# User's Manual

# FN310 Field Wireless Multi-Protocol Module (HART Protocol)

IM 01W03D01-01EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01W03D01-01EN
7th Edition

# FN310
# Field Wireless Multi-Protocol Module
# (HART Protocol)

IM 01W03D01-01EN 7th Edition

# Contents


1. Introduction ..... 1-1
   - 1.1 Safe Use of This Product ..... 1-2
   - 1.2 Warranty ..... 1-2
   - 1.3 Trademark and Notice ..... 1-3
   - 1.4 Control of Pollution Caused by the Product ..... 1-4
2. Notes on Handling ..... 2-1
   - 2.1 Check the Model Name and Configuration ..... 2-1
   - 2.2 Transport ..... 2-2
   - 2.3 Storage ..... 2-2
   - 2.4 Selecting the Installation Location ..... 2-2
   - 2.5 Use of a Transceiver ..... 2-3
   - 2.6 Installation of an Explosion Protected Instrument ..... 2-3
     - 2.6.1 FM Approval (United States) ..... 2-4
     - 2.6.2 FM Approval (Canada) ..... 2-10
     - 2.6.3 ATEX Certification ..... 2-16
     - 2.6.4 IECEx Certification ..... 2-18
   - 2.7 EMC Conformity Standards ..... 2-20
   - 2.8 Safety Requirement Standards ..... 2-21
3. Component Names ..... 3-1
4. Installation ..... 4-1
   - 4.1 Precautions ..... 4-1
   - 4.2 Mounting ..... 4-1
     - 4.2.1 Installation of FN110 ..... 4-2
     - 4.2.2 Mounting to the HART Device ..... 4-3
     - 4.2.3 Mounting on a 50A (2-inch) Pipe ..... 4-3
5. Wiring ..... 5-1
   - 5.1 Notes on Wiring ..... 5-1
   - 5.2 Cable Selection ..... 5-1
     - 5.2.1 Selection of the Input Cable ..... 5-1
     - 5.2.2 Selection of the Remote Antenna Cable ..... 5-1
   - 5.3 Installation and Connection of FN110 ..... 5-2
     - 5.3.1 Installation of FN110 ..... 5-2
     - 5.3.2 Connection of FN110 ..... 5-3



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**5.4 Connection of HART Devices ..... 5-3**
5.4.1 Connecting Input Terminal and Grounding Terminal ..... 5-3
**5.5 Grounding ..... 5-7**
**6. Operation ..... 6-1**
**6.1 Preparation for Starting Operation ..... 6-1**
**6.2 Starting Operation ..... 6-2**
**6.3 Connecting to the Field Wireless Network ..... 6-2**
**6.4 Display Contents of the Integral Indicator ..... 6-5**
**6.5 Shutting Down ..... 6-5**
**7. Setting Parameters ..... 7-1**
**7.1 Preparation for Parameter Setting ..... 7-1**
**7.2 Preparing Software ..... 7-1**
7.2.1 Softwares for the Field Wireless Configuration Tool and the Device Configuration Tool ..... 7-1
7.2.2 Software Download ..... 7-1
**7.3 Setting Parameters ..... 7-2**
7.3.1 Parameter Usage and Selection ..... 7-2
7.3.2 Function Block and Menu Tree ..... 7-2
7.3.3 Parameters for Wireless Communication ..... 7-7
7.3.4 Tag and Device Information ..... 7-7
7.3.5 Setup the Integral Indicator ..... 7-7
7.3.6 Parameters for HART Device ..... 7-8
7.3.7 Assignment to AI Object ..... 7-9
7.3.8 Write Protect ..... 7-9
7.3.9 Switching to Deep Sleep Mode ..... 7-10
7.3.10 Switching to the Silence Mode ..... 7-10
**7.4 Self-Diagnostics ..... 7-11**
7.4.1 Identify Problems by Using the Device Configuration Tool ..... 7-11
7.4.2 Alert Report ..... 7-11
7.4.3 Checking with Integral Indicator ..... 7-12
**8. Maintenance ..... 8-1**
**8.1 General ..... 8-1**
**8.2 Recommended Products List ..... 8-1**
**8.3 Replacing the Battery Pack ..... 8-1**
**8.4 Replacing the Batteries ..... 8-2**
**8.5 Handling Batteries ..... 8-3**
**8.6 Switching LCD Display ..... 8-4**
**8.7 Replacing the FN110 ..... 8-4**
**8.8 Replacing the FN310 ..... 8-4**
**8.9 Replacing the HART Device ..... 8-5**

**8.10 Troubleshooting ..... 8-5**
8.10.1 Basic Troubleshooting Flow ..... 8-5
8.10.2 Example of Troubleshooting Flow ..... 8-6
8.10.3 Errors and Countermeasures ..... 8-7
**9. Parameter Summary ..... 9-1**
**10. General Specifications ..... 10-1**
**Revision Information**

# 1. Introduction

This manual describes how to use the FN310 Field Wireless Multi-Protocol Module (hereafter simply referred to as FN310).

FN310 was precisely calibrated at the factory before shipment. To ensure both safety and efficiency, please read this manual carefully before you operate this product.

FN310 works by utilizing the FN110 Field Wireless Communication Module (hereafter simply referred to as FN110). Please attach FN110 before use.

Table1.1 summarizes the related document list of this manual.

**Table 1.1 Related Document List**

| Title | Document No. |
|---|---|
| FieldMate<br>Versatile Device Management Wizard<br>User's Manual | IM 01R01A01-01E |
| YFGW410<br>Field Wireless Management Station<br>User's Manual | IM 01W02D01-01EN |
| FN110<br>Field Wireless Communication Module<br>General Specifications | GS 01W03B01-01EN |
| FN310<br>Field Wireless Multi-Protocol Module | GS 01W03D01-01EN |

### ■ Regarding This Manual

- This manual should be provided to the end user.
- This manual and the identification tag attached on packing box are essential parts of the product; keep them in a safe place for future reference.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to , implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made products. When products whose suffix code or optional codes contain code "Z" and an exclusive document is attached, please read it along with this manual.
- Please note that changes in the specifications, construction, or component parts of this product may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.
- The following safety symbols are used in this manual:

**WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or physical damage. It may also be used to alert against unsafe practices.

**IMPORTANT**

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

**NOTE**

Draws attention to information essential for understanding the operation and features.

## 1.1 Safe Use of This Product

This product is designed to be used by a person with specialized knowledge. For the safety of the operator and to protect this product and the system, please be sure to follow this manual's safety instructions when handling this product. If these instructions are not heeded, the protection provided by this product may be impaired. In this case, Yokogawa cannot guarantee that this product can be safely operated. Please pay special attention to the following points:

### (a) Installation

- This product may only be installed by an engineer or technician who has an expert knowledge of this product. Operators are not allowed to carry out installation unless they meet this condition.
- With high process temperatures, care must be taken not to burn yourself by touching this product or its casing.
- All installation shall comply with local installation requirements and the local electrical code.

### (b) Wiring

- This product must be installed by an engineer or technician who has an expert knowledge of this product. Operators are not permitted to carry out wiring unless they meet this condition.

### (c) Maintenance

- Please carry out only the maintenance procedures described in this manual. If you require further assistance, please contact the nearest Yokogawa office.
- Care should be taken to prevent the build up of dust or other materials on the display glass and the name plate. To clean these surfaces, use a soft, dry cloth.

### (d) Explosion Protected Type Instrument

- Users of explosion protected instruments should refer first to section 2.6 (Installation of an Explosion Protected Instrument) of this manual.
- The use of this instrument is restricted to those who have received appropriate training in the device.
- Take care not to create sparks when accessing the instrument or peripheral devices in a hazardous location.
- Repair or modification to this instrument by customer will cause malfunction of explosion protect function and hazardous situation. If you need to repair or modification, please contact the nearest Yokogawa office.

### (e) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this product by the customer.

### (f) Authorized Representative in the EEA

- The Authorized Representative for this product in the EEA is: Yokogawa Europe B.V. Euroweg 2, 3825 HD Amersfoort, THE NETHERLANDS.

## 1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurring during the warranty period shall basically be repaired free of change.
- If any problems are experienced with this product, the customer should contact the Yokogawa representative from which this product was purchased or the nearest Yokogawa office.
- If a problem arises with this product, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- The party responsible for the cost of fixing the problem shall be determined by Yokogawa following an investigation conducted by Yokogawa.

■ **The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:**

- Improper and/or inadequate maintenance by the purchaser.
- Malfunction or damage due to a failure to handle, use, or store this product in accordance with the design specifications.
- Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
- Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
- Malfunction or damage from improper relocation of the product in question after delivery.
- Reason of force majeure such as fires, earthquakes, storms/floods, thunder/ lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

## 1.3 Trademark and Notice

### ■ Trademarks

In this document, trademarks or registered trademarks are not marked with "™" or "®". Product names and company names in this document are trademarks or registered trademarks of the respective companies.

### ■ Notice

NO RIGHTS OR LICENSES, EXPRESS OR IMPLIED, ARE GRANTED TO USE THIRD-PARTY DEVICES IN COMBINATION WITH THESE PRODUCTS IN A WIRELESS MESH NETWORK, OR TO USE THIRD-PARTY SERVICES TO ACCESS, MONITOR OR CONTROL THESE PRODUCTS IN A WIRELESS MESH NEWORK VIA THE INTERNET OR ANOTHER EXTERNAL WIDE AREA NETWORK.

### ■ Patent Marking

Covered by one or more claims of patents: http://sipcollc.com/patent-list/ and http://intusiq.com/patent-list/.

## 1.4 Control of Pollution Caused by the Product

### ■ EU RoHS

This product is in conformity with the following standard:
EN IEC 63000 (Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances)

### ■ China RoHS

This is an explanation for the product based on “Control of Pollution caused by Electronic Information Products” in the People’s Republic of China.

**電子情報製品汚染制御管理弁法（中国版 RoHS）**

**产品中有害物质或元素的名称及含量**

| 型号 | 部件名称 | 有害物质 | | | | | |
|---|---|---|---|---|---|---|---|
| | | 铅（Pb） | 汞（Hg） | 镉（Cd） | 六价铬（Cr(VI)） | 多溴联苯（PBB） | 多溴二苯醚（PBDE） |
| FN310 现场无线多协议转换模块 | 壳体(金属) | × | ○ | ○ | ○ | ○ | ○ |
| | 壳体(塑料) | ○ | ○ | ○ | ○ | ○ | ○ |
| | 基板组件 | × | ○ | ○ | ○ | ○ | ○ |
| | 电缆 | × | ○ | ○ | ○ | ○ | ○ |
| ○：表示该部件的所有均质材料中的有害物质的含量均在GB/T26572 标准中所规定的限量以下。<br>×：表示至少该部件的某些均质材料中的有害物质的含量均在GB/T26572 标准中所规定的限量以上。 | | | | | | | |

**环保使用期限：**




**该标识适用于 SJ/T11364 中所述，在中华人民共和国销售的电子电气产品的环保使用期限。**

**注）该年数为“环保使用期限”，并非产品的质量保证期。**

# 2. Notes on Handling

The FN310 is fully factory-tested before shipment. When the FN310 delivered, check the appearance for damage, and also check that the mounting parts shown in Figure 2.1 are included with your shipment. If “No Mounting Bracket” or “Horizontal connection” is indicated, no mounting bracket is included.

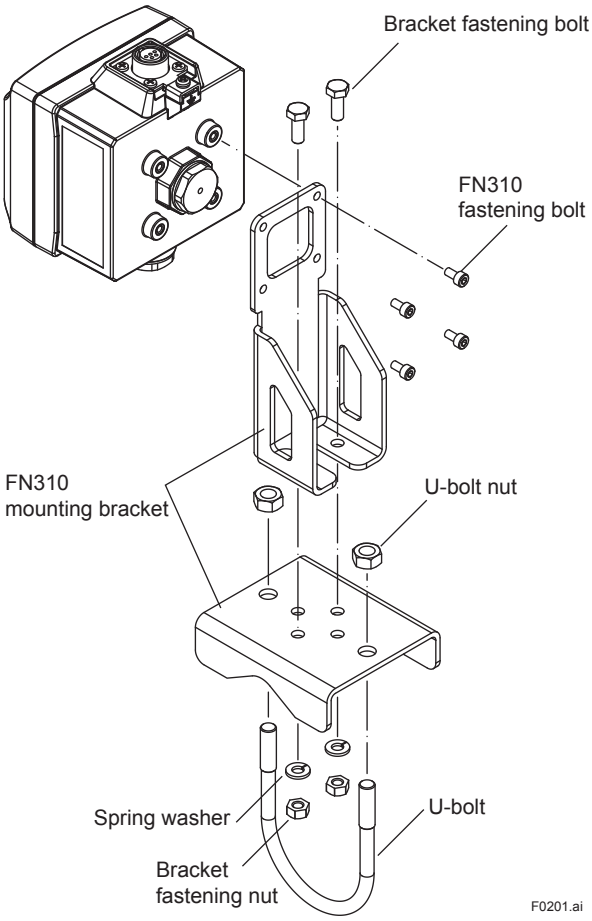



**Figure 2.1 FN310 Mounting Hardware**

**Table 2.1 FN310 Mounting Hardware**

| Part name | Quantity |
|---|---|
| FN310 mounting bracket | 1 |
| FN310 fastening bolt | 4 |
| Bracket fastening bolt | 2 |
| Bracket fastening nut | 2 |
| Spring washer | 2 |
| U-bolt | 1 |
| U-bolt nut | 2 |

**■ Bundled items**

- User’s Manual (IM 01W03D01-01EN)
- Horizontal connection male thread
  When specified horizontal connection.
- Clamp
  When specified horizontal connection.
- FN310 mounting hardware
  When specified mounting bracket.
- Protection cap (optional specifications)
- Wired tag plate (optional specifications)
- EU DECLARATION OF CONFORMITY (F9090HZ), if optional specification /KS27 is specified.

## 2.1 Check the Model Name and Configuration

The model name and configuration are indicated on the nameplate. Verify that the configuration indicated in the “Model and Suffix Code” in subsection 10.2 is in compliance with the specifications written on the order sheet. Manual number omitting the language code at the end is printed on the nameplate.

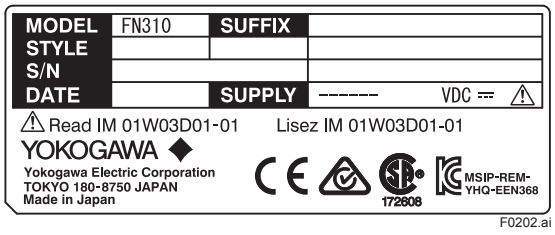



**Figure 2.2 Nameplate**

MODEL : Specified model code.
SUFFIX : Specified suffix code.
STYLE : Style code.
S/N : Serial number.
DATE : Date of manufacture.
SUPPLY : Supply voltage.
TOKYO 180-8750 JAPAN: The manufacturer name and the address *1.

*1 “180-8750” is a zip code which represents the following address. 2-9-32 Nakacho, Musashino-shi, Tokyo Japan

## 2.2 Transport

To prevent damage while in transit, leave the FN310 in the original shipping container until it reaches the installation site. For transportation of batteries, refer to subsection 8.5 “Handling Batteries”.

## 2.3 Storage

When storing this product, observe the following precautions.

1. Chose a storage location that satisfies the following requirements.
   - A location that is not exposed to rain or water.
   - A location subject to a minimum of vibration or impact.
   - The following temperature and humidity range is recommended. Ordinary temperature and humidity (25°C, 65%) are preferable.
     Temperature: -40 to 85°C
     Humidity : 0 to 100% RH
     (no condensation)
2. If at all possible, store the FN310 in factory-shipped condition, that is, in the original shipping container.
3. Preferably remove the batteries for storage. For maximum battery life, the storage temperature should not exceed 30°C.

**NOTE**

When storing FN310 with a battery pack, it is recommended to put the FN310 in Deep Sleep mode to conserve the batteries. For details on how to switch to Deep Sleep mode, refer to subsection 7.3.9 “Switching to the Deep Sleep Mode”.

## 2.4 Selecting the Installation Location

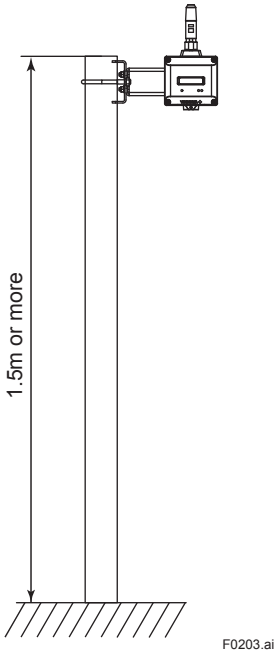
Although this product is designed to operate in a harsh environment, to maintain stability and accuracy, the following is recommended.

### ■ Wireless Communication

**NOTE**

The installation location of this product must meet the following conditions:

- Install this product to be perpendicular to the ground.
- When using a remote antenna cable, regardless of the installing direction of the FN310, install the FN110 to be perpendicular to the ground.
- Install the FN110 at least 1.5 m above the ground or floor.




- Ensure that there are no obstacles such as walls or pipes within a 30 cm radius of the FN110.
- Confirm that each field wireless equipment can see the antenna of other devices which locate within its own communication range.

### ■ Ambient Temperature

It is preferable to not to expose the instrument to extreme temperatures or temperature fluctuations. If FN310 is exposed to radiation heat a thermal protection system or appropriate ventilation is recommended.

### ■ Environmental Requirements

Do not allow FN310 to be installed in a location that is exposed to corrosive atmospheric conditions. When using this product in a corrosive environment, ensure the location is well ventilated.
The unit and its wiring should be protected from exposure to rainwater.

### ■ Impact and Vibration

It is recommended that the FN310 be installed in a location that is subject to a minimum amount of impact and vibration.

### ■ Installation of Explosion Protected Products

An explosion protected products is certified for installation in a hazardous area containing specific gas types. See subsection 2.6 “Installation of an Explosion Protected Instrument”.

## 2.5 Use of a Transceiver

**IMPORTANT**

Although FN310 has been designed to resist high frequency electrical noise, if a radio transceiver is used near the FN310 or its external wiring, the FN310 may be affected by high frequency noise pickup. To test this, start out from a distance of several meters and slowly approach the FN310 with the transceiver while observing the measurement loop for noise effects. Thereafter use the transceiver outside the range where the noise effects were first observed.

## 2.6 Installation of an Explosion Protected Instrument

If a customer makes a repair or modification to an intrinsically safe instrument and the instrument is not restored to its original condition, its intrinsically safe construction may be compromised and the instrument may be hazardous to operate. Please contact Yokogawa before making any repair or modification to an instrument.

**WARNING**

- Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of the product with a dry cloth.
- To satisfy IP66, IP67 and Type 4X,
  - Connect to a connector JR13WPI-5P (Hirose Electric) and tightened with a specified torque.
  - Apply waterproof glands to the electrical connection port, at models FN310-xx-J00, FN310-xx-J01, and FN310-xx-J02.
  - Connect to equipment, using a clamp and an adapter, at models FN310-xx-J03, FN310-xx-J04, and FN310-xx-J05.(See subsection 4.2.2 “Mounting to the HART Device”)
- The instrument modification or parts replacement by other than an authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.
- When replacing the battery pack, be sure to minimize the risk of explosion from electrostatic discharge. Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of the battery pack and product with a dry cloth.

**CAUTION**

- This instrument has been tested and certified as being intrinsically safe. Please note that severe restrictions apply to this instrument’s construction, installation, external wiring, maintenance and repair. A failure to abide by these restrictions could make the instrument a hazard to operate.
- Be careful to make sure that an intrinsically safe apparatus, intrinsically safe devices, and wiring to connect them are arranged so that current and voltage are not induced by electromagnetic or electrostatic induction in the intrinsically safe circuit in order to prevent impairment of the intrinsically safe and explosion protected performance of the intrinsically safe circuit.

### 2.6.1 FM Approval (United States)

#### (1) Technical Data

Caution for FM Approval (US) Intrinsically safe type.

Note 1. Model FN310 Field Wireless Multi-Protocol Module (HART Protocol) with optional code /FS17 for potentially explosive atmospheres:

- Applicable Standards:
  FM 3600, FM 3610, FM 3810,
  ANSI/UL 60079-0 Ed. 7 (2020),
  ANSI/UL 60079-11 Ed. 6 (2018),
  ANSI/UL 61010-1 Ed. 3 (2012),
  NEMA 250:2003, ANSI/IEC 60529:2004
- Certificate number: FM21US0034X
- Specific Ex marking:
  IS CL I/II/III DIV 1 GP ABCDEFG T4
  CL I ZN 0 AEx ia IIC T4
- Enclosure: IP66 and Type 4X
- Temperature Class: T4
- Ambient Temperature:
  –40 to 70°C (–40 to 158 °F)
- Signals: RS485 Communication (FN110)
- Dielectric strength: 500V AC,r.m.s., 1min

Note 2. Electrical Parameters
(Refer to the Control Drawing)

Note 3. Installation

- Installation should be in accordance with local installation requirements. (Refer to the Control Drawing)

Note 4. Operation

**WARNING**

POTENTIAL ELECTROSTATIC CHARGING HAZARD

- In hazardous areas, avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.
- To prevent electrostatic discharge caused by static charge built up on the operator, ground the operator through conductive shoes and floors and by wearing anti-static work clothes to prevent charge build-up.
- Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of Battery Pack and product with a dry cloth.
- If static electricity cannot be suppressed, check that the surrounding atmosphere does not contain explosive gas or steam before replacing the Battery Pack.

