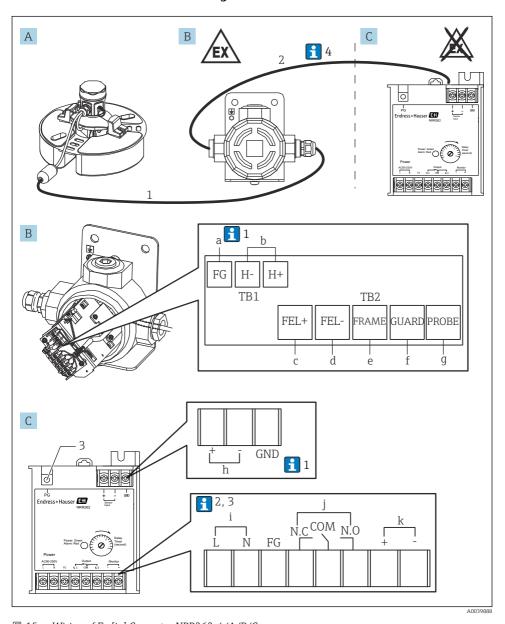
■ 14 Wiring of Ex d [ia] Converter NRR261-4/A/B/C

NAR300 system Electrical connection

- A Float sensor NAR300-x1xxxx
- *B* Ex d [ia] Converter NRR261 (integrated type)
- a Blue 1 (already wired at shipping), screw (M3)
- b Blue 2 (already wired at shipping), screw (M3)
- c Green, screw (M3)
- d Red, screw (M3)
- e Blue 3. screw (M3)
- f Yellow, screw (M3)
- *g* Black, screw (M3)
- h White, screw (M3)
- 1 Ex d terminal
- 2 Ex [ia] terminal
- 3 Ex [ia]-dedicated connection cable used (6 to 30 m (19.69 to 98.43 ft): Supplied with the product depending on the option code)
- 4 Power supply: AC/DC
- 5 Alarm output: Alarm/PLC/DCS, etc.
- 6 Power supply arrester (installed)
- \square Below, the numbers correspond to the description in the diagram.
- 1. The GND between L and N of NRR261 is connected when an FG-equipped AC cable is used.
- 2. When the power supply is 22 to 26 V_{DC} , terminal number L is + (plus) and N is (minus).
- 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. The cable for connecting NAR300 and NRR261 (3) is included with NAR300. The alarm output cable (4) from NRR261 and the power cable (5) to NRR261 are not included and must be procured by the customer. For detailed information on the connection cables, refer to the "Process conditions" section.

Electrical connection NAR300 system

6.2 NRR262-4/A/B/C wiring



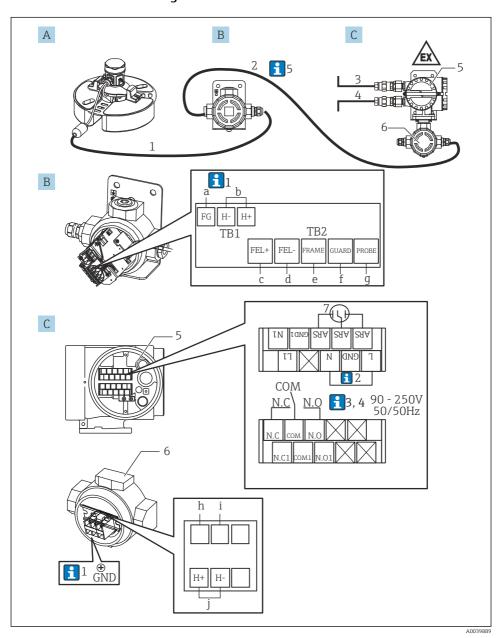
■ 15 Wiring of Ex [ia] Converter NRR262-4/A/B/C

NAR300 system Electrical connection

- A Float sensor NAR300-x5xxxx (sensor I/F Ex box is also included in the code)
- B Sensor I/F Ex box
- C Ex [ia] Converter NRR262
- a Green, screw (M3) (see 1 below)
- b Output to NRR262, screw (M3)
- c Red, screw (M3)
- d Blue, screw (M3)
- e Yellow, screw (M3)
- f Black, screw (M3)
- *g* White, screw (M3)
- h Input from sensor I/F Ex box, screw (M3)
- i 90 to 250 V_{AC}50/60 Hz, screw (M3)
- *i* Alarm output, screw (M3)
- k Check monitor output, screw (M3)
- 1 Ex [ia]-dedicated connection cable used (6 to 30 m (19.69 to 98.43 ft): Supplied with the product depending on the option code)
- 2 Sensor I/F Ex box and NRR262 cable (must be prepared by the customer)
- 3 For protective grounding, screw (M4)
- Below, the numbers correspond to the description in the diagram.
- 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 the power supply is 22 to 26 V_{DC} , terminal number L is + (plus) and N is (minus).
- 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 procured by the customer. For detailed information on the connection cables, refer to the "Process conditions" section.