Note 5. Maintenance and repair

**WARNING**

A modification of the equipment would no longer comply with the construction described in the certificate documentation.
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
USE ONLY YOKOGAWA BATTERY PACK F9090FC or F9090GC

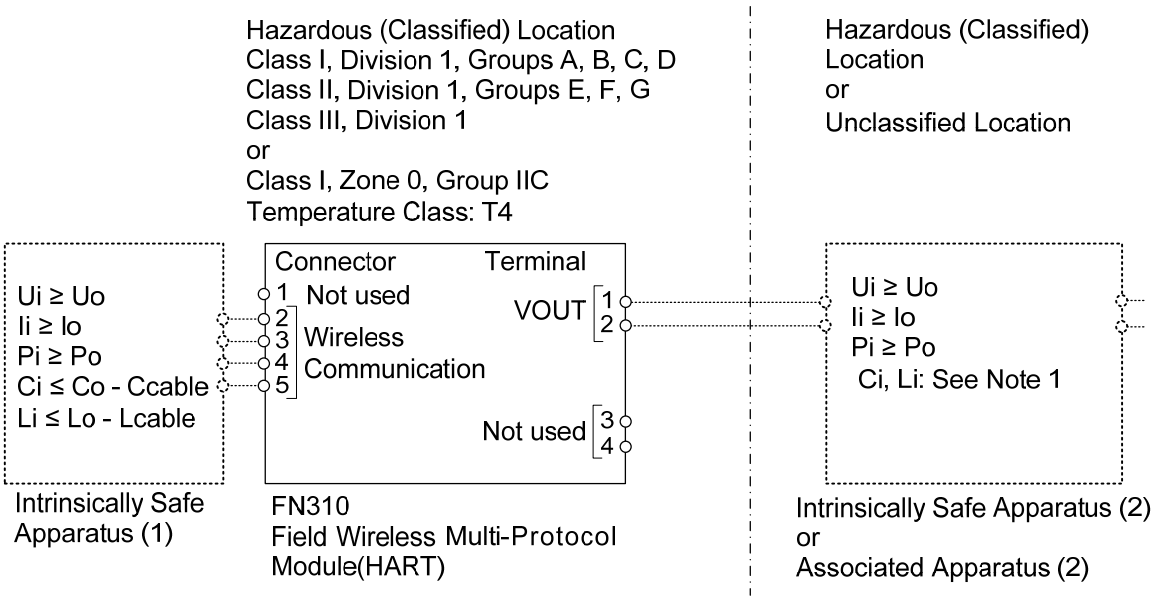
THE BATTERY PACK CAN BE REPLACED IN A HAZARDOUS LOCATION. THE BATTERY PACK HAS SURFACE RESISTIVITY GREATER THAN 1G OHM AND MUST BE PROPERLY INSTALLED IN THE ENCLOSURE OF THE EQUIPMENT. CARE MUST BE TAKEN DURING TRANSPORTATION TO AND FROM THE POINT OF INSTALLATION TO PREVENT ELECTROSTATIC CHARGE BUILD-UP
CELLS MUST BE CHANGED IN A NON-HAZARDOUS AREA ONLY
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

Note 6. Specific conditions of use

- Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts of the equipment.
- The connector (FN110 terminal) on the enclosure contains aluminum and is considered a potential risk of ignition caused by impact or friction. When the equipment is mounted in Zone 0, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- Rigid type conduit shall not be used as the wiring method.

| Yokogawa Electric Corporation | | Model | | FN310 Series | | | |
|---|---|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | | | |
| No. | IFM043-A71 | Page | 1 | Revision | 1 | Date | 2020-09-11 |

One-to-one Connection [2-wire or 4-wire (Passive)]




Wireless Communication (Connector)

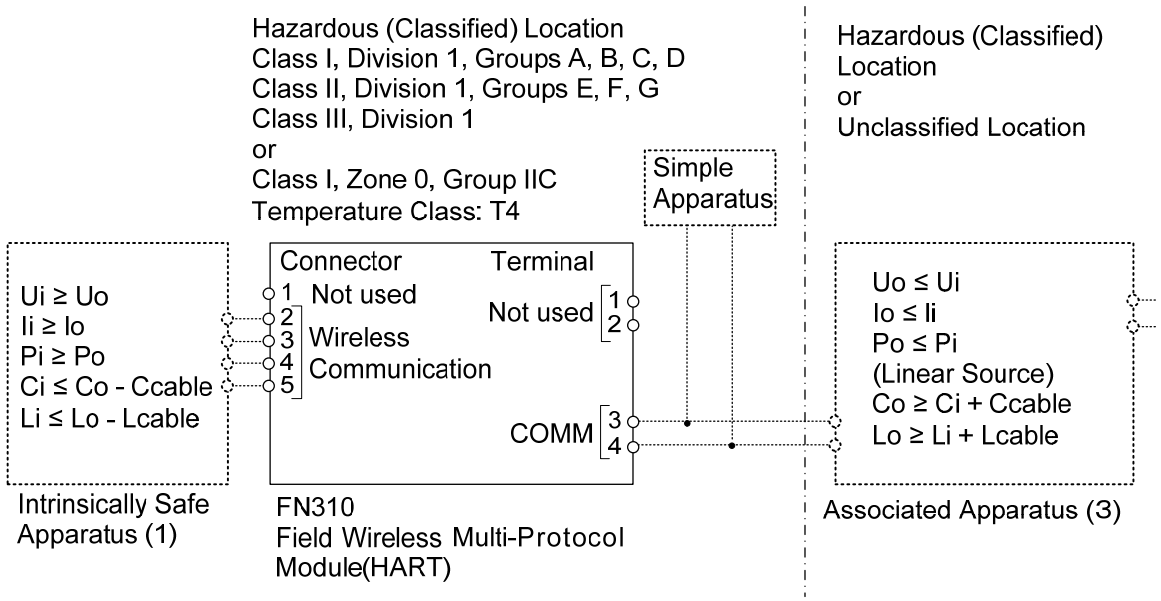
| | | |
|---|---|---|
| Uo : | 5.88 | V |
| Io : | 613 | mA |
| Po : | 907 | mW |
| Co : | 5.82 | µF |
| Lo : | 25 | µH |

VOUT (Terminal 1, 2)

| | | |
|---|---|---|
| Uo : | 23.1 | V |
| Io : | 87 | mA |
| Po : | 450 | mW |
| Co : | 100 | nF |
| Lo : | 3 | mH |

| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 2 | Revision | 1 |

One-to-one Connection [4-wire (Active)]




Wireless Communication (Connector)

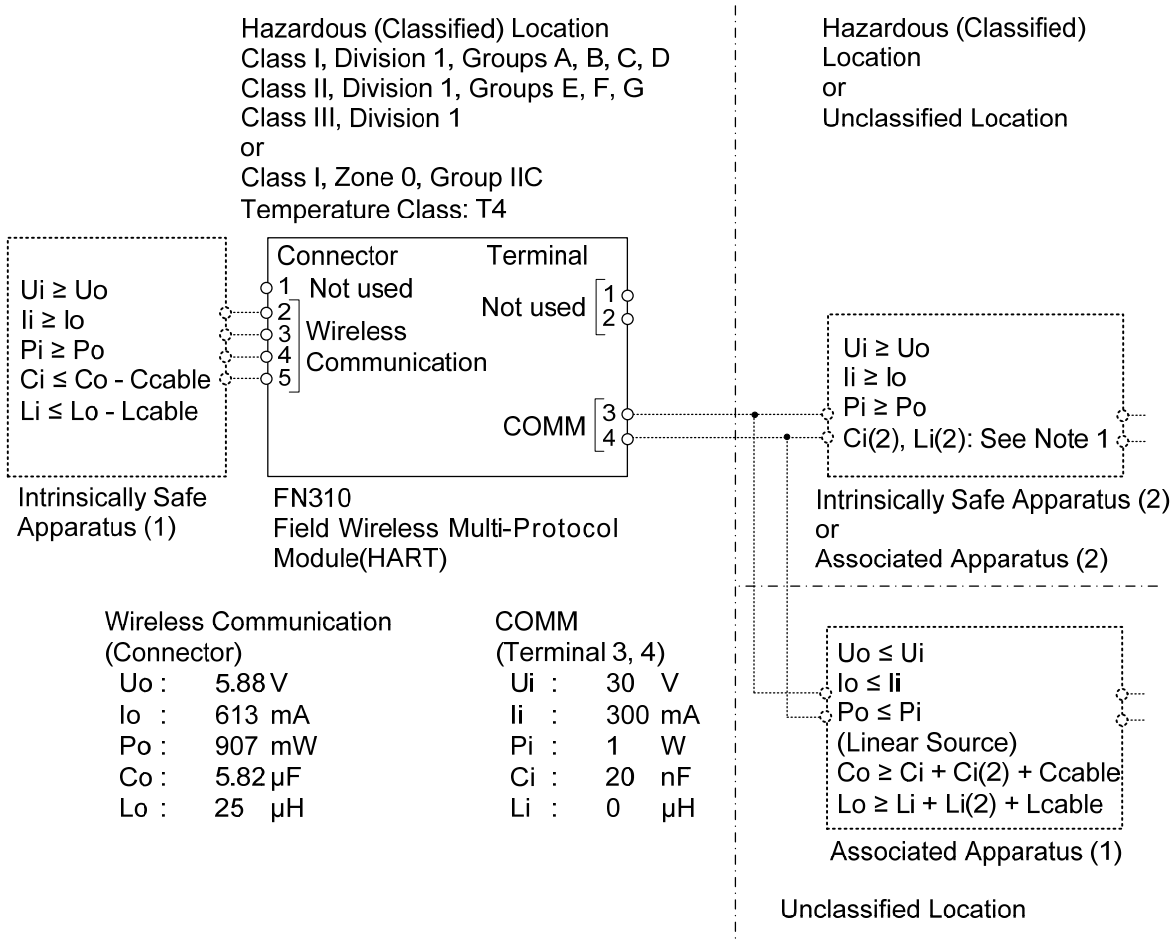
| | | |
|---|---|---|
| Uo : | 5.88 | V |
| Io : | 613 | mA |
| Po : | 907 | mW |
| Co : | 5.82 | µF |
| Lo : | 25 | µH |

COMM (Terminal 3, 4)

| | | |
|---|---|---|
| Ui : | 30 | V |
| Ii : | 300 | mA |
| Pi : | 1 | W |
| Ci : | 20 | nF |
| Li : | 0 | µH |

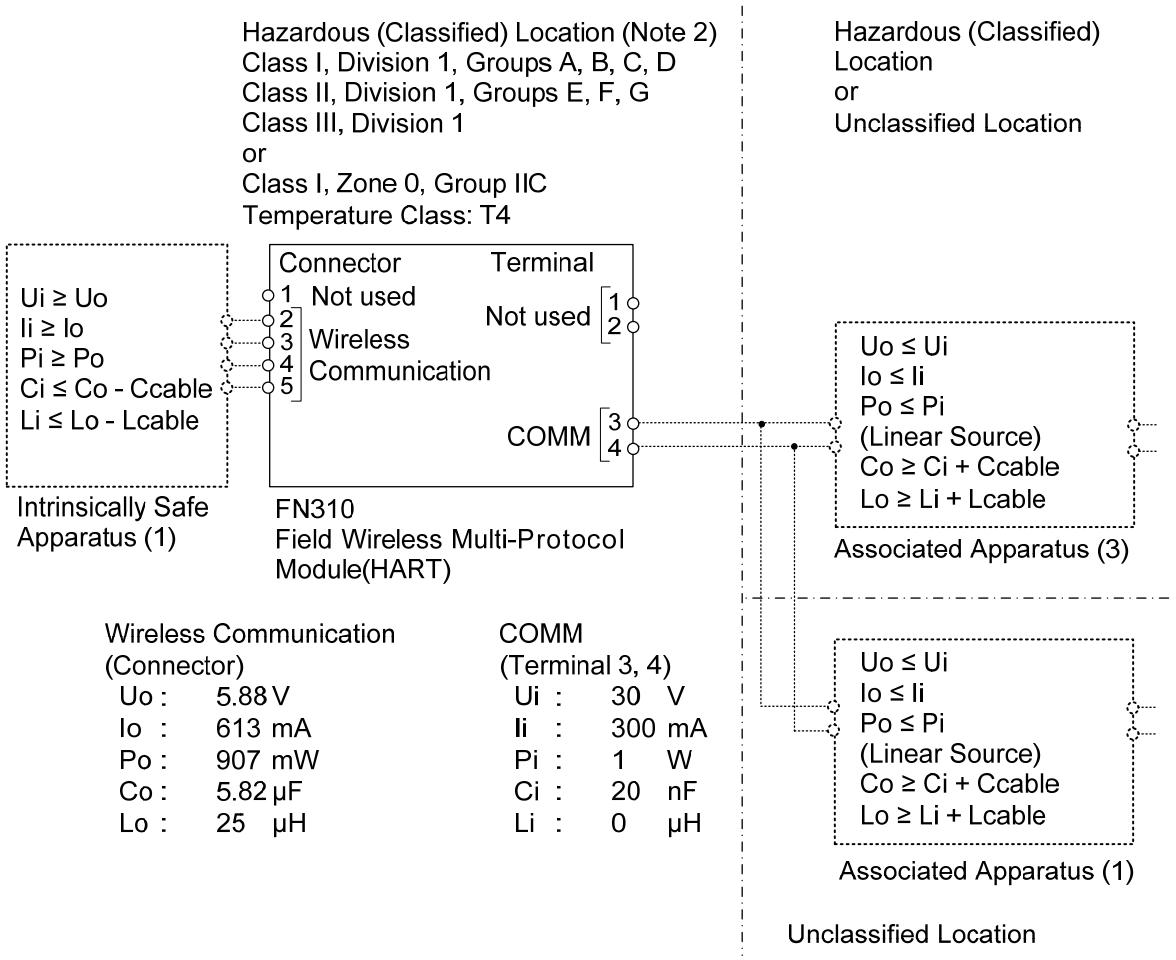
| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 3 | Revision | 1 |

4−20 mA Loop Connection [2-wire or 4-wire (Passive)]



| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 4 | Revision | 1 |

4−20 mA Loop Connection [4-wire (Active)]




Wireless Communication (Connector)

| | | |
|---|---|---|
| Uo : | 5.88 | V |
| Io : | 613 | mA |
| Po : | 907 | mW |
| Co : | 5.82 | µF |
| Lo : | 25 | µH |

COMM (Terminal 3, 4)

| | | |
|---|---|---|
| Ui : | 30 | V |
| Ii : | 300 | mA |
| Pi : | 1 | W |
| Ci : | 20 | nF |
| Li : | 0 | µH |

| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 5 | Revision | 1 |

Notes:

1. As allowable connection values of an Intrinsically Safe Apparatus (2) or an Associated Apparatus (2), the following conditions of (a) or (b) must be satisfied.
   (a) {( Li × 100 ≤ Lo) or (Ci × 100 ≤ Co)} and {Li ≤ (Lo - Lcable) and Ci ≤ (Co - Ccable)}
   (b) { Li ≤ (Lo / 2 - Lcable) and Ci ≤ (Co / 2 - Ccable)} and
   [{(Ci + Ccable) ≤ 600 nF for Group IIC} or {(Ci + Ccable) ≤ 1 µF for Group IIA, IIB}]

2. As for 4−20 mA Loop Connection [4-wire (Active)], the level of protection of COMM circuit is reduced to “ib”.

3. (For US) No revision to this drawing without prior approval of FM.

4. (For US ) Installation must be in accordance with the National Electrical Code (NFPA 70), ANSI/ISA-RP12.06.01, and relevant local codes.

5. (For Canada) Installation must be in accordance with the Canadian Electrical Code Part I (C22.1), ANSI/ISA-RP12.06.01, and relevant local codes.

6. (For US) IS Apparatus (or Associated Apparatus) must be FM approved.

7. Control equipment connected to IS Apparatus (or Associated Apparatus) must not use or generate a voltage more than Um of the control equipment.

8. The equipment satisfies the requirements for IP66 and Type 4X only when it is connected to a connector JR13WPI-5P (Hirose Electric) and tightened with a torque of 1.2-2.0 N·m. Appropriate type of plug must be used in accordance with the instructions.

9. Models FN310-xx-J03, FN310-xx-J04, and FN310-xx-J05 satisfy the requirement for IP66 and Type 4X only when they are connected to equipment, using a clamp and an adaptor, and tightened with a torque of 4.8-5.3 N·m.

10. The control drawing of IS Apparatus (or Associated Apparatus) must be followed when installing the equipment.

**WARNING**

- Be sure to use the specified battery pack and batteries. For details, refer to section 8.5 “Handling Batteries.”
- With an intrinsically safe products, the battery pack is replaceable in a hazardous area. During the replacement work, make sure that dust and water droplets do not enter inside the products. For details on how to replace the battery pack, refer to section 8.3 “Replacing the Battery Pack.”

### 2.6.2 FM Approval (Canada)

#### (1) Technical Data

Caution for FM Approval (Canada) Intrinsically safe type.

Note 1. Model FN310 Field Wireless Multi-Protocol Module (HART Protocol) with optional code /CS17 for potentially explosive atmospheres:

- Applicable Standards: CAN/CSA-C22.2 No. 0, C22.2 No. 60079-0:19, CAN/CSA-C22.2 No. 60079-11:14, CAN/CSA-C22.2 No. 61010-1, CAN/CSA-C22.2 No. 94.1, CAN/CSA-C22.2 No. 94.2, CAN/CSA-C22.2 No. 60529:05
- Certificate number: FM21CA0023X
- Specific Ex marking: Ex ia IIC T4 Ga IS CL I/II/III DIV 1 GP ABCDEFG T4
- Enclosure: IP66 and Type 4X
- Temperature Class: T4
- Ambient Temperature: –40 to 70°C (–40 to 158 °F)
- Signals: RS485 Communication (FN110)
- Dielectric strength: 500V AC,r.m.s. , 1min

Note 2. Electrical Parameters (Refer to the Control Drawing)

Note 3. Installation

- Installation should be in accordance with local installation requirements. (Refer to the Control Drawing)

Note 4. Operation

**WARNING**

POTENTIAL ELECTROSTATIC CHARGING HAZARD
In hazardous areas, avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.
To prevent electrostatic discharge caused by static charge built up on the operator, ground the operator through conductive shoes and floors and by wearing anti-static work clothes to prevent charge build-up.
Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of Battery Pack and product with a dry cloth.
If static electricity cannot be suppressed, check that the surrounding atmosphere does not contain explosive gas or steam before replacing the Battery Pack.

Note 5. Maintenance and repair

**WARNING**

A modification of the equipment would no longer comply with the construction described in the certificate documentation.
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment
USE ONLY YOKOGAWA BATTERY PACK F9090FC or F9090GC

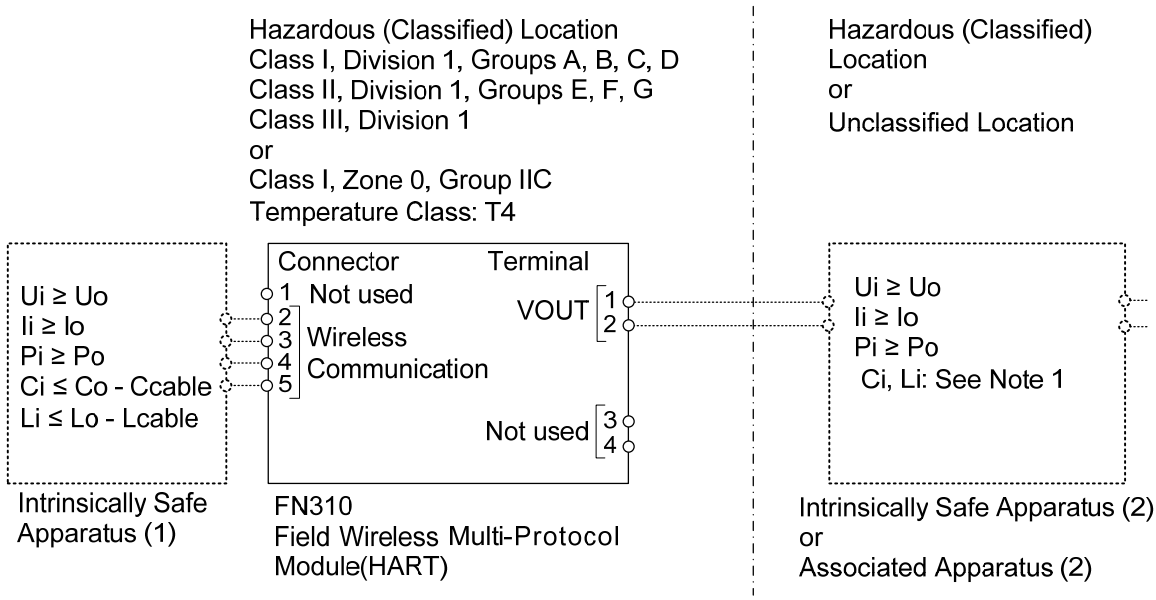
THE BATTERY PACK CAN BE REPLACED IN A HAZARDOUS LOCATION. THE BATTERY PACK HAS SURFACE RESISTIVITY GREATER THAN 1G OHM AND MUST BE PROPERLY INSTALLED IN THE ENCLOSURE OF THE EQUIPMENT. CARE MUST BE TAKEN DURING TRANSPORTATION TO AND FROM THE POINT OF INSTALLATION TO PREVENT ELECTROSTATIC CHARGE BUILD-UP
CELLS MUST BE CHANGED IN A NON-HAZARDOUS AREA ONLY
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

Note 6. Specific conditions of use

- Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts of the equipment.
  The connector (FN110 terminal) on the enclosure contains aluminum and is considered a potential risk of ignition caused by impact or friction. When the equipment is mounted in Zone 0, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
  Rigid type conduit shall not be used as the wiring method.

| Yokogawa Electric Corporation | | Model | | FN310 Series | | | |
|---|---|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | | | |
| No. | IFM043-A71 | Page | 1 | Revision | 1 | Date | 2020-09-11 |

One-to-one Connection [2-wire or 4-wire (Passive)]




Wireless Communication (Connector)

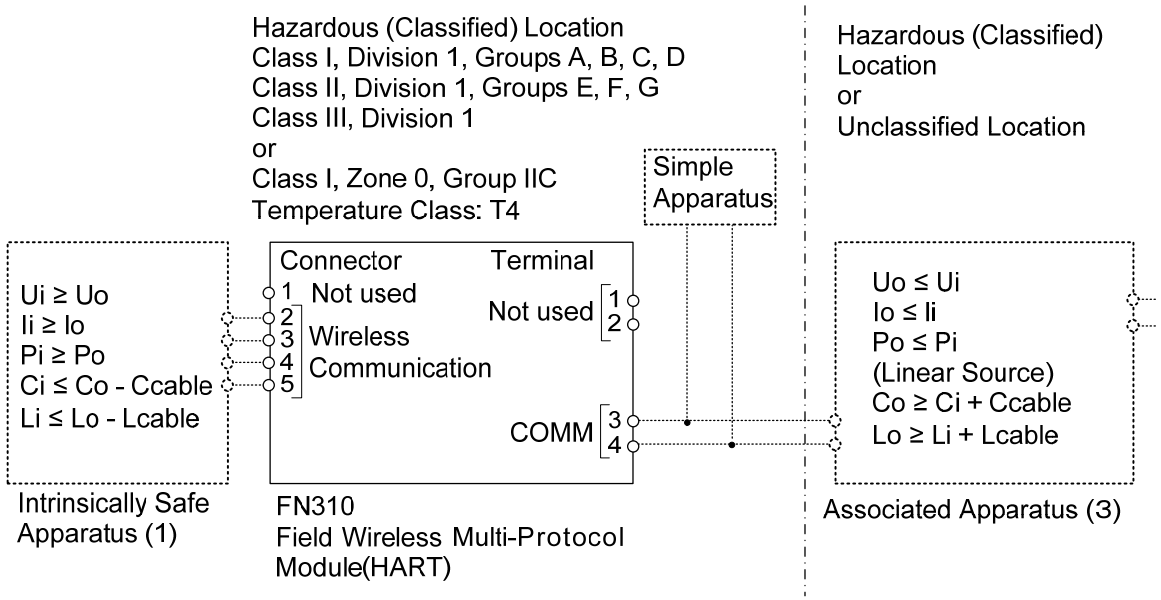
| | | |
|---|---|---|
| Uo : | 5.88 | V |
| Io : | 613 | mA |
| Po : | 907 | mW |
| Co : | 5.82 | µF |
| Lo : | 25 | µH |

VOUT (Terminal 1, 2)

| | | |
|---|---|---|
| Uo : | 23.1 | V |
| Io : | 87 | mA |
| Po : | 450 | mW |
| Co : | 100 | nF |
| Lo : | 3 | mH |

| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 2 | Revision | 1 |

One-to-one Connection [4-wire (Active)]




Wireless Communication
(Connector)

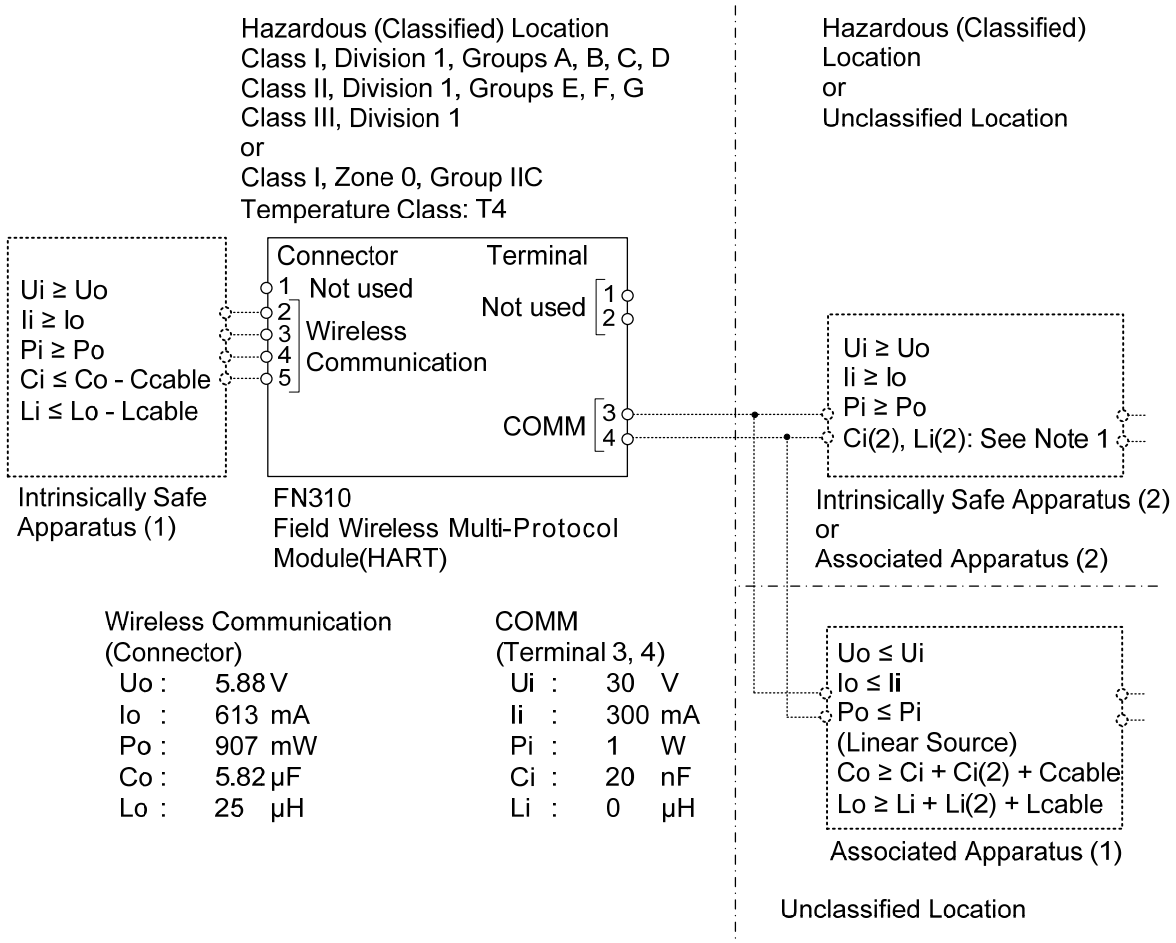
| | | |
|---|---|---|
| Uo : | 5.88 | V |
| Io : | 613 | mA |
| Po : | 907 | mW |
| Co : | 5.82 | µF |
| Lo : | 25 | µH |

COMM
(Terminal 3, 4)

| | | |
|---|---|---|
| Ui : | 30 | V |
| Ii : | 300 | mA |
| Pi : | 1 | W |
| Ci : | 20 | nF |
| Li : | 0 | µH |

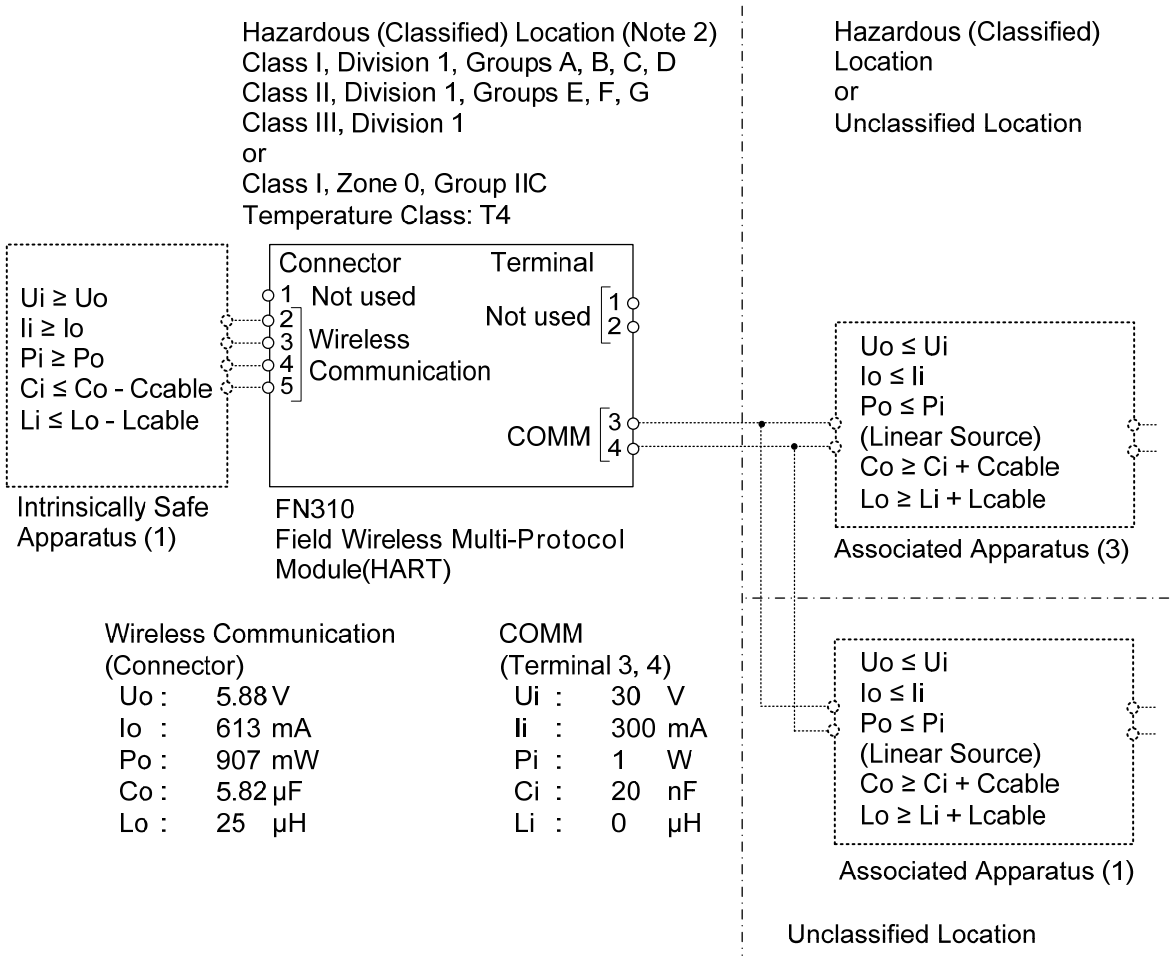
| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 3 | Revision | 1 |

4−20 mA Loop Connection [2-wire or 4-wire (Passive)]



| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 4 | Revision | 1 |

4−20 mA Loop Connection [4-wire (Active)]



| Yokogawa Electric Corporation | | Model | | FN310 Series | |
|---|---|---|---|---|---|
| Title | Control drawing (US / Canada) | | | | |
| No. | IFM043-A71 | Page | 5 | Revision | 1 |

Notes:

1. As allowable connection values of an Intrinsically Safe Apparatus (2) or an Associated Apparatus (2), the following conditions of (a) or (b) must be satisfied.
   (a) {( Li × 100 ≤ Lo) or (Ci × 100 ≤ Co)} and {Li ≤ (Lo - Lcable) and Ci ≤ (Co - Ccable)}
   (b) { Li ≤ (Lo / 2 - Lcable) and Ci ≤ (Co / 2 - Ccable)} and
   [{(Ci + Ccable) ≤ 600 nF for Group IIC} or {(Ci + Ccable) ≤ 1 µF for Group IIA, IIB}]

2. As for 4−20 mA Loop Connection [4-wire (Active)], the level of protection of COMM circuit is reduced to “ib”.

3. (For US) No revision to this drawing without prior approval of FM.

4. (For US ) Installation must be in accordance with the National Electrical Code (NFPA 70), ANSI/ISA-RP12.06.01, and relevant local codes.

5. (For Canada) Installation must be in accordance with the Canadian Electrical Code Part I (C22.1), ANSI/ISA-RP12.06.01, and relevant local codes.

6. (For US) IS Apparatus (or Associated Apparatus) must be FM approved.

7. Control equipment connected to IS Apparatus (or Associated Apparatus) must not use or generate a voltage more than Um of the control equipment.

8. The equipment satisfies the requirements for IP66 and Type 4X only when it is connected to a connector JR13WPI-5P (Hirose Electric) and tightened with a torque of 1.2-2.0 N·m. Appropriate type of plug must be used in accordance with the instructions.

9. Models FN310-xx-J03, FN310-xx-J04, and FN310-xx-J05 satisfy the requirement for IP66 and Type 4X only when they are connected to equipment, using a clamp and an adaptor, and tightened with a torque of 4.8-5.3 N·m.

10. The control drawing of IS Apparatus (or Associated Apparatus) must be followed when installing the equipment.

## WARNING / AVERTISSEMENT

- DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES
  - QUAND LE MATÉRIEL EST UTILISÉ DANS DES ENDROITS DANGEREUX, ÉVITER TOUTE ACTION QUI GENERENT CHARGES ELECTROSTATIQUES, COMME FROTTANT AVEC UN CHIFFON SEC
- QUAND LE MATÉRIEL EST UTILISÉ DANS LA ZONE 0, IL DOIT ÊTRE INSTALLÉE TELLE QUE, MÊME EN CAS D'INCIDENTS RARE, SOURCES D'ALLUMAGE DUE AUX IMPACTS ET SPARKS FRICTION EST EXCLUE
- POUR ÉVITER ALLUMAGE DES ATMOSPHÉRES INFLAMMABLES OU COMBUSTIBLES, LISEZ, COMPRENDRE ET RESPECTER ELS PROCÉDURES D'ENTRETIEN DU CONSTRUCTEUR
- UTILISER UNIQUEMENT DES ACCUMULATEUR F9090FC OU F9090GC (YOKOGAWA)
- LA BATTERIE PEUT ÊTRE REMPLACÉ DANS DES ENDROITS DANGEREUX. BATTERIE POSSÈDE UNE RÉSISTANCE DE SURFACE QUI EST SUPÉRIEURE À 1 G OHM ET DOIT ÊTRE INSTALLÉ DANS L'ENVELOPPE DE L'ÉQUIPEMENT, SOIN PENDANT LE TRANSPORT ET DEPUIS LE POINT DE L'INSTALLATION POUR ÉVITER CHARGE ÉLECTROSTATIQUE BUILD-UP
- CELLULES DOIVENT ÊTRE CHANGÉ DANS UN ENDROIT UNCLASSIFIED SEULEMENT
- SUBSTITUTION DE COMPOSANTS PEUT IMPAIR LA SÉCURITÉ INTRINSÈQUE
- Be sure to use the specified battery pack and batteries. For details, refer to section 8.5 "Handling Batteries."
- With an intrinsically safe Products, the battery pack is replaceable in a hazardous area. During the replacement work, make sure that dust and water droplets do not enter inside the products. For details on how to replace the battery pack, refer to section 8.3 "Replacing the Battery Pack."

### 2.6.3 ATEX Certification

#### (1) Technical Data

Caution for ATEX Intrinsically safe type.

Note 1. Model FN310 Field Wireless Multi-Protocol Module (HART Protocol) with optional code /KS27 for potentially explosive atmospheres:

- Applicable Standards: EN IEC 60079-0, EN 60079-11, EN 60079-28
- Certificate number: FM15ATEX0069X
- Specific Ex marking: Ex ia op is IIC T4 Ga
- Group: II
- Category: 1 G
- Amb. Temp.: –40 to 70°C (–40 to 158°F)
- Enclosure: IP66 in accordance with only IEC 60529
- Signals: RS485 Communication (FN110)
- Dielectric strength: 500V AC,r.m.s., 1min

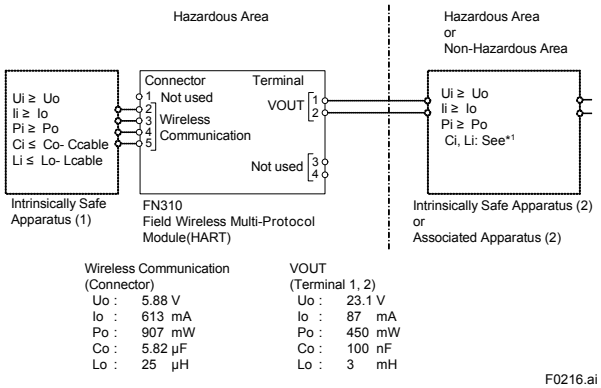
Note 2. Electrical Parameters
(Refer to the Control Drawing)

Note 3. Installation

- Installation should be in accordance with local installation requirements.
(Refer to the Control Drawing)

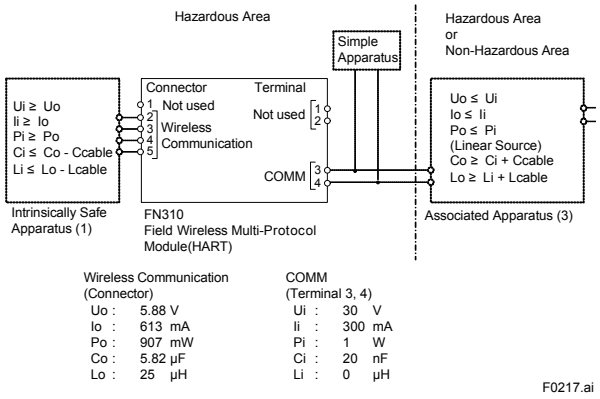
**[Control Drawing, IFM043-A72 for ATEX Certification]**

- One-to-one Connection [2-wire or 4-wire (Passive)]

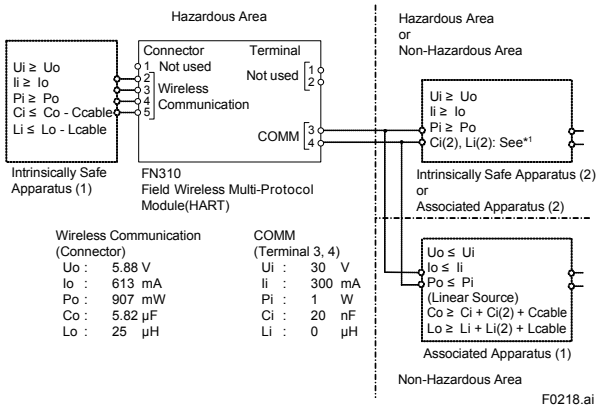



F0216.ai

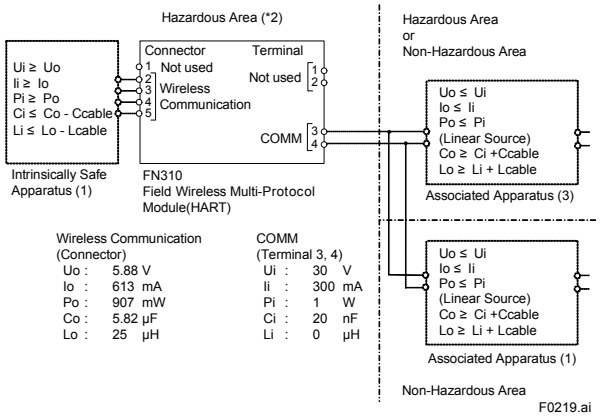
- One-to-one Connection [4-wire (Active)]




- 4–20mA Loop Connection [2-wire or 4-wire (Passive)]




- 4–20mA Loop Connection [4-wire (Active)]




*1 As allowable connection values of an Intrinsically Safe Apparatus (2) or an Associated Apparatus (2), the following conditions of (a) or (b) must be satisfied.
(a) {( Li × 100 ≤ Lo) or (Ci × 100 ≤ Co)} and {Li ≤ (Lo - Lcable) and Ci ≤ (Co - Ccable)}
(b) { Li ≤ (Lo / 2 - Lcable) and Ci ≤ (Co / 2 - Ccable)} and [{(Ci + Ccable) ≤ 600 nF for Group IIC} or {(Ci + Ccable) ≤ 1µF for Group IIA, IIB}]

*2 As for 4-20mA Loop Connection [4-wire (Active)], the level of protection of COMM circuit is reduced to “ib”.

*3 The equipment satisfies the requirement for IP66 only when it is connected to a connector JR13WPI-5P (Hirose Electric) and tightened with a specified torque. Appropriate type of plug must be used in accordance with the instructions.

*4 Models FN310-xx-J03, FN310-xx-J04, and FN310-xx-J05 satisfy the requirement for IP66 only when they are connected to equipment, using a clamp and an adapter in accordance with the instructions.

Note 4. Battery Pack

- Use only YOKOGAWA battery pack F9090FC or F9090GC.

**WARNING**

- Be sure to use the specified battery pack and batteries. For details, refer to section 8.5 “Handling Batteries.”
- With an intrinsically safe Products, the battery pack is replaceable in a hazardous area. During the replacement work, make sure that dust and water droplets do not enter inside the Products. For details on how to replace the battery pack, refer to section 8.3 “Replacing the Battery Pack.”

Note 5. Specific conditions of use

- Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts of the equipment.
  The connector (FN110 terminal) on the enclosure contains aluminum and is considered a potential risk of ignition caused by impact or friction. When the equipment is mounted in a potentially explosive atmosphere requiring equipment category 1 G, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.

### (2) Operation

**WARNING**

Take care not to generate mechanical sparking when access to the instrument and peripheral devices in a hazardous location.

**WARNING**

POTENTIAL ELECTROSTATIC CHARGING HAZARD
In hazardous areas, avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.
To prevent electrostatic discharge caused by static charge built up on the operator, ground the operator through conductive shoes and floors and by wearing anti-static work clothes to prevent charge build-up.
Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of Battery Pack and product with a dry cloth.
If static electricity cannot be suppressed, check that the surrounding atmosphere does not contain explosive gas or steam before replacing the Battery Pack.

### (3) Maintenance and repair

**WARNING**

The instrument modification or parts replacement by other than an authorized Representative of Yokogawa Electric Corporation is prohibited and will void the certification.

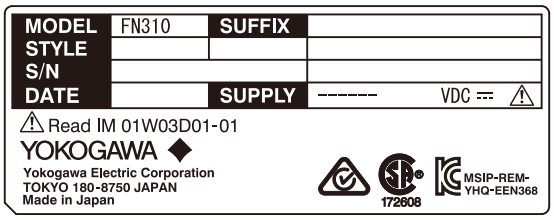
**WARNING**

A modification of the equipment would no longer comply with the construction described in the certificate documentation.
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment
USE ONLY YOKOGAWA BATTERY PACK F9090FC or F9090GC

THE BATTERY PACK CAN BE REPLACED IN A HAZARDOUS LOCATION. THE BATTERY PACK HAS SURFACE RESISTIVITY GREATER THAN 1G OHM AND MUST BE PROPERLY INSTALLED IN THE ENCLOSURE OF THE EQUIPMENT. CARE MUST BE TAKEN DURING TRANSPORTATION TO AND FROM THE POINT OF INSTALLATION TO PREVENT ELECTROSTATIC CHARGE BUILD-UP
CELLS MUST BE CHANGED IN A NON-HAZARDOUS AREA ONLY
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

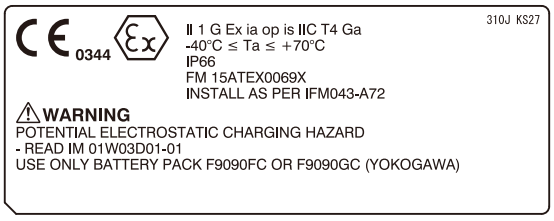
### (4) Name Plate

- Name Plate




F0220.ai

- Name Plate for intrinsically safe type




F0221.ai

## 2.6.4 IECEx Certification

### (1) Technical Data

Caution for IECEx Intrinsically safe type.