Electrical connection NAR300 system

6.3 NRR261-5 wiring



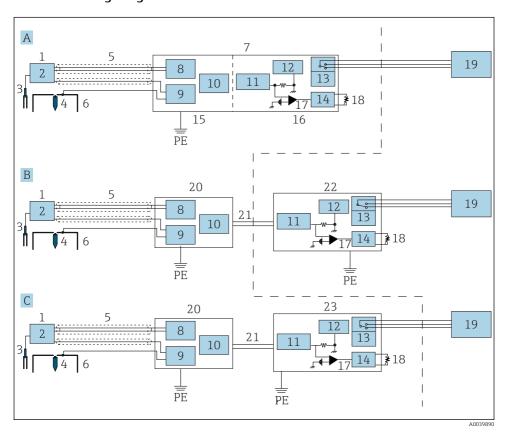
■ 16 Wiring of Ex d [ia] Converter NRR261-5

NAR300 system Electrical connection

- A Float sensor NAR300-x5xxxx (sensor I/F Ex box is also included in the code)
- B Sensor I/F Ex box
- C Ex d [ia] Converter NRR261 (separate type)
- a Green, screw (M3) (see 1 below)
- b Output to NRR261-3/5xx, screw (M3)
- c Red, screw (M3)
- d Blue 1, screw (M3)
- e Yellow, screw (M3)
- f Black, screw (M3)
- *g* White, screw (M3)
- h Blue 2, screw (M4) (connected at the time of shipping)
- i Blue 3, screw (M4) (connected at the time of shipping)
- *j* Input from sensor I/F Ex box, screw (M4)
- 1 Ex [ia]-dedicated connection cable used (6 to 30 m (19.69 to 98.43 ft): Supplied with 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), screw (M3)
- Below, the numbers correspond to the description in the diagram.
- 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. The GND between L and N of NRR261 is connected when an FG-equipped AC cable is used
- 3. When the power supply is 22 to 26 V_{DC} , terminal number L is + (plus) and N is (minus).
- 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 for connecting NAR300 and the sensor I/F Ex box (1) is included with NAR300. Cable (2) for connecting the sensor I/F Ex box to NRR261, the alarm output cable (3) from NRR261, as well as the power cable (4) to NRR261 are not included and must be procured by the customer. For detailed information on the connection cables, refer to the "Process conditions" section.

Electrical connection NAR300 system

6.4 Wiring diagram



■ 17 Wiring diagram

- A Ex d-type converter system (integrated type)
- *B Intrinsically safe-type converter system (separate type)*
- C Ex d [ia] converter system (separate type)
- *PE Protection earth (protective grounding)*
- 1 Float sensor NAR300
- 2 Tuning fork driving unit
- 3 Tuning fork
- 4 Conductivity detection electrode (sensor)
- 5 Dedicated cable
- 6 Conductivity detection electrode (float)
- 7 Converter NRR261 (integrated type)
- 8 Liquid detection circuit
- 9 Conductivity detection circuit
- 10 Current output circuit
- 11 Safety barrier
- 12 Power supply circuit

NAR300 system Electrical connection

- 13 Relay
- 14 Delay circuit
- 15 Ex [ia] circuit
- 16 Ex d circuit
- 17 Current detection
- 18 Delay trimmer
- 19 Alarm
- 20 Sensor I/F Ex box
- 21 Current signal
- 22 Converter NRR262
- 23 Converter NRR261 (separate type)

Electrical connection NAR300 system

6.5 Operating principles of alarm activation

The oil leak detection signal detected by the NAR300 float sensor is converted to a current signal in the converter 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 converter. 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 "Alarm output table" below).

Alarm output table

NRR261/NRR262 terminals		Between NC and COM	Between NO and COM	
Condition	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			

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







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