Note 1. Model FN310 Field Wireless Multi-Protocol Module (HART Protocol) with optional code /SS27 for potentially explosive atmospheres:

- Applicable Standards:
  IEC 60079-0, IEC 60079-11, IEC 60079-28
- Certificate number: IECEx FMG 15.0039X
- Specific Ex marking: Ex ia op is IIC T4 Ga
- Enclosure:
  IP66 in accordance with only IEC 60529
- Ambient Temperature:
  –40 to 70°C (–40 to 158°F)
- Siganls: RS485 Communication (FN110)
- Dielectric strength: 500V AC,r.m.s., 1min

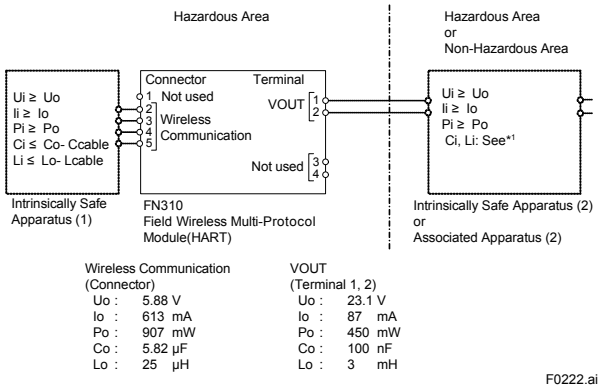
Note 2. Electrical Parameters
(Refer to the Control Drawing)

Note 3. Installation

- Installation should be in accordance with local installation requirements. (Refer to the Control Drawing)

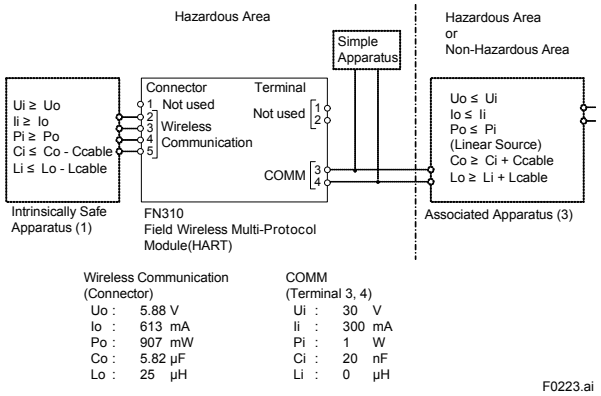
## [Control Drawing, IFM043-A72 for IECEx Certification]

- One-to-One Connection [2-wire or 4-wire (Passive)]



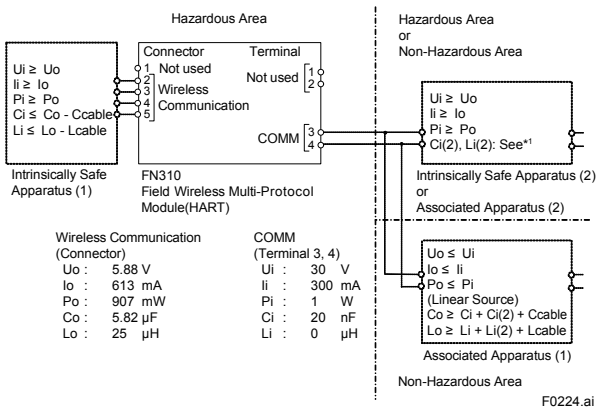

F0222.ai

- One-to-One Connection [4-wire (Active)]



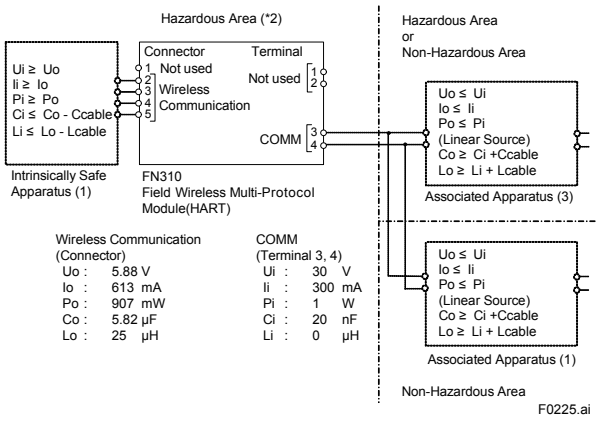

F0223.ai

- 4-20mA Loop Connection [2-wire or 4-wire (Passive)]




F0224.ai

- 4-20mA Loop Connection [4-wire (Active)]




F0225.ai

*1 As allowable connection values of an Intrinsically Safe Apparatus (2) or an Associated Apparatus (2), the following conditions of (a) or (b) must be satisfied.
(a) {( Li × 100 ≤ Lo) or (Ci × 100 ≤ Co)} and {Li ≤ (Lo - Lcable) and Ci ≤ (Co - Ccable)}
(b) { Li ≤ (Lo / 2 - Lcable) and Ci ≤ (Co / 2 - Ccable)} and [{(Ci + Ccable) ≤ 600 nF for Group IIC} or {(Ci + Ccable) ≤ 1µF for Group IIA, IIB}]

*2 As for 4-20mA Loop Connection [4-wire (Active)], the level of protection of COMM circuit is reduced to "ib".

*3 The equipment satisfies the requirement for IP66 only when it is connected to a connector JR13WPI-5P (Hirose Electric) and tightened with a specified torque. Appropriate type of plug must be used in accordance with the instructions.

*4 Models FN310-xx-J03, FN310-xx-J04, and FN310-xx-J05 satisfy the requirement for IP66 only when they are connected to equipment, using a clamp and an adapter in accordance with the instructions.

### Note 4. Battery Pack

- Use only YOKOGAWA battery pack F9090FC or F9090GC.

**WARNING**

- Be sure to use the specified battery pack and batteries. For details, refer to section 8.5 "Handling Batteries."
- With an intrinsically safe products, the battery pack is replaceable in a hazardous area. During the replacement work, make sure that dust and water droplets do not enter inside the products. For details on how to replace the battery pack, refer to section 8.3 "Replacing the Battery Pack."

Note 5. Specific conditions of use

- Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts of the equipment.
  The connector (FN110 terminal) on the enclosure contains aluminum and is considered a potential risk of ignition caused by impact or friction. When the equipment is mounted in a potentially explosive atmosphere requiring EPL Ga, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.

**(2) Operation**

**WARNING**

POTENTIAL ELECTROSTATIC CHARGING HAZARD
In hazardous areas, avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.
To prevent electrostatic discharge caused by static charge built up on the operator, ground the operator through conductive shoes and floors and by wearing anti-static work clothes to prevent charge build-up.
Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of Battery Pack and product with a dry cloth.
If static electricity cannot be suppressed, check that the surrounding atmosphere does not contain explosive gas or steam before replacing the Battery Pack.

**WARNING**

Take care not to generate mechanical sparking when access to the instrument and peripheral devices in a hazardous location.

**(3) Maintenance and repair**

**WARNING**

A modification of the equipment would no longer comply with the construction described in the certificate documentation.
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment
USE ONLY YOKOGAWA BATTERY PACK F9090FC or F9090GC

THE BATTERY PACK CAN BE REPLACED IN A HAZARDOUS LOCATION. THE BATTERY PACK HAS SURFACE RESISTIVITY GREATER THAN 1G OHM AND MUST BE PROPERLY INSTALLED IN THE ENCLOSURE OF THE EQUIPMENT. CARE MUST BE TAKEN DURING TRANSPORTATION TO AND FROM THE POINT OF INSTALLATION TO PREVENT ELECTROSTATIC CHARGE BUILD-UP
CELLS MUST BE CHANGED IN A NON-HAZARDOUS AREA ONLY
SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

**WARNING**

The instrument modification or parts replacement by other than an authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

## 2.7 EMC Conformity Standards

EN61326-1 Class A Table 2, EN55011 Class A

**CAUTION**

This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.

## 2.8 Safety Requirement Standards

Applicable standard:
EN61010-1, CAN/CSA-C22.2 No.61010-1

### (1) Pollution Degree 2

“Pollution degree” describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. “2” applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation must be expected.

### (2) Installation Category I

“Overvoltage category (Installation category)” describes a number which defines a transient overvoltage condition. It implies the regulation for impulse withstand voltage. “I” applies to electrical equipment which is supplied from the circuit when appropriate transient overvoltage control means (interface) are provided.

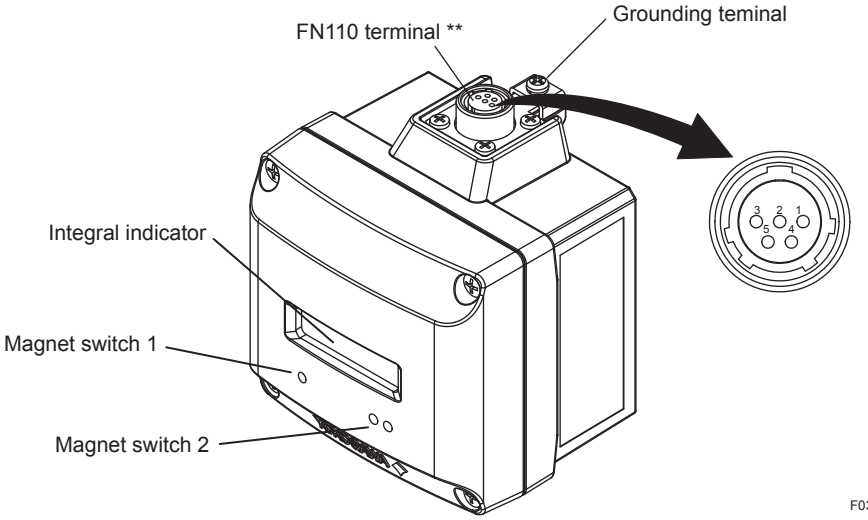
### (3) Indoor/Outdoor use

It can be used in indoors and outdoors.

### (4) Altitude of installation site

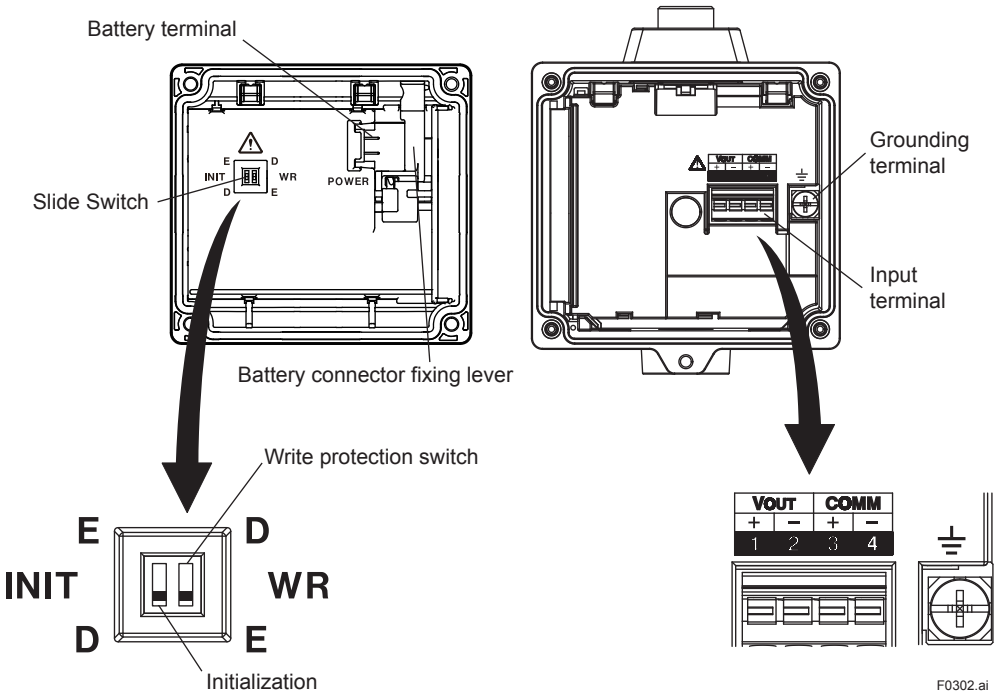
Max. 3,000 m above sea level

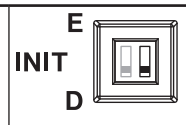
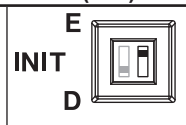
# 3. Component Names




| Pin | Signal |
|---|---|
| 1 | Frame Ground * |
| 2 | Signal Ground |
| 3 | Power Supply |
| 4 | Transmit/Receive Data positive |
| 5 | Transmit/Receive Data negative |

* Wired to the ground terminal inside the FN310 housing.
** Connector type of FN310: JR13WRI-5S (connector mating with type of JR13WPI-5P)




| Hardware Write Protection Switch (WR) | | |
|---|---|---|
| Write Protection Switch Position *1 |  F0303.ai |  F0304.ai |
| Write Protection | No (Write enabled) | Yes *2 (Write disabled) |

*1: Initialization switch is not used. Set to D side (disabled) always.
*2: When the switch is D side (write protection setting), provisioning is acceptable. For details of provisioning, refer to subsection 6.3 “Connecting to the Field Wireless Network”.

| Terminal | Signal | | | |
|---|---|---|---|---|
| | One-to-one Connection | | | 4-20 mA Loop Connection |
| | 2-wire | 4-wire (Active) | 4-wire (Passive) | |
| 1 | Power Supply and Input Signal + | No Connection | Loop Power and Input Signal + | No Connection |
| 2 | Power Supply and Input Signal - | No Connection | Loop Power and Input Signal - | No Connection |
| 3 | No Connection | Input Signal + | No Connection | Input Signal + |
| 4 | No Connection | Input Signal - | No Connection | Input Signal - |
| ⏚ | Frame Ground | | | |

# 4. Installation

## 4.1 Precautions

- Before installing FN310, read the cautionary notes in subsection 2.4 “Selecting the Installation Location”.
- For additional information on the ambient conditions allowed at the installation location, refer to subsection 10.1 “Standard Specifications”.

### IMPORTANT

**Connector Protection**

The FN110 terminal is covered with a cap during shipping. Keep the cap attached until connecting the FN110 or remote antenna cable to protect the inside connection part. The unscrewed cap should be stored in order to replace it immediately after the FN110 or remote antenna cable is removed. If there is a possibility that get wet with water, order FN310 with optional specification for a protection cap.

**Installation Work**

- When performing on-site pipe fitting work that involves welding, use case to prevent the welding current to damage the FN310.
- Do not use the FN310 as a foothold.

### NOTE

- Before using FN310, install FN110. For detail on how to install FN110, refer to subsection 4.2.1 “Installation of FN110”.
- To connect FN310 to the field wireless network, information for connecting to the field wireless devices needs to be set beforehand. Refer to subsection 6.3 “Connecting to the Field Wireless Network”.

## 4.2 Mounting

This product supports following mounting options.

**■ Mounting to the HART device**

FN310 is installed directly to the electrical connection port of HART devices. Refer to subsection 4.2.2 “Mounting to the HART device” for details. For detail on how to install FN110, refer to subsection 4.2.1 “Installation of FN110”. For using remote antenna cable, refer to subsection 5.3 “Installation and Connection of FN110”.

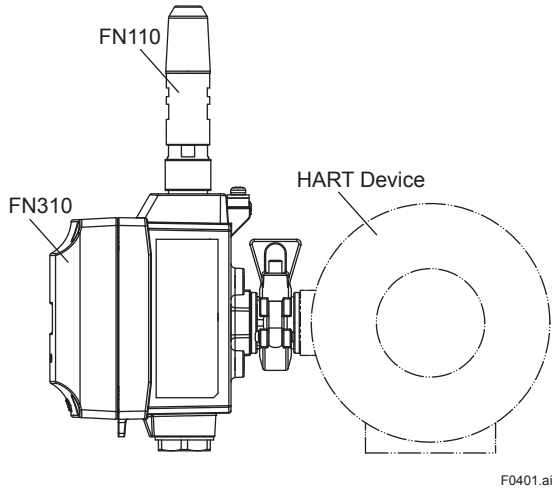



**Figure 4.1 Direct Mounting of FN110**

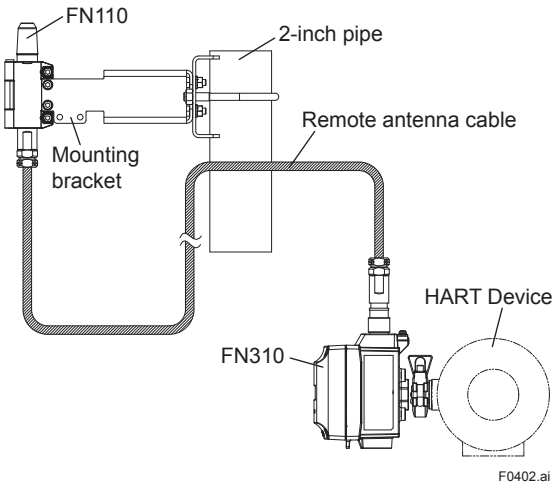



**Figure 4.2 Using Remote Antenna Cable**

■ **Mounting on a 50A (2-inch) pipe**

FN310 is installed on a 50A (2-inch) pipe with mounting bracket. It supports both of a horizontal pipe and a vertical pipe. Refer to subsection 4.2.3 “Mounting on a 50A (2-inch) Pipe” for details. For detail on how to install FN110, refer to subsection 4.2.1 “Installation of FN110”. For using remote antenna cable, refer to subsection 5.3 “Installation and Connection of FN110”.

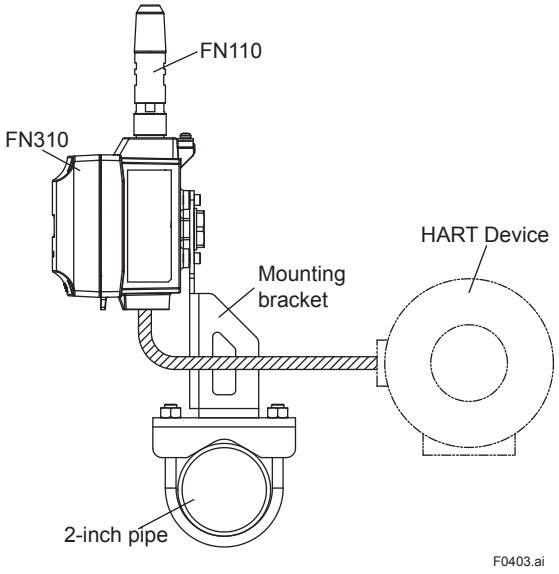



**Figure 4.3 Direct Mounting of FN110**

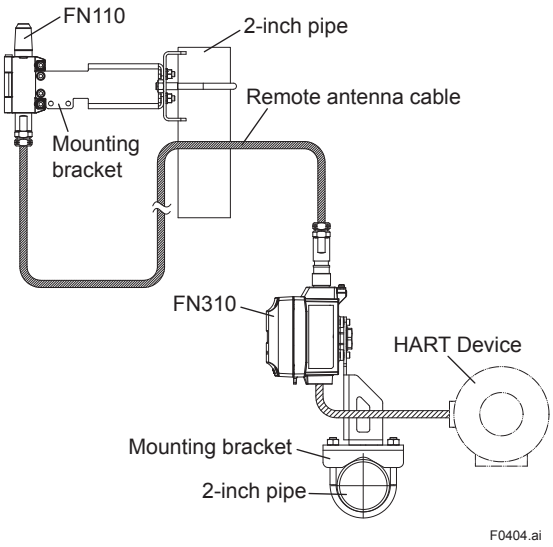



**Figure 4.4 Using Remote Antenna Cable**

## 4.2.1 Installation of FN110

Install FN110 to the FN110 terminal of FN310. Before installation, remove the unscrewed cap attached to the connector and remove the battery pack from FN310.

The installation procedure is as follows.

1. Check the direction of the pin, connect FN110 to FN310.
2. Tighten the lock nut to torque of 1.2 N•m.

Removal is the reverse procedure of the installation.

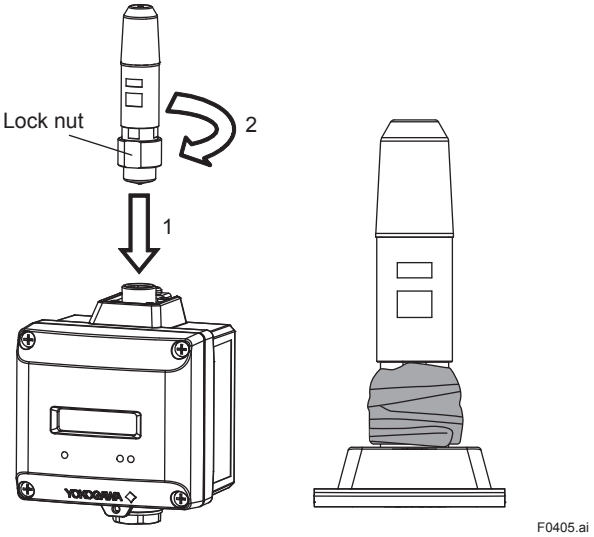



**Figure 4.5 Installation of FN110 and Sealing of the Connector**

## CAUTION

- To maintain a good connection between the modules, protect the connector from the corrosive atmosphere by the following treatment.
  1. Clean the connection to be protected.
  2. Wind the butyl rubber self-bonding tape around the connection. See the manual of the tape about the winding.
  3. To protect the butyl rubber self-bonding tape from the environment such as ultraviolet rays and so on, wind vinyl tape (or a vinyl type self-bonding tape) on it.
  4. When the tape is necessary, prepare appropriate tape for the installing environment.

  Do not cover the nameplate by the tapes.
- When a remote antenna cable is used for installing FN110, refer to subsection 5.3 “Installation and Connection of FN110”.
- Remove the battery pack before installing FN110. Refer to subsection 8.3 “Replacing the Battery Pack” for the battery pack removing.
- When installing FN110, fix the FN110 by tightening the lock nut. Screwing by holding the FN110 housing may cause failure such as cable disconnection. The same manner should be taken when removing the FN110.

### 4.2.2 Mounting to the HART Device

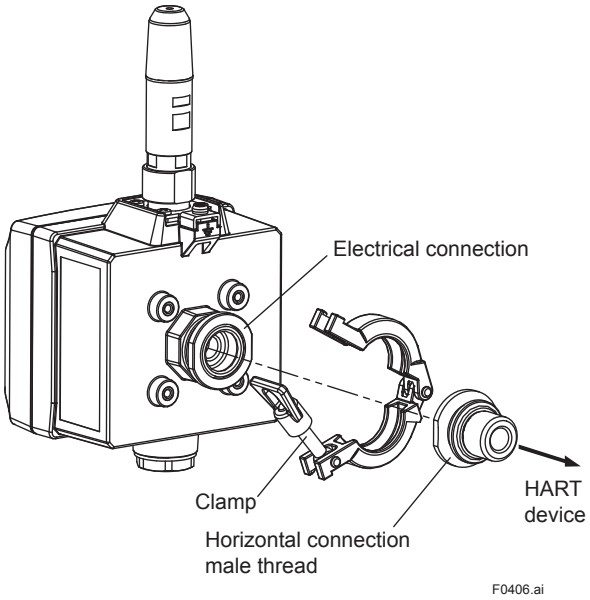



**Figure 4.6 Direct Mounting of FN310**

### 4.2.3 Mounting on a 50A (2-inch) Pipe

■ **To directly install FN310 to the HART device, follow the procedure below.**

1) Screw the horizontal connection male thread to the electrical connection port of the HART device.
2) Pass the cable from the HART device to the electrical connection port of the FN310.
3) Attach the electrical connection port of the FN310 and horizontal connection male thread so as not to pinch the cable. Then, secure using a clamp.

## IMPORTANT

When a Horizontal connection 1/2 NPT male thread is used, apply a water proofing sealant to the threads of the connection port. (It is recommended that you use non-hardening sealant made of silicon resin for waterproofing.)

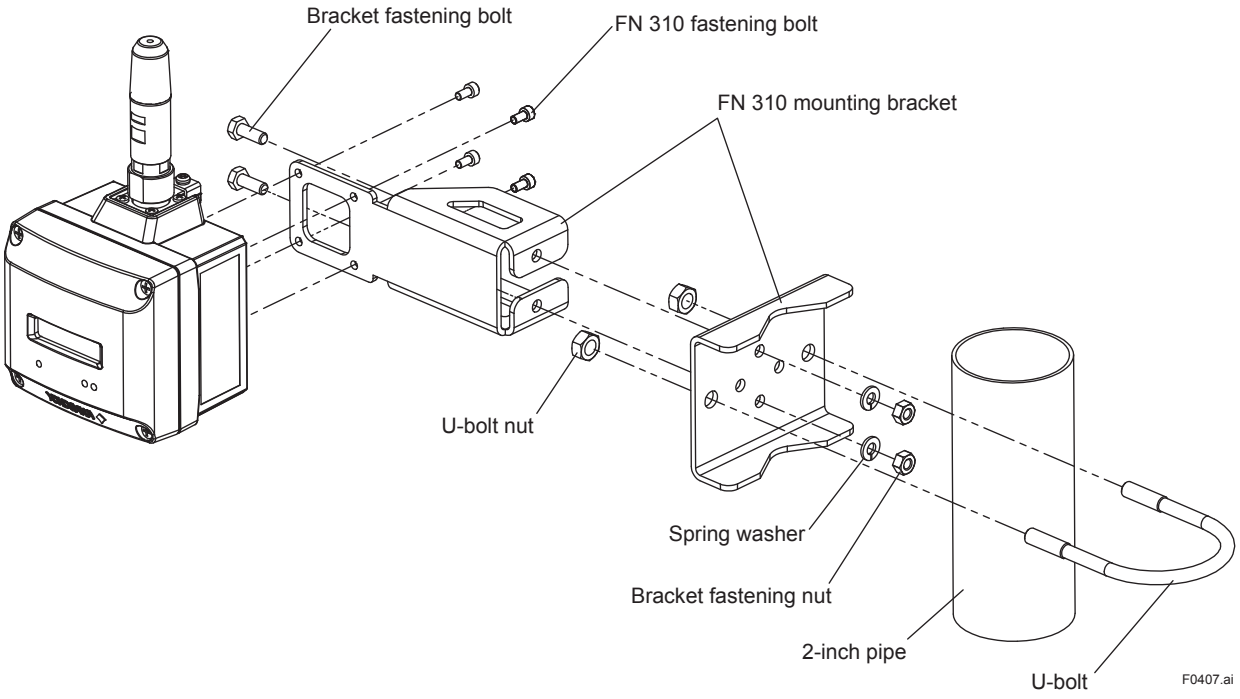



**Figure 4.7 Vertical Pipe Mounting**

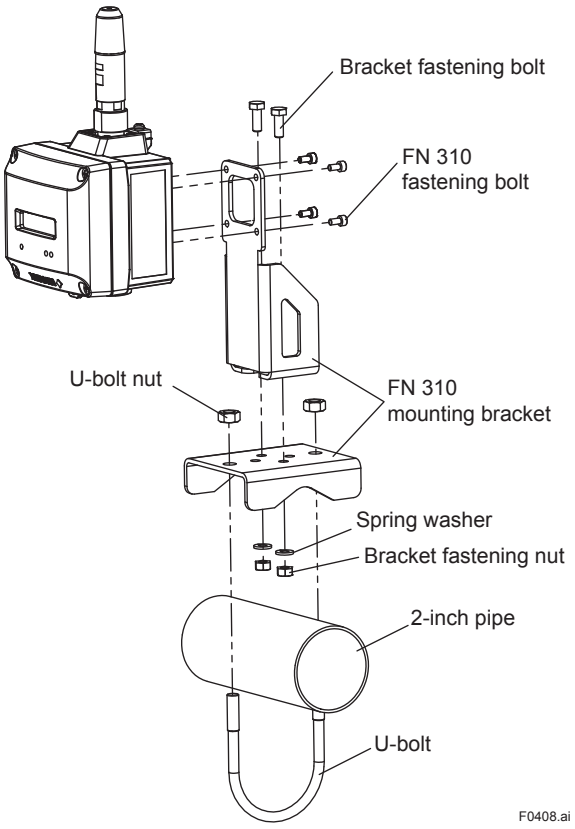



**Figure 4.8 Horizontal Pipe Mounting**

■ **To install FN310 on a 50A (2-inch) pipe, follow the procedure below.**

1) Assemble the FN310 mounting bracket.
2) Install FN310 to the mounting bracket using provided bolt (4) with a torque 1.4 N•m .
3) Install FN310 mounting bracket to the 2-inch pipe by U-bolt.

# 5. Wiring

## 5.1 Notes on Wiring

**IMPORTANT**

- Apply a waterproofing sealant to the threads of the connection port. (It is recommended that you use non-hardening sealant made of silicon resin for waterproofing.)
- Lay wiring as far away as possible from electrical noise sources such as large transformers, motors and power supplies.
- Remove the wiring connection dust-caps before wiring.
- When you open the front panel, pay great attention to the environmental conditions in order to prevent dust and water droplets entering inside the product.
- To run wiring to the sensor, pay sufficient attention to the wiring parameters described in section 2.6 “Installation of an Explosion Protected Instrument.”
- To prevent electrical noise, the signal cable and the power cable must not be housed in the same conduit.

**NOTE**

- When wiring where the ambient temperature is high or low, use the cable or wire that appropriate to that place.
- When the maximum operating temperature is more than 60°C, use the cable of 85°C or higher temperature rating.

## 5.2 Cable Selection

### 5.2.1 Selection of the Input Cable

For wiring the HART device and the FN310, use a shielded cable of AWG22 to 14. When connect to the 4-20 mA loop, use a shielded cable also in the 4-20 mA loop. The maximum length of the input cable is 20 m. In the case of the 4-20 mA loop connection, refer to Figure 5.1. Refer to subsection 5.5 “Grounding” for the grounding cable.

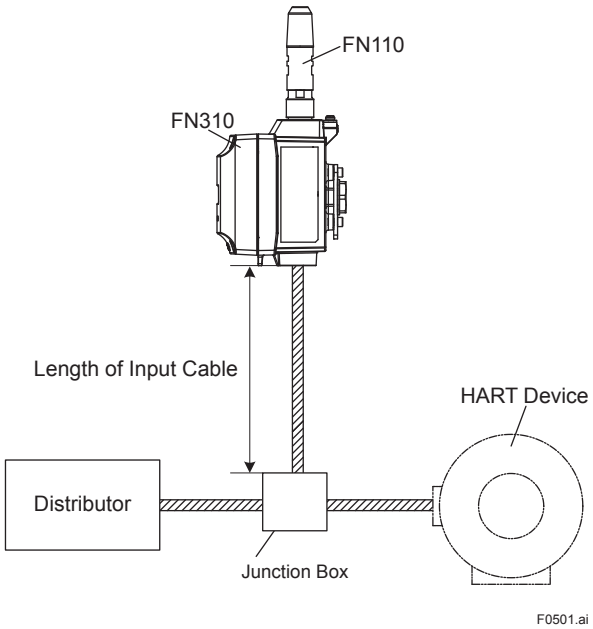



**Figure 5.1 Length of Input Cable in 4-20 mA Loop Connection**

### 5.2.2 Selection of the Remote Antenna Cable

Use a dedicated remote antenna cable specified in the accessories of FN110 when installing the FN310 and the FN110 separately. For details of remote antenna cable, refer to General Specifications of FN110 (GS 01W03B01-01EN).

## 5.3 Installation and Connection of FN110

**IMPORTANT**

The FN110 terminal is covered with a cap at the time of deliverty. Keep the cap attached until connecting the FN110 or remote antenna cable to protect the inside connection part. The unscrewed cap should be stored in order to replace it immediately after the FN110 or remote antenna cable is removed. If there is a possibility that get wet with water, order FN310 with optional specification for a protection cap.

### 5.3.1 Installation of FN110

**■ Location of FN110**

Mount the FN110 at the proper location according to the wireless environment described in subsection 2.4 “Selecting the Installation Location”. The mounting to the pipe such as 50A (2-inch) pipe needs to secure the enough strength to endure a strong wind, vibration and so on. The FN110 must be mounted vertically.

**■ Fixing of FN110**

Fix the FN110 on a 50A (2-inch) pipe with the mounting bracket provided as the remote antenna cable option.

**■ To install FN110 with mounting bracket, follow the procedure below.**

1) Assemble the mounting bracket and fix it on a 50A (2-inch) pipe.
2) Connect the remote antenna cable to the FN110.
3) Protect the connection as necessary. For details of the protection, refer to subsection 4.2.1 “Installation of FN110”.
4) Fix the FN110 to the mounting bracket.

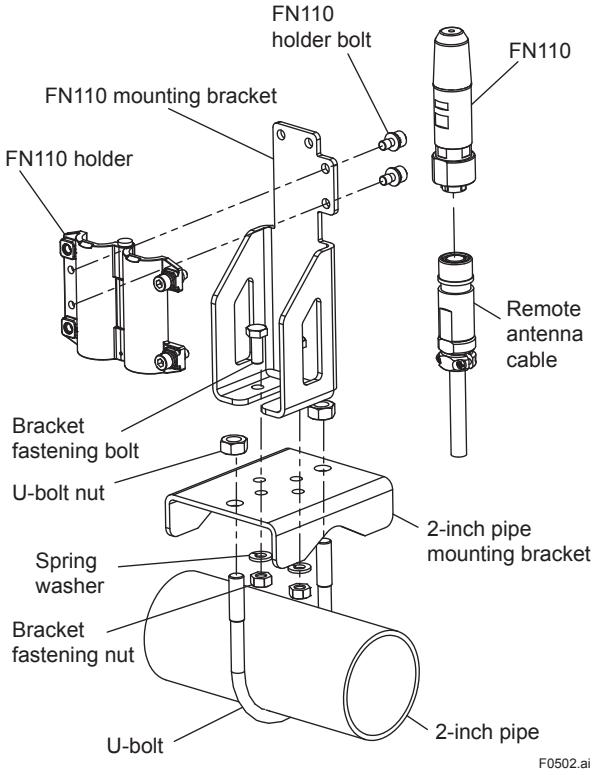



**Figure 5.2 Horizontal Pipe Mounting of FN110**

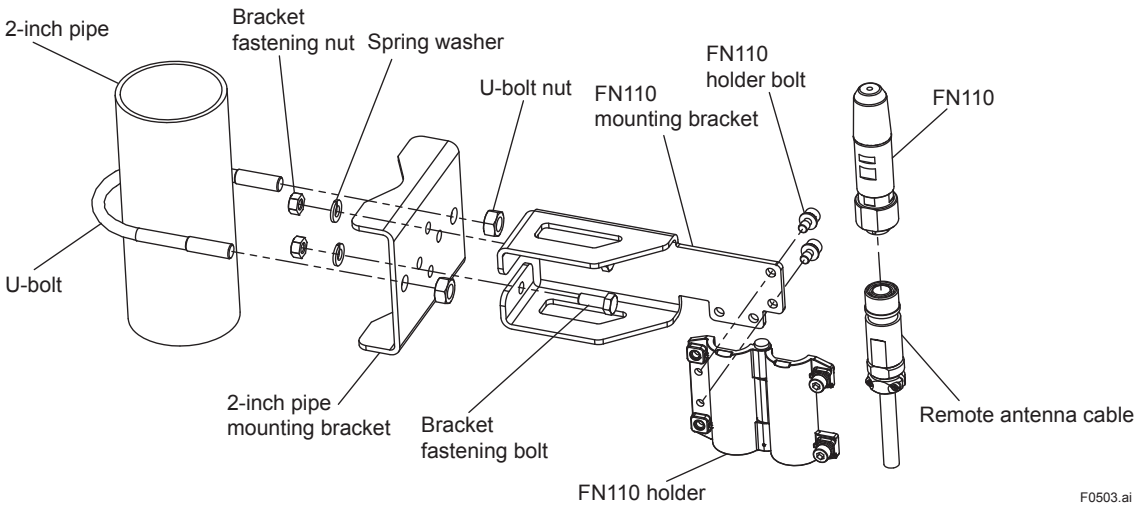



**Figure 5.3 Vertical Pipe Mounting of FN110**

### 5.3.2 Connection of FN110

**■ To install FN110 with remote antenna cable, follow the procedure below.**

Remove the battery pack from FN310 before connecting the remote antenna cable.

1. Connect the FN110 and the FN310 with the dedicated remote antenna cable. Tighten the connector of the remote antenna cable with a torque of 1.2 N•m. The minimum bend radius should be more than 100 mm.
2. Protect the connectors of the FN110 and remote antenna cable as necessary. For details of the protection, refer to subsection 4.2.1 “Installation of FN110”.
3. Fix the remote antenna cable to an appropriate structure to protect the cable from the vibration, wind, and so on. The minimum bending radius for fixing in the state maintained for a long period should be more than 100 mm.

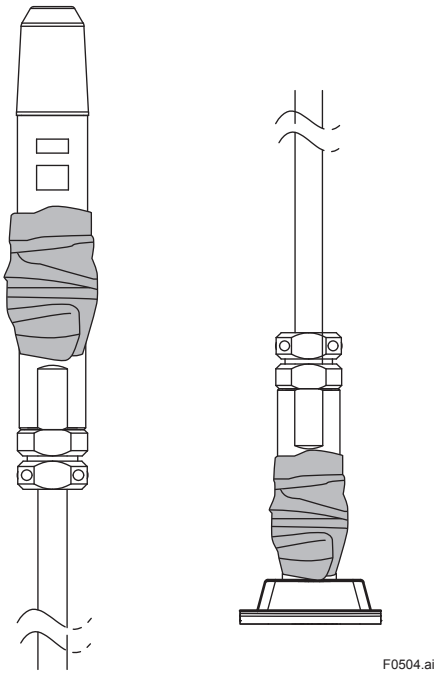



**Figure 5.4 Sealing of the Remote Antenna Cable**

**CAUTION**

- Use the dedicated remote antenna cable provided by Yokogawa as accessories for FN110.
- The remote antenna cable and other cables should not be bundled together.
- Remove the battery pack before installing FN110. Refer to subsection 8.3 “Replacing the Battery Pack” for the battery pack removing.

## 5.4 Connection of HART Devices

Strip the insulated cover of the cable end.

### 5.4.1 Connecting Input Terminal and Grounding Terminal

**■ Vertical Connection**

After stripping the insulated cover, keep a length of about 50 mm for input signal cables, and about 65 mm for grounding cable.

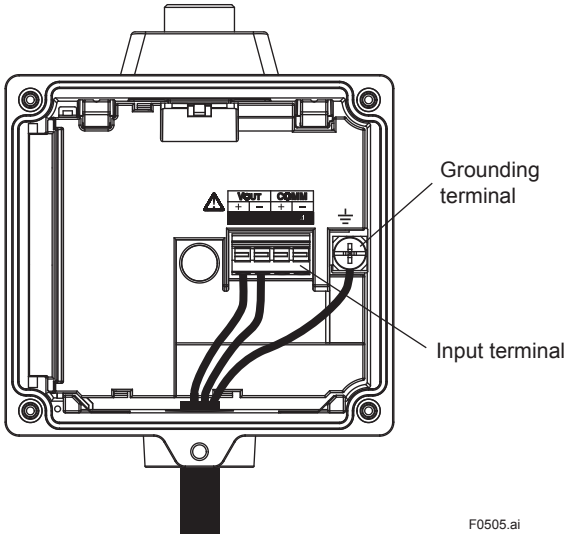



**Figure 5.5 Vertical Connection Wiring**

The cable gland is not included. Prepare a cable gland with a flat gasket matching the electrical connection.
When M20 female is selected for vertical connection, tighten the cable gland with a torque of 2 N•m. When G 1/2 female or 1/2 NPT female is selected for vertical connection, fix the hexagonal shape part by tool and tighten the cable gland as shown in Figure 5.6.

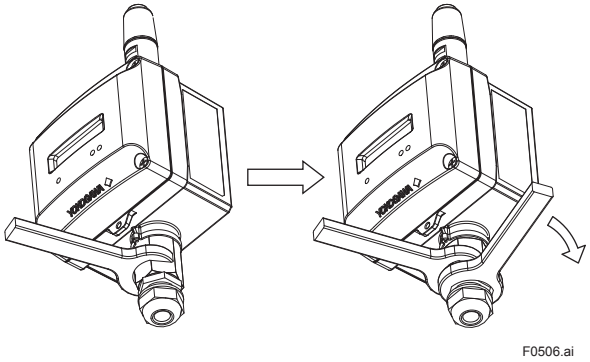



**Figure 5.6 Tightening the Cable Gland**

**IMPORTANT**

When using a cable gland, apply a water proofing sealant to the threads of the cable gland. (It is recommended that you use non-hardening sealant made of silicon resin for waterproofing.)

### ■ Horizontal Connection

After stripping the insulated cover, keep a length of about 60 mm for input terminal 1, about 75 mm for input cable 2, and about 100 mm for grounding cable. Connecting to the input terminal and grounding terminal, pass the cable through the horizontal connection port. Install FN310 to the HART device and do wiring at HART device side.

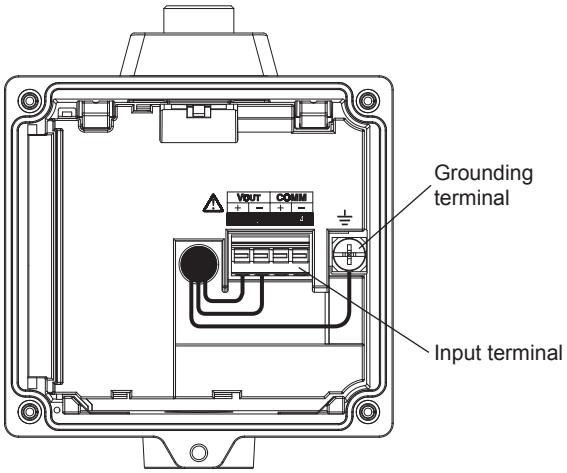



**Figure 5.7 Horizontal Connection Wiring**

### ■ Input Terminal

Input terminal is a spring terminal. When using a solid conductor cable or with sleeve, connect the cable to the input terminal. When using a standard conductor, push down the top of a cable inlet and insert the cable. To unplug the cable, push down the top of a cable inlet and unplug the cable.

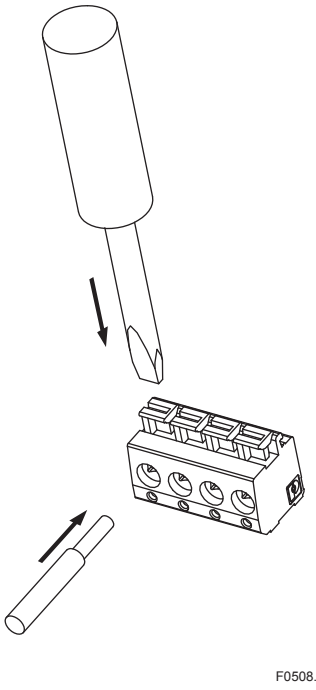



**Figure 5.8 Connecting to the Input Terminal**

### ■ Wiring to Input Terminals:1 (with sleeve)

The sleeve can prevent cable leads from untwist when you connect the cable. Select a sleeve to match the cable size. If the length of cable leads does not match the length of sleeve ($l_2$), strip the cable to the correct length. Strip the cable for a length so that the core wire slightly extends from the metal tube of the sleeve. If this causes the length of the metal tube of the sleeve to be slightly shorter than the stripping length, this is no problem.
The wiring cables and applicable sleeves are listed in the table below. Use the same manufacturer for sleeves and tools.
Example of tool: Phoenix Contact's CRIMPFOX6
For details on sleeves and crimp tools, contact to Phoenix Contact Inc.

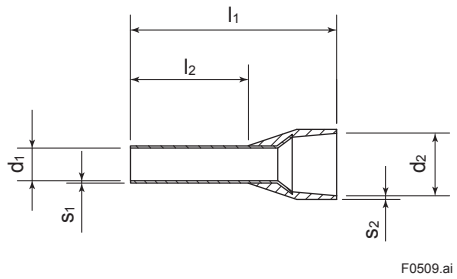



**Figure 5.9 Sleeve Length**

### ■ Wiring to Input Terminals:2 (without sleeve)

- When using a solid conductor cable, strip the insulated cover and connect it. Strip the insulated cover for 8mm.
- When using a stranded conductor, strip the insulated cover and twist and connect it. Strip the insulated cover for 8mm. Never solder the stranded conductor when connecting cables. Be careful not to cause the loosely stranded conductor to come in contact with adjacent terminals or others. Insert the cable leads into the terminal block securely.

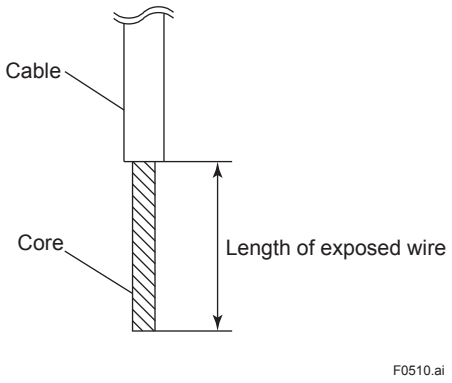



**Figure 5.10 Length of Exposed Wire**

**Table 5.1 List of Input Cables**

| Cable | | Dimensions (mm) | | | | | | Phoenix Contact's type |
|---|---|---|---|---|---|---|---|---|
| AWG | Strip length (mm) | $l_1$ | $l_2$ | $d_1$ | $S_1$ | $d_2$ | $S_2$ | |
| 22 | 8 | 12.5 | 8 | 0.8 | 0.15 | 2 | 0.25 | AI 0.34-8 TQ |
| 20 | 8 | 14 | 8 | 1.1 | 0.15 | 2.5 | 0.25 | AI 0.5-8WH |
| 18 | 8 | 14 | 8 | 1.3 | 0.15 | 2.8 | 0.25 | AI 0.75-8 GY |
| 18 | 8 | 14 | 8 | 1.5 | 0.15 | 3 | 0.3 | AI 1-8 RD |
| 16 | 8 | 14 | 8 | 1.8 | 0.15 | 3.4 | 0.3 | AI 1.5-8 BK |
| 14 | 8 | 14 | 8 | 2.3 | 0.15 | 4.2 | 0.3 | AI 2.5-8 BU |

### ■ One-to-one Connection

When connect the FN310 and HART device in one-to-one, connect as Figure 5.11.

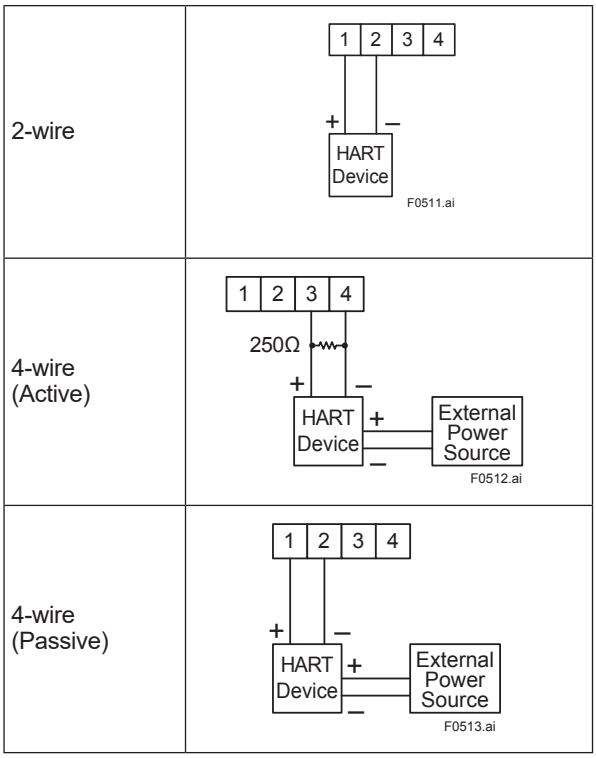



**Figure 5.11 FN310 Input Terminal Wire Connection Diagram**

### ■ 4-20 mA Loop Connection

When connect FN310 to the 4-20 mA loop, connect as Figure 5.12.

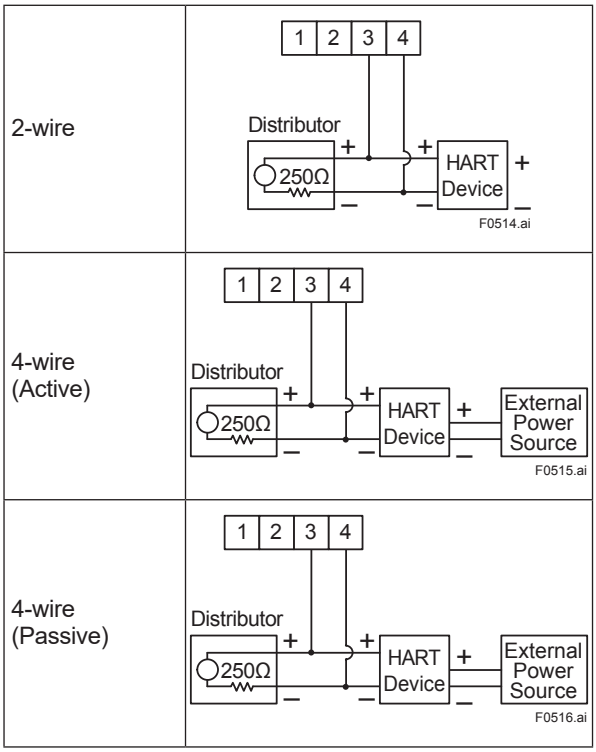



**Figure 5.12 FN310 Input Terminal Wire Connection Diagram to 4-20 mA Loop**

In the 4-20 mA loop, use a 250 ohm resistor. When connecting the FN310 away from HART device, use a junction box. When connecting the FN310 directly, connect to 4-20 mA loop by using splice connector.

## CAUTION

- Remove the battery pack before wiring. Refer to subsection 8.3 “Replacing the Battery Pack” for the battery pack removing.
- When wiring to 4-20 mA loop, switch off the power supplies of the 4-20 mA loop.

## NOTE

Strip the insulated cover of the input cable inside the FN310 so as not to interfere with the battery pack.

### ■ Wiring to Ground Terminal

Protect the cable of the ground terminal by using heat-shrink tubing, etc. Use a ring tongue terminal for M4 terminals with an insulation sleeve.

## 5.5 Grounding

Class D grounding with the grounding resistance of 100Ω or less is necessary. To connect the grounding cable to FN310 directly, use the ground terminal on the top of the housing. Do not share the ground wiring with other devices.

### ■ Applicable Cables

Insulated cables for industrial equipment such as;

- 600V polyvinyl chloride insulated wires (IV); JIS C3307
- Polyvinyl chloride insulated wires for electrical apparatus (KIV); JIS C3316
- 600V grade heat-resistant polyvinyl chloride insulated wires (HIV); JIS C3317
- Heatproof vinyl insulated wires VW-1 (UL1015/ UL1007)

Wire size

- Core: AWG14 to 13 (2mm$^2$ to 2.6mm$^2$)

Termination

- Use a ring tongue terminal for M4 terminals: with an insulation sleeve

### ■ Ground Wiring

Connect the grounding cable to ground terminal on the top of the housing.

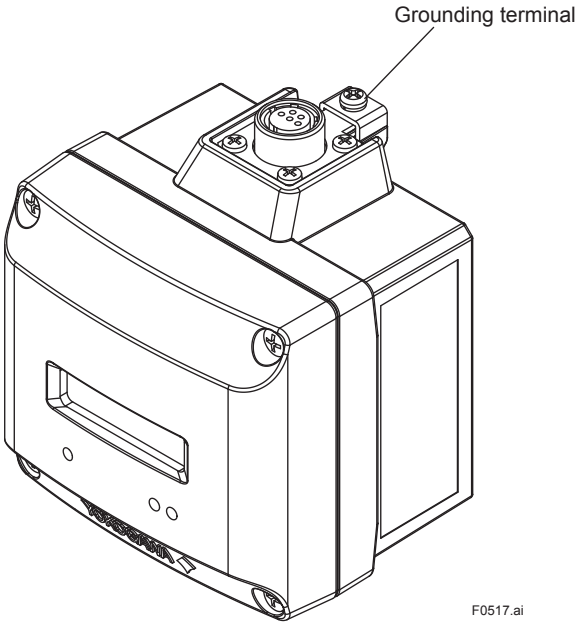



**Figure 5.13 Grounding Terminal**

**CAUTION**

Grounding is required for safe operation.

### ■ Input Cable Wiring

The input cable shield should be connected to grounding terminal inside of the housing.

- The input cable shield should not be connected to grounding terminal inside of the HART device.
- Connection to the ground terminal of HART device housing, refer to the User's Manual.

### ■ Grounding When Connecting to the 4-20 mA Loop

When using junction box, connect the shield wire of the input cable and 4-20 mA loop cable. In order to avoid the multi point grounding, do not connect the grounding terminal inside of the housing when grounded in the 4-20 mA loop side. Otherwise, connect the shield wire to grounding terminal inside of the housing.

**IMPORTANT**

Proper grounding is necessary to maintain the function and performance of this product. When the grounding is inadequate, the equipment may be damaged.
Refer to TI 01W01A58-01EN for details of grounding method and precautions.

- Use a grounding cable of AWG 14 (2 mm$^2$) or more between the grounding electrode and the grounding terminal of this product, and connect with the shortest route.
- Select the grounding cable that has a structure of adequately protects against mechanical damage, chemical or electrical degradation, electrodynamic force and thermodynamic force for connection of the grounding electrode and the ground terminal of this product.

# 6. Operation

## 6.1 Preparation for Starting Operation

**NOTE**

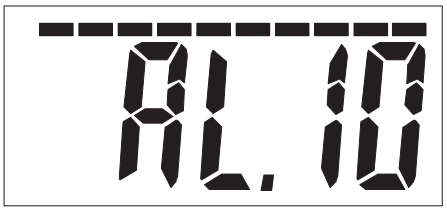
- Before using FN310, connect FN110. For detail on how to install the FN110, refer to subsection 4.2.1 “Installation of FN110”.
- It is required to set security and network information to enable this product to be connected to the field wireless network. For more details, refer to subsection 6.3 “Connecting to the Field Wireless Network”.

1) Setting the HART Device
   Set the parameters of the HART device as shown in Table 6.1. Refer to the user manual of the HART device for the setting method.
2) Checking Installation and Wiring
   Ensure that the FN310, FN110 and the HART device are installed correctly according to the procedures described in section 4 “Installation”, and section 5 “Wiring”.
3) Connecting to the Field Wireless Network
   Insert batteries into the battery case, and install to the FN310. For details of installation of battery, refer to subsection 8.3 “Replacing the Battery Pack” and subsection 8.4 “Replacing the Batteries”.
   Provisioning is to set the security and network information. For details of provisioning, refer to section 6.3 “Connecting to the Field Wireless Network”.
4) Checking parameter of the FN310 and the HART device
   Use the device configuration tool and confirm that the HART device and the FN310 operate properly. Check parameter values or change the setpoints as necessary.
   The integral indicator can be used to confirm that this product is operating properly.
   For details on how to confirm this, refer to subsection 7.4 “Self-Diagnostics”. ISA100 devices display self-diagnostic information in an easy-to-understand manner using four categories (Function check, Maintenance required, Failure, and Out of specification) according to NAMUR NE107*

* NAMUR NE107 “Self-Monitoring and Diagnosis of Field Devices”

### ■ Confirm operation status by integral indicator

If the FN310 is faulty, an error code is displayed.




F0601.ai

**Figure 6.1 Integral Indicator with Error Code**

**NOTE**

If any of the above errors are indicated on the display of the integral indicator or the device configuration tool, refer to subsection 8.10.3 “Errors and Countermeasures” for the corrective action.

### ■ Verify and Change HART Device Setting and Values

Table 6.1 lists the required configuration for the HART device. These parameters must be set before connecting the HART device to the FN310. Refer to the HART device User’s Manual for how to set the parameters.

**Table 6.1 Setting Items of HART Device**

| Item | Value | |
|---|---|---|
| | One-to-One Connection | 4-20 mA Loop Connection |
| Burst Mode | Disable | Disable |
| Event Notification* | Disable | Disable |
| HART Polling Address | 1 | 0 |
| Loop Current Mode* | Disable | Enable |

*: HART 7 only

**NOTE**

When HART device is connected as One-to-one connection, be sure the following precautions.

- Change the output settings of the HART device before connection as follows.
  - 4 mA in a normal operation.
  - 3.6 mA or less when sensor failure.
- When the HART device is connected to the VOUT terminal, the FN310 changes it’s HART Polling Address automatically. If the HART Polling Address of the HART device is 0, the FN310 changes it to 1.

### ■ Verify and Change the FN310 Setting and Values

Table 6.2 lists the required configuration for the FN310. These parameters must be set before starting operation.

**Table 6.2 Setting Items of FN310**

| Item | One-to-one Connection | 4-20 mA Loop Connection |
|---|---|---|
| Sensor Type | ○ | ○ |
| Power Source | ○ | ○ |
| Boot Strap Time | ○ | N/A |
| Configuration Saving Time | ○ | N/A |
| HART Master Mode | ○ | ○ |
| HART Preamble | ○ | ○ |

- Sensor Type
  Select the type of sensor to be connected to FN310. Select Not Used when using as a routing device without the HART device. IFO block cannot be set when Not Used is selected. Refer to section 9 “Parameters Summary” for detail.
- Power Source
  Select the method of supplying power to the HART device. When connecting by 4-wire (Active) or to the 4-20 mA loop, select the “Line Powered”. Refer to section 9 “Parameters Summary” for detail.
- Boot Strap Time
  Set the time until the HART device can acquire the process value stable after starts up. About this parameter, please contact the manufacturer of the HART device. Refer to subsection 7.3.6 “Parameters for HART device” for detail. This parameter is not required when connecting to the 4-20 mA loop.
- Configuration Saving Time
  The HART device requires storing time the setting after changed. This parameter is required to change when a configuration saving time of HART device is longer than the default value. Otherwise do not change default value. About this parameter, please contact the manufacturer of the HART device. Refer to subsection 7.3.6 “Parameters for HART device” for detail. This parameter is not required when connecting to the 4-20 mA loop.
- HART Master Mode
  Set the HART Master Mode of FN310. When there is a HART Master device on the 4-20 mA loop, set HART Master Mode of FN310 to avoid duplication. Refer to section 9 “Parameters Summary” for detail.
- HART Preamble
  Set the number of the Preamble to be added to the top of the HART frame when starting to transmit the HART Command by FN310. This parameter is recommended to use the initial value because affects the battery life. When the HART device does not work with the initial value of this product, please contact the manufacturer of the HART device. Refer to section 9 “Parameters Summary” for detail.

## 6.2 Starting Operation

Ensure that the installation, the wiring, the network connection, and the behavior of the FN310 are correct before starting operation.

**IMPORTANT**

Close the front panel. Tighten each screws to a torque of 0.7 N•m.

**NOTE**

When connecting to the 4-20 mA loop, follow the procedure below.
1. Supply power to the 4-20 mA loop.
2. Confirm the operation of HART device.
3. Start up the FN310.

## 6.3 Connecting to the Field Wireless Network

### ■ Preparation Work Prior to Connecting to a Field Wireless Network

FN310 does not need to be connected with a physical wire. Instead of physical wiring, to set security and field network information is required. This procedure is called a provisioning.
FN310 supports provisioning via infrared communication using a provisioning device and can be securely connected to a network. If the provisioning information is not set, the FN310 cannot be connected to the field wireless network.

**NOTE**

Before provisioning, connect the FN110. For detail on how to install the FN110, refer to subsection 4.2.1 “Installation of FN110”.

For details on provisioning using a provisioning device, connecting to a field wireless network and the setting procedure, refer to the User's Manual, FieldMate Versatile Device Management Wizard (IM 01R01A01-01E), and YFGW410 Field Wireless Management Station (IM 01W02D01-01EN).

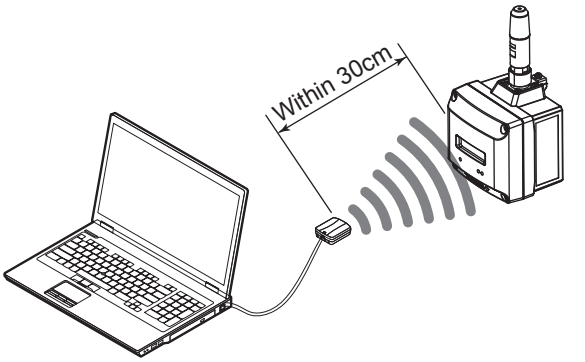



**Figure 6.2 Provisioning Example**

### ■ Provisioning Work

This subsection describes provisioning work using FieldMate as the provisioning device.
Provisioning work performs provisioning for each field wireless device using FieldMate and an infrared adapter.
When using the Yokogawa recommended near infrared adapter for the provisioning device, the distance between the front panel of this product and the infrared surface of the near infrared adapter should be within 30 cm. For details on the Yokogawa recommended infrared adapter, refer to subsection 8.2 "Recommended Products List".
Perform the following provisioning tasks.

- Setting provisioning information
- Creating a provisioning information file

1) Setting provisioning information
Set the device tag and Network ID using a FieldMate provisioning function. The device tag, Network ID, and join key are set in the field wireless device. It is not necessary to input a join key because FieldMate automatically generates it.

- Setting device tag
  The device tag is used for the user to recognize the field wireless device.
- Setting Network ID
  This is the Network ID for the field wireless network to which the field wireless device is connected. Set a value from 2 to 65535.

The field wireless device is connected to the field wireless network corresponding to the Network ID set by provisioning work.

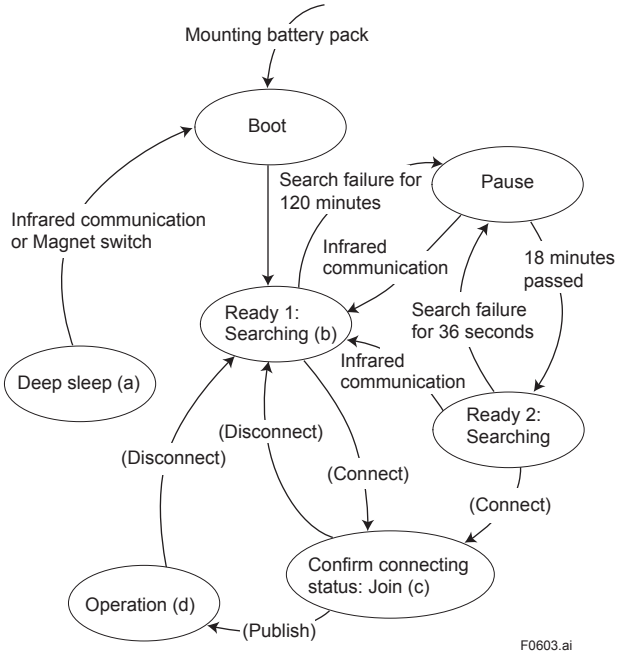
2) Creating a provisioning information file
The following provisioned information is stored in the provisioning information file.

- Network ID
- Device tag
- EUI64
- Join key
- Provisioner (name of the user who performed provisioning work by Field Mate)
- Date (Time and date when provisioning was performed by FieldMate)

This provisioning information file is required to load from the field wireless configurator to the field wireless integrated gateway. Store the file carefully.

## ■ Connecting to a Field Wireless Network

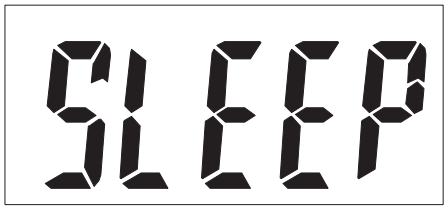
The action after installing the battery pack varies depending on the silence setting.
Mounting the battery pack automatically starts a search for the field wireless network and the device goes into the join state when the field wireless gateway is found. If the field wireless gateway is not found and a specified time based on the silence mode has elapsed, a cycle of 18-minute pause and 36-second search is repeated until the device can join the field wireless network.
For details on the silence setting, refer to subsection 7.3.10 “Switching to the Silence Mode”.




* By using a magnet switch or filed device configuration tool, transitions to the Deep sleep state from any state.

**Figure 6.3 Wireless Status Transition**

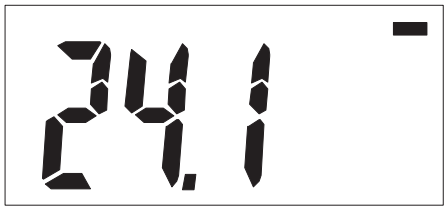
(a) Deep Sleep




F0604.ai

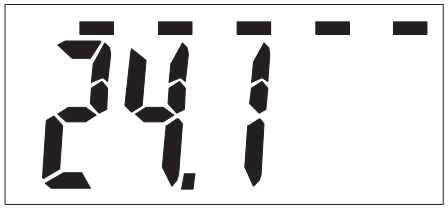
Displays for 2 seconds in deep sleep setting, and then turns off.

(b) Ready



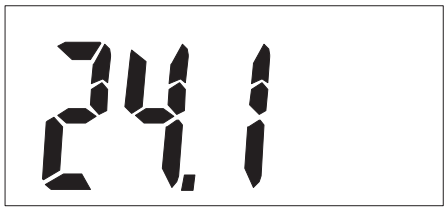

F0605.ai

(c) Confirm Connecting Status




F0606.ai

(d) Join




F0607.ai

**NOTE**

If the FN310 searches the field wireless network for long time low ambient temperature condition, sometimes error “AL.20 LOWBAT” is displayed on the integral indicator. It occurs because of battery characteristics even when using new batteries. After joining to the field wireless network, this error will be cleared within one hour if battery has no failure.

## 6.4 Display Contents of the Integral Indicator

### ■ Write Protect Status



When the write protection is enabled, the lock icon is displayed in the upper left corner of the integral indicator. For details on how to enable write protection, refer to subsection 7.3.8 “Write Protect”.

### ■ Wireless Communication Status

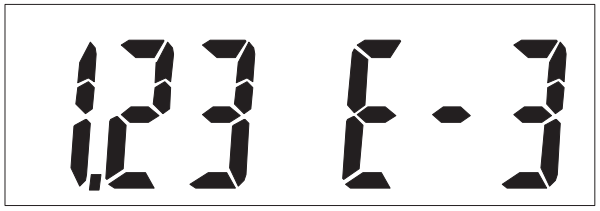
The status of wireless communication is indicated by the segments on the top of the integral indicator. Possible status are shown in Table 6.3.

**Table 6.3 Wireless Communication Status List**

| Integral Indicator | Wireless Communication Status |
|---|---|
| No display | • RePause (Silence mode)<br>• ReOperation (Published) |
| - | • Ready<br>• Joining |
| - - - - - | • Confirm connecting status |
| ---------- | • Startup<br>• Alert |

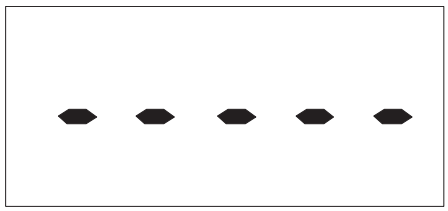
### ■ Process Value

The process value obtained from the HART device is displayed. For detail information about the display settings, refer to section 7 “Setting Parameters”. When sensor data is more than five orders of magnitude, scroll automatically after 2 seconds.



F0608.ai

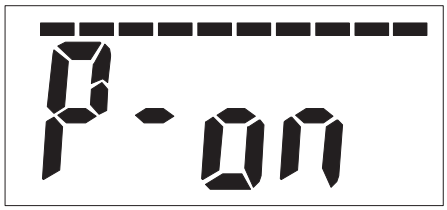
When publish is not configured or reading of process value from the HART device are not set, following is displayed.



F0609.ai

### ■ Startup

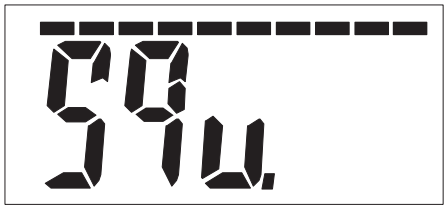
When the FN310 powers on or recovers from the deep sleep mode, the following is displayed for 2 seconds.



F0610.ai

### ■ Setting the Find Device

When UAPMO.Find Device is set from FieldMate or PRM, following is displayed. The duration the display can be changed. For detail on how to display, refer to section 7 “Setting Parameters”.



F0611.ai

## 6.5 Shutting Down

When shut down the FN310, remove the battery pack or set the FN310 to deep sleep mode by the device configuration tool or magnet switch.

**NOTE**

- Refer to subsection 8.3 “Replacing the Battery Pack” for the battery pack removing.
- When storing the FN310 with a battery pack inserted, it is recommended to put the FN310 into deep sleep mode to conserve battery power. For details on how to switch to deep sleep mode, refer to subsection 7.3.9 “Switching to the Deep Sleep Mode”.

# 7. Setting Parameters

FN310 can remotely handle sensor type changes, Tag No. setup, monitoring of self-diagnostic results, according to communication with the field wireless configuration tool or the device configuration tool.

## 7.1 Preparation for Parameter Setting

This product can be set parameters via infrared port or field wireless network.
When setting parameters via field wireless network, connect this product to the field wireless network.
For details on how to connect to the field wireless network, refer to subsection 6.3 “Connecting to the Field Wireless Network”.
When setting parameters via infrared port, use the infrared port on front of this product.

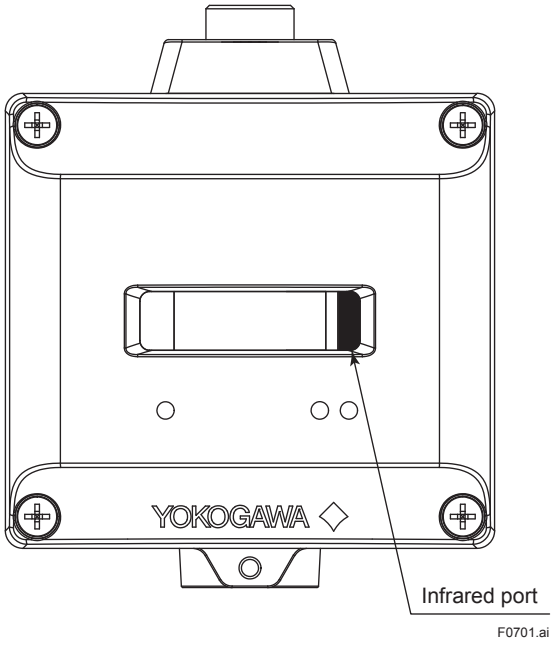



**Figure 7.1 Connecting the Configuration Tool**

## 7.2 Preparing Software

### 7.2.1 Softwares for the Field Wireless Configuration Tool and the Device Configuration Tool

Before using the device configuration tool, confirm that CF/DD and DeviceDTM for this product are installed in the device configuration tool.
Refer to the following website for the latest information on CF/DD and DeviceDTM.
<http://www.field-wireless.com/>

**CF(Capabilities File)/DD(Device Description)**

A CF file contains information, such as the vendor of the field device, its model and revision, available types of process data (flow rate, temperature, pressure, etc.), and number of data items. A DD file contains the information on parameters, such as data structures and attributes.

**DeviceDTM**

DeviceDTM, (Device Type Manager) is driver software for field devices provided based on the FDT (Field Device Tool) technology.

The field wireless configuration tool or the device configuration tool allows to read the device information.
Refer to subsection 8.2 “Recommended Products List” for the field wireless configuration tool or the device configuration tool of our recommendation.
Refer to the following website for the latest configuration tool and DeviceFile.
<http://www.field-wireless.com/>

### 7.2.2 Software Download

Software download function allows to update wireless field device software via ISA100.11a wireless communication. For details, refer to YFGW410 Field Wireless Management Station (IM 01W02D01-01EN).

## 7.3 Setting Parameters

### 7.3.1 Parameter Usage and Selection

Before setting a parameter, please see the following table for a summary of how and when each parameter is used. FN310 supports a HART device connection and each value of HART device is assigned to AI1/AI2/AI3/AI4.

**IMPORTANT**

After setting and sending data with the field wireless configuration tool or the device configuration tool, wait 30 seconds before turning off the FN310. If it is turned off too soon, the setting will not be stored in the FN310.

**Table 7.1 Parameter Usage and Selection**

| Item | Description |
|---|---|
| Tag No. | Sets the Tag No. for Device Tag (software tag). The Tag No. can be set sixteen characters (alphanumeric characters, including - and . ). |
| Output mode | Allows outputting process value and self-diagnostic information via field wireless network.<br>Either or all of sensor input (AI1/AI2/AI3/AI4: Process Value), and self-diagnostic information (UAPMO: Diagnostic Status) can be set output data. |
| HART device setting | Sets the information about the HART device to be connected to the FN310. |
| Integral indicator display setting | Sets the process value to display on the LCD. |
| Software write protect | Prohibit writing the setting data. |
| Memo field | Memo field available to write the check date, checker and others (as an adjustment information), or anything. |
| Operational mode | Set the operational mode of the sensor and integral indicator, etc. |

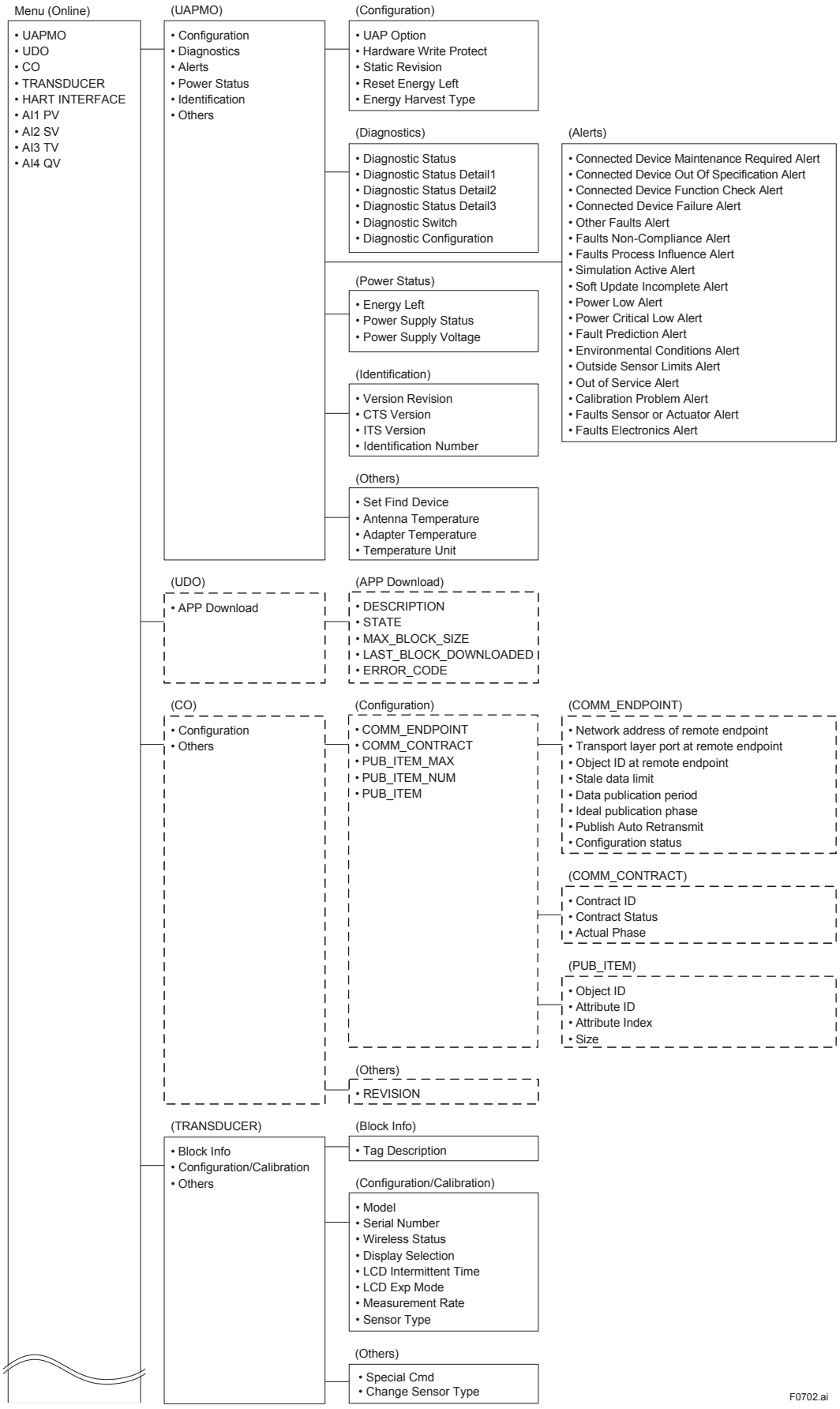
**NOTE**

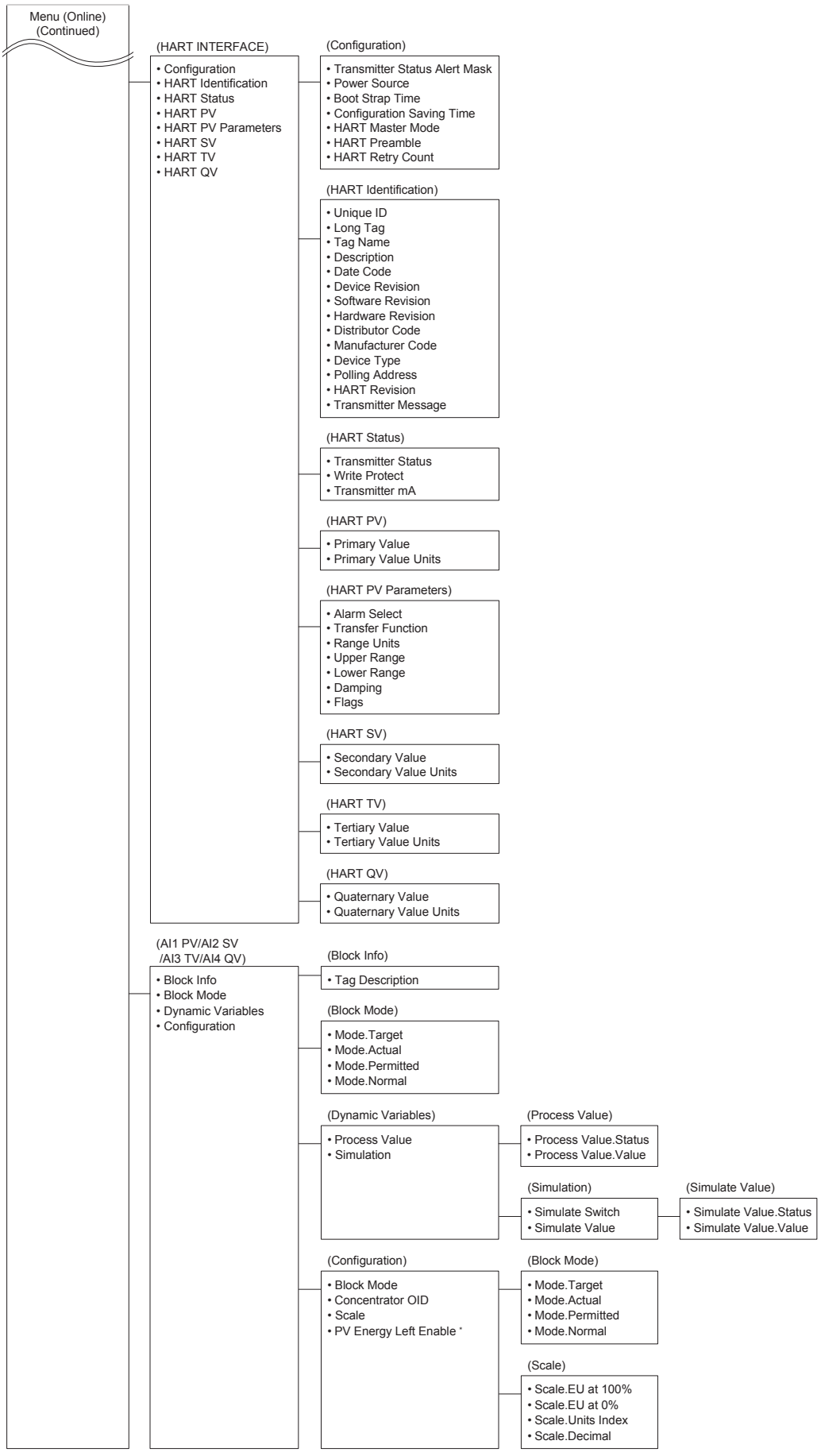
Some of the parameter setting are in the dialogue form called method, by following the on-line instructions you can configure the parameters easily.

### 7.3.2 Function Block and Menu Tree

#### (1) Function Block

The function of FN310 is shown below. Some functions may not be available depending on the device configuration tool used. When the device configuration tool of our recommendation is used, the software attached to the Field Wireless Integrated Gateway or Field Wireless Management Station is necessary for setting the dotted line part. Refer to subsection 8.2 “Recommended Products List” for the field wireless configuration tool of our recommendation.


Menu (Online)
• UAPMO
• UDO
• CO
• TRANSDUCER
• HART INTERFACE
• AI1 PV
• AI2 SV
• AI3 TV
• AI4 QV
(UAPMO)
• Configuration
• Diagnostics
• Alerts
• Power Status
• Identification
• Others
(Configuration)
• UAP Option
• Hardware Write Protect
• Static Revision
• Reset Energy Left
• Energy Harvest Type
(Diagnostics)
• Diagnostic Status
• Diagnostic Status Detail1
• Diagnostic Status Detail2
• Diagnostic Status Detail3
• Diagnostic Switch
• Diagnostic Configuration
(Alerts)
• Connected Device Maintenance Required Alert
• Connected Device Out Of Specification Alert
• Connected Device Function Check Alert
• Connected Device Failure Alert
• Other Faults Alert
• Faults Non-Compliance Alert
• Faults Process Influence Alert
• Simulation Active Alert
• Soft Update Incomplete Alert
• Power Low Alert
• Power Critical Low Alert
• Fault Prediction Alert
• Environmental Conditions Alert
• Outside Sensor Limits Alert
• Out of Service Alert
• Calibration Problem Alert
• Faults Sensor or Actuator Alert
• Faults Electronics Alert
(Power Status)
• Energy Left
• Power Supply Status
• Power Supply Voltage
(Identification)
• Version Revision
• CTS Version
• ITS Version
• Identification Number
(Others)
• Set Find Device
• Antenna Temperature
• Adapter Temperature
• Temperature Unit
(UDO)
• APP Download
(APP Download)
• DESCRIPTION
• STATE
• MAX_BLOCK_SIZE
• LAST_BLOCK_DOWNLOADED
• ERROR_CODE
(CO)
• Configuration
• Others
(Configuration)
• COMM_ENDPOINT
• COMM_CONTRACT
• PUB_ITEM_MAX
• PUB_ITEM_NUM
• PUB_ITEM
(COMM_ENDPOINT)
• Network address of remote endpoint
• Transport layer port at remote endpoint
• Object ID at remote endpoint
• Stale data limit
• Data publication period
• Ideal publication phase
• Publish Auto Retransmit
• Configuration status
(COMM_CONTRACT)
• Contract ID
• Contract Status
• Actual Phase
(PUB_ITEM)
• Object ID
• Attribute ID
• Attribute Index
• Size
(Others)
• REVISION
(TRANSDUCER)
• Block Info
• Configuration/Calibration
• Others
(Block Info)
• Tag Description
(Configuration/Calibration)
• Model
• Serial Number
• Wireless Status
• Display Selection
• LCD Intermittent Time
• LCD Exp Mode
• Measurement Rate
• Sensor Type
(Others)
• Special Cmd
• Change Sensor Type
F0702.ai

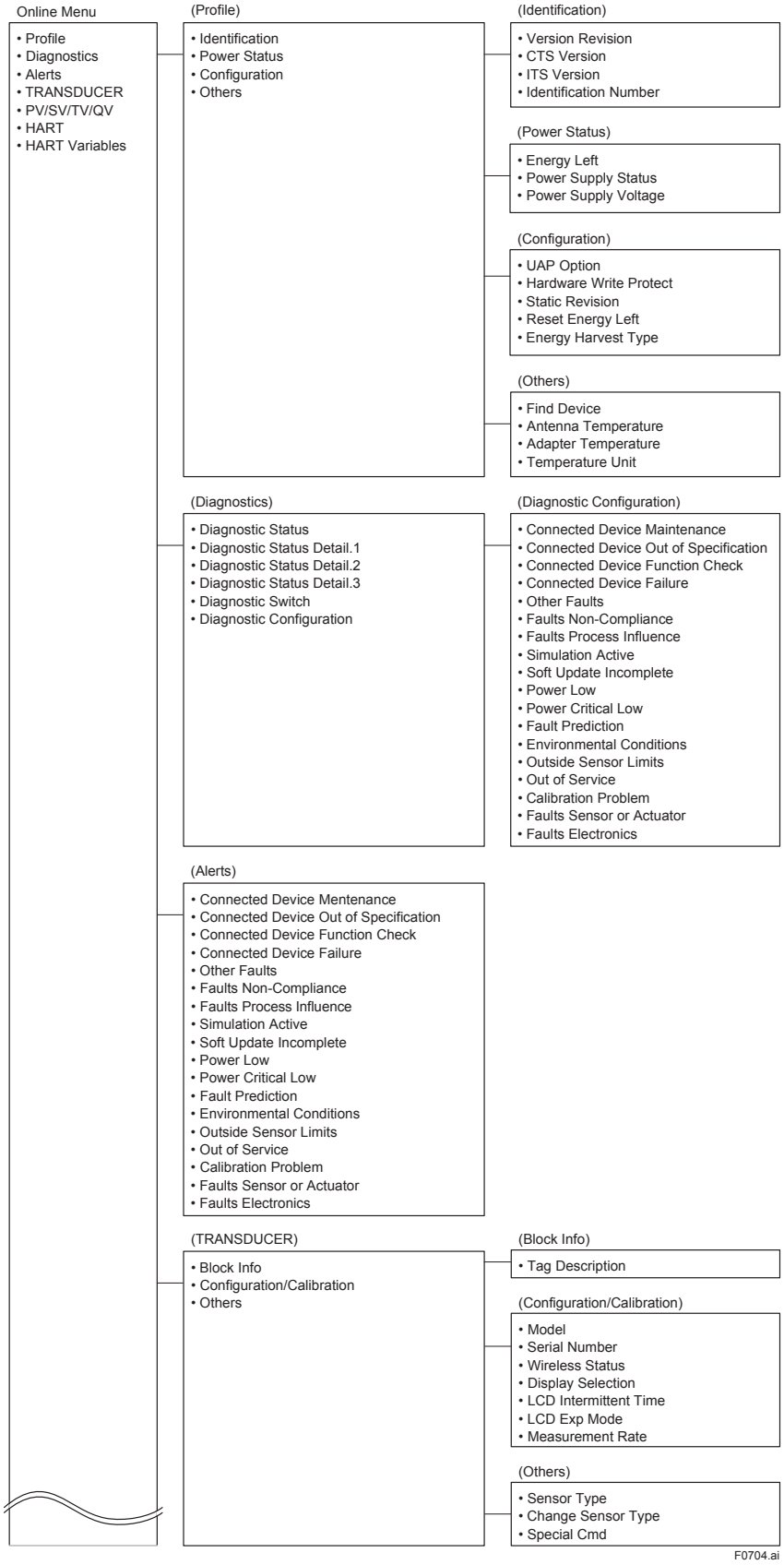



*: Only AI1 PV

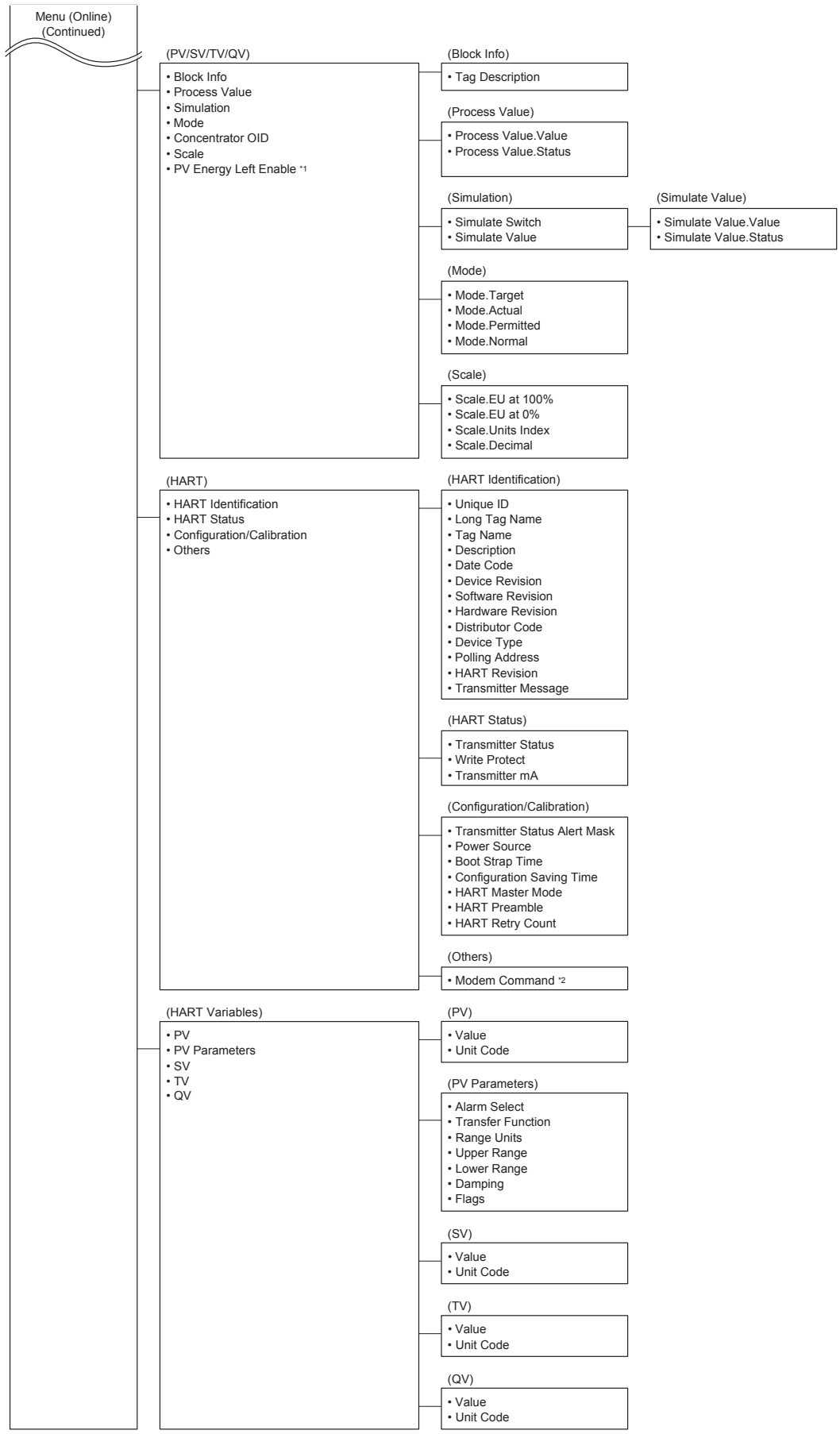
F0703.ai

## (2) Menu Tree

The menu tree of the our recommended device configuration tool is shown below.
Refer to subsection 8.2 “Recommended products list” for the device configuration tool of our recommendation.



F0704.ai




F0705.ai

*1: Only PV
*2: Only via Field Wireless Integrated Gateway or Field Wireless Management Station

### 7.3.3 Parameters for Wireless Communication

#### (1) Network Information

Concentrator Object block: Configuration
The network-related information can be checked.

#### (2) Update Time

CO block: Data publication period
Set the update time value to 5 to 3600 seconds.
The setting affects the battery life.
When update time is set 0 second, FN310 stops updating process variables via the field wireless network. And it also stops the acquisition of process variables from the HART device.

#### (3) Remaining Battery Life

UAPMO block: Energy Left
The number of days of battery life remaining is indicated assuming ambient temperature condition as 23 °C. It takes several days for the value to be stabilized after the power on and initialization of the remaining battery life.
UAPMO block: Reset Energy Left
When changing batteries, the remaining battery life is initialized by Reset Energy Left parameter.

#### (4) LCD Display

TRANSDUCER block: LCD Intermittent Time
The integral indicator has three modes: Continuous, Intermittent, and Off. These modes are switched by LCD Intermittent Time parameter. The intermittent mode repeats on/off at defined seconds.
In any mode, current process value is displayed by magnet switch operation. After displaying current process value, returns to the configured mode.
Refer to subsection 8.6 “Switching LCD Display” for details.

**NOTE**

When the FN310 detects AL.01, AL.02 and AL.03 error, the LCD display does not dim regardless of the status in LCD mode. See Table 8.4 for details.

### 7.3.4 Tag and Device Information

You can specify the Device Tag when ordering the corresponding FN110 Field Wireless Communication Module.
Device Tag and device information can be checked as follows.

#### ■ Procedure to Read the Device Tag and Device Information

- Device Tag (Software Tag)
  This is specified by writing characters (up to 16 characters) that differs from those specified in Tag No. to the module. For details how to confirm this, refer to subsection “Connecting to the Field Wireless Network”.
- Tag Description
  This is a universal parameter to store the comment that describes the content of the tag located in the TRANSDUCER and AI1/AI2/AI3/AI4 blocks.

#### ■ Limitation of Device Information

When changing the device information, input the information based on the following limitation on the number of characters.

- Message function (up to 32 characters)
  TRANSDUCER block: Tag Description
  AI1/AI2/AI3/AI4 block: Tag Description

### 7.3.5 Setup the Integral Indicator

TRANSDUCER block: LCD Exp Mode
Set the display method of the PV on the integral indicator. Index display or base display is selectable.

### 7.3.6 Parameters for HART Device

■ **HART Device Information**

IFO block:Boot Strap Time and Configuration Saving Time

Figure 7.2 shows the detail about the Boot Strap Time and the Configuration Saving Time. Boot Strap Time is defined as the time from the power-on of the HART device until the reliable data is available. When Update Time is shorter than Boot Strap Time or the difference between Update Time and Boot Strap Time is less than 2 seconds, HART device operates continuously and FN310 supplies power at all times.

Configuration Saving Time is defined as the time until the HART device finishes saving the configuration. Configuration Saving Time is required to change when Configuration Saving Time of HART device is longer than the default value. Otherwise do not change default values.

When connecting to the 4-20 mA loop, do not change these parameters from default values.

Refer to section 9 “Parameter Summary”.

**NOTE**

- After changing the parameter of Boot Strap Time or Configuration Saving Time, restart FN310 to apply the changing.
- When the Boot Strap Time is longer than the time-out of the device configuration tool, an error may occur. At that time, reconnect the tool to get the value.

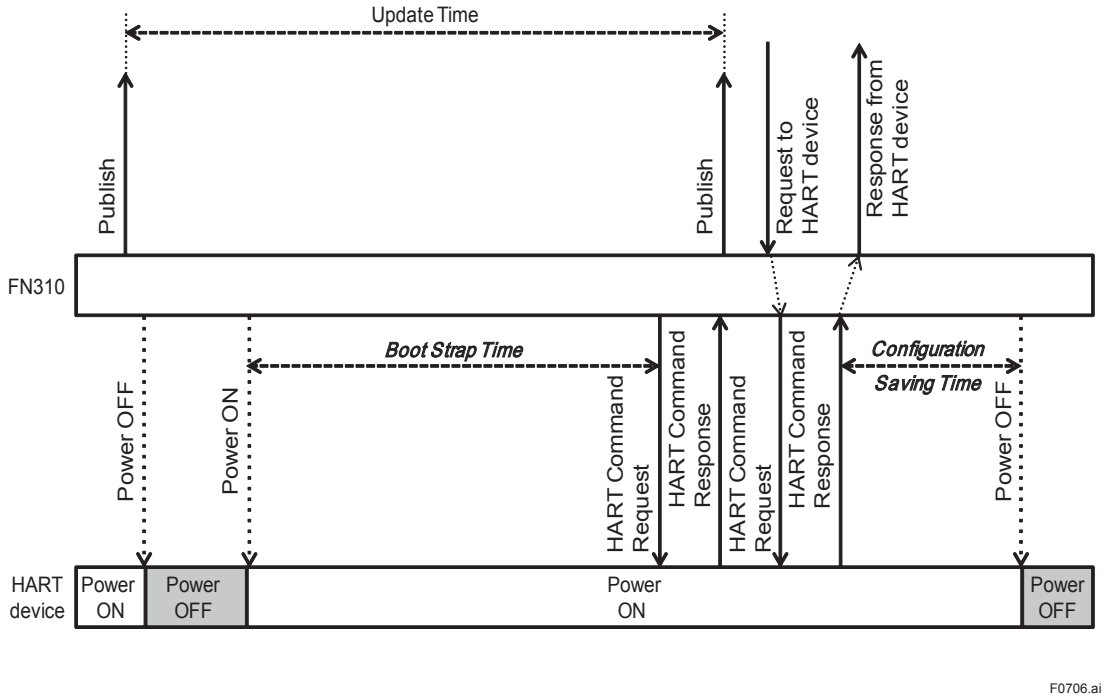



**Figure 7.2 Boot Strap Time and Configuration Saving Time**

### ■ HART Data Conversion

There are different encoding in some fields that are defined in the ISA100.11a and HART. FN310 converts into ISA100.11a encoding when mapping parameters to IFO block. Table 7.2 shows the conversion method.
HART data conversion is only applicable to HART Command of transmitting from the FN310. HART Command sent from the host system is not converted.

**Table 7.2 HART Data Conversion**

| Item | HART | ISA100.11a | Remarks |
|---|---|---|---|
| String | Packed ASCII | ASCII | Holds the converted value for the following parameters of IFO object.<br>Tag Name<br>Description<br>Transmitter Message |
| Unit Code | Engineering Unit Code (1 - 169, 220 - 239) | Convert to 1000-1717 according to FF FN-21 | Holds the converted value for the following parameters of IFO object.<br>AI1.Scale.EU.Unit<br>AI2.Scale.EU.Unit<br>AI3.Scale.EU.Unit<br>AI4.Scale.EU.Unit |
| | Unicode expanded area (170 - 219) | Convert to 1588 (No Units) | |
| | Manufacturer specific definition (240 - 249) | | |
| | User defined unit (250 - 253) | | |

## 7.3.7 Assignment to AI Object

FN310 has four AI blocks. Input value of Process Value parameters for each AI block depends on the setting of the Sensor Type parameter of TRANSDUCER block.

**Table 7.3 HART Data Conversion**

| AI Object | TRANSDUCER.Sensor Type | |
|---|---|---|
| | 0 : HART Device | 1 : No Sensor |
| AI1 | Primary Value of HART devices | UAPMO.EnergyLeft * |
| AI2 | Secondary Value of HART devices | Not Assigned |
| AI3 | Tertiary Value of HART devices | Not Assigned |
| AI4 | Quaternary Value of HART devices | Not Assigned |

*: Disabled by default

## 7.3.8 Write Protect

Hardware write protection and software write protection functions are available for FN310. The write protection status is displayed on the LCD. Refer to subsection 6.4 “Display Contents of the Integral Indicator” for details.

### ■ Hardware Write Protection

Hardware Write Protection is set by slide switch on the front panel back.

### ■ Software Write Protection

Software Write Protection is set by the parameter of software write protect of UAP Option in UAPMO block.
For the relationship between hardware write protection and software write protection, refer to section 9 “Parameter Summary”.

### 7.3.9 Switching to Deep Sleep Mode

When the FN310 will not be used for a long time, switch the FN310 to the deep sleep mode to conserve battery power. There are two methods of switching to the deep sleep mode. To switch to deep sleep mode, follow the procedure below.

**■ Magnet Switch Operation**

Procedures for switching to the deep sleep mode using a magnet switch are as follows.

1. Touch the magnet switch 1 for 5 seconds by a magnet (LCD displays “SLEEP” flashing).
2. Touch the magnet switch 1 for an additional 5 seconds by a magnet (LCD displays “SLEEP”).
3. Touch the magnet switch 2 within next 5 seconds by a magnet.

**■ Write Parameter**

TRANSDUCER block: Special Cmd
Set 1 to Special Cmd parameter.

There are three methods to start from the deep sleep mode.

**■ Restart**

Restart by re-connection of the battery pack.

**■ Infrared Communication**

Start by receiving infrared communication. Use the wireless field device configuration tool (for infrared) or device provisioning tool.

**■ Magnet Switch Operation**

Start by touching a magnet to magnet switch 1 for 10 seconds.

**CAUTION**

After setting the deep sleep mode by infrared device configuration tool, keep the infrared port of device away from any other infrared signals.

**NOTE**

- After switching to deep sleep mode, the FN310 stops any field wireless communication. For this reaon, there is the case that an error is display on field wireless configuraiton tool.
- To wake up from deep sleep mode by reconnection of battery pack, please pull battery pack and wait more than 30 seconds before attaching battery pack.

### 7.3.10 Switching to the Silence Mode

This is a function to pause the FN310 when it cannot join the field wireless network after a specified time has elapsed. This function is effective in conserving battery power when, for example, the installation of the Field Wireless Integrated Gateway is delayed compared to that of field wireless devices. When the FN310 fails to search the network for about 120 minutes, it switches to silence mode automatically. Thereafter, a cycle of 18 minutes pause and 36 seconds search is repeated until the FN310 can join the field wireless network. To minimize the consumption of the battery, the FN310 turns off the integral indicator and stops the measurement.
To start from the silence mode, either removes and inserts the battery pack, or receiving infrared communication. Use the device configuration tool (for infrared) or device provisioning tool.

## 7.4 Self-Diagnostics

### 7.4.1 Identify Problems by Using the Device Configuration Tool

The device configuration tool allows checking the self-diagnostic results and settings of the FN310. First, check Diagnostic Status of the self-diagnostic results.

■ **Procedure to Call Up the Self-Diagnostic Parameter**
**UAPMO block: Diagnostic Status**

Any of the four categories (Function check, Maintenance required, Failure, and Out of specification) according to NAMUR NE107 is supplied to Diagnostic Status of each diagnostic result.

Checking the Diagnostic Status category allows taking the proper action. The Diagnostic Status contents are common for all ISA devices, and the setting for the Diagnostic Status category can be changed. For further details, refer to Diagnostic Status Detail.
In Diagnostic Status Contents that can be diagnosed by the FN310, the alert category set in Out of Service can be changed to Function check. To do so, follow the procedures below.

1. UAPMO block: UAP Option Enable diagnostic status configuration select “enable”.
2. UAPMO block: Diagnostic Configuration change Out of Service from “Failure” to “Function check”.
3. UAPMO block: UAP Option Enable diagnostic status configuration select “disable”.

In Diagnostic Configuration setting, select one from the followings;

F: Failure Status
C: Function check status
O: Out of specification status
M: Maintenance required status

The contents of Diagnostic Status are defined either valid or invalid at Diagnostic Switch parameter. Follow the example below to change “Out of Service” to invalid.

1. UAPMO block: UAP Option Enable diagnostic status configuration select “enable”.
2. UAPMO block: Diagnostic Switch turn “Off” for Out of Service.
3. UAPMO block: UAP Option Enable diagnostic status configuration select “disable”.

**NOTE**

Be careful when changing the alert category and turning detection on and off as described above. Be sure to set UAP Option Enable diagnostic status configuration to disable again to prevent setting errors.

### 7.4.2 Alert Report

FN310 generates alert information related to Diagnostic Status and automatically sends to a field wireless gateway. To use this function, the following alert setting is necessary. When “Out of Service” for Diagnostic Status alert is required, choose “FALSE” for [Out of Service.Alert Disable] in the UAPMO block. Refer to the field wireless gateway User’s Manual for the setting procedure to obtain the alert information from the gateway.
The alert report consists of the list of parameter name as shown Table 7.4.

**Table 7.4 Contents of Alert Report**

| Parameter name | Description |
|---|---|
| DetectObjectTLPort | Alert detection port<br>UAP (0xF0B2) fixed |
| DetectObject | Alert detection block<br>UAPMO (1) fixed |
| DetectTime | Time stamp |
| AlertDirection | 1: generated, 0: clear |
| AlertPriority | Alert priorities set by users |
| AlertType | Alert types, see Alert Type in Table 7.6 |
| AlertValue | NAMUR107 category<br>0: Failure<br>1: Function Check<br>2: Out Of Specification<br>3: Maintenance Required |

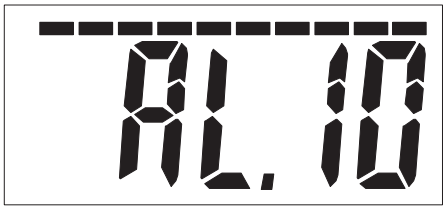
**CAUTION**

For a wireless gateway which does not support the alert report function, the alert setting in UAPMO block for this product must be set to “Disable”. Note that YFGW710 Field Wireless Integrated Gateway does not have the alert report function.

### 7.4.3 Checking with Integral Indicator

**NOTE**

If an error is detected by running self-diagnostics, an error number is displayed on the integral indicator. If there is more than one error, the error number changes at 2 seconds interval. See table 8.4 regarding the alarm codes.




F0707.ai

**Figure 7.3 Error Check with Integral Indicator**

**Table 7.5 Diagnostic Status**

| Bits | Contents | NAMUR NE107 Categorization* |
|---|---|---|
| Bit31(MSB) | F: Failure status | --- |
| Bit30 | C: Function check status | --- |
| Bit29 | O: Out of specification status | --- |
| Bit28 | M: Maintenance required status | --- |
| Bit27 | Faults in electronics | F |
| Bit26 | Faults in sensor or actuator element | F |
| Bit25 | Installation, calibration problem | C |
| Bit24 | Out of service | C |
| Bit23 | Outside sensor limits | O |
| Bit22 | Environmental conditions out of device specification | O |
| Bit21 | Fault prediction: Maintenance required | M |
| Bit20 | Power is critical low: maintenance need short-term | M |
| Bit19 | Power is low: maintenance need mid-term | M |
| Bit18 | Software update incomplete | C |
| Bit17 | Simulation is active | C |
| Bit16 | Faults due to process influence | F |
| Bit15 | Faults due to non-compliance with specified operating conditions | F |
| Bit14 | Other faults | F |
| Bit13-Bit09 | reserved by WCI | --- |
| Bit08 | Connected device: Failure | F |
| Bit07 | Connected device: Function Check | C |
| Bit06 | Connected device: Out of Specification | O |
| Bit05 | Connected device: Maintenance required | M |
| Bit04-Bit01 | vendor specific area | --- |
| Bit00 | Detail information available | --- |
| | 1: available | |
| | 0: no available | |

*: NAMUR NE107 “Self-Monitoring and Diagnosis of Field Devices”

**Table 7.6 Diagnostic Results Summary**

| Diagnostic Status Contents | Alert Type | NAMUR NE107 Category* | Diagnostic Status Detail | Description |
|---|---|---|---|---|
| Faults in electronics | 78 | F | ADAPTER FAIL | FN310 failure |
| | | | ANTENNA FAIL | FN110 failure |
| | | | INTERNAL BUS FAIL | Communication failure between FN110 and FN310 |
| Faults in sensor or actuator element | 77 | F | SENSOR FAIL | Communication failure between FN310 and HART devices |
| Installation, calibration problem | 76 | C | DEVICE CONNECTION ERR | Connection failure between FN310 and HART devices |
| | | | DEVICE ADDRESS ERR | Address setting error of HART devices |
| | | | BURST MODE | Burst mode detection of HART devices |
| | | | BOOT TIME ERR | Boot time setting error of HART devices |
| Out of service | 75 | C | AI1 OUT OF SERVICE | AI1 O/S Mode |
| | | | AI2 OUT OF SERVICE | AI2 O/S Mode |
| | | | AI3 OUT OF SERVICE | AI3 O/S Mode |
| | | | AI4 OUT OF SERVICE | AI4 O/S Mode |
| Environmental conditions out of device specification | 73 | O | ADAPTER TEMP HI | FN310 temperature is above +85°C |
| | | | ADAPTER TEMP LO | FN310 temperature is below -40°C |
| | | | ANTENNA TEMP HI | FN110 temperature is above +85°C |
| | | | ANTENNA TEMP LO | FN110 temperature is below -40°C |
| Power is critical low: maintenance need short-term | 71 | M | CRITICAL LOWBAT | Low battery alert |
| Power is low: maintenance need mid-term | 70 | M | LOWBAT_ALM | Low battery |
| Simulation is active | 68 | C | AI1 SIMULATION ACTIVE | AI1 Simulation Mode |
| | | | AI2 SIMULATION ACTIVE | AI2 Simulation Mode |
| | | | AI3 SIMULATION ACTIVE | AI3 Simulation Mode |
| | | | AI4 SIMULATION ACTIVE | AI4 Simulation Mode |
| Connected device: Failure | 59 | F | HART DEVICE MALFUNCTIONED | Detect HART Status Device Malfunctioned |
| Connected device: Function Check | 58 | C | HART DEVICE CONFIGURATION CHANGED | Detect HART Status Configuration Changed |
| | | | HART DEVICE COLD START | Detect HART Status Cold Start |
| | | | HART DEVICE MORE STATUS AVAILABLE | Detect HART Status More Status Available |
| | | | HART DEVICE LOOP CURRENT FIXED | Detect HART Status Loop Current Fixed |
| Connected device: Out of Specification | 57 | O | HART DEVICE LOOP CURRENT SATURATED | Detect HART Status Loop Current Saturated |
| | | | HART DEVICE NON PRIMARY VARIABLE OOL | Detect HART Status Non Primary Variable out of limits |
| | | | HART DEVICE PRIMARY VARIABLE OOL | Detect HART Status Primary Variable out of limits |

*: NAMUR NE107 “Self-Monitoring and Diagnosis of Field Devices”

# 8. Maintenance

## 8.1 General

This chapter describes the procedures of replacing batteries and the status check method required for maintenance of FN310.
Please carefully and thoroughly read the following sections for information on how to properly handle this product while performing maintenance.

## 8.2 Recommended Products List

Table 8.1 lists the recommended products of our equipment needed to set up and use the FN310.

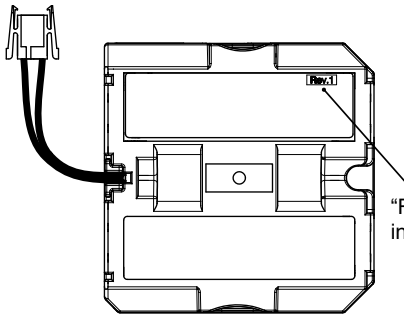
**Table 8.1 Recommended Products List**

| Yokogawa-recommended Instrument |
|---|
| **Provisioning Device Tool**<br>• FieldMate (R2.03 or later)<br>• Provisioning Device Tool<br>• Infrared Adapter certified by Yokogawa<br>Supplier: ACTiSYS<br>Product name: IrDA InfraRed USB Adaptor<br>Product number: IR224UN-LN96 (9600bps) |
| **Field Wireless Configuration Tool**<br>• Field Wireless Integrated Gateway attached Software<br>Field Wireless Configurator<br>Field Wireless Management Tool<br>• Field Wireless Management Station attached Software<br>Field Wireless Management Console |
| **Device Configuration Tool**<br>• FieldMate (R2.06.02 or later)<br>DeviceFile (R3.05.04 or later) |
| **Field Wireless System related Product**<br>• Plant Resource Manager (PRM) (R3.20 or later)<br>DeviceFile (R3.06.10 or later) |

## 8.3 Replacing the Battery Pack

**WARNING**

- To ensure the installation minimizes the risk from electrostatic discharge.
  To prevent electrostatic discharge caused by static charge built up on the operator, ground the operator through conductive shoes and floors and by wearing anti-static work clothes to prevent charge build-up.
  Avoid any actions that cause the generation of electrostatic charge, such as rubbing surface of Battery Pack and product with a dry cloth.
  If static electricity cannot be suppressed, check that the surrounding atmosphere does not contain explosive gas or steam before replacing the Battery Pack.
- Be sure to use a battery pack that is indicated as “Rev.1” or higher for explosion protected instruments.




The battery pack in an intrinsically safe explosion protected product can be replaced in the installed condition in a hazardous area.

### ■ Preparation

Initialize the value of remaining battery life.
To initialize the battery life, set the Reset Energy Left parameter in UAPMO block. When the FN310 stop working because of low battery, initialize the remaining battery life immediately after replacing the battery pack. In the case of initialize the remaining battery life after replacing the battery pack, perform warm restart after initializing. For details on how to warm restart, refer to field wireless gateway User’s Manual (IM 01W02D01-01EN for YFGW410.

### ■ Removing

1. Loosen the four screws on the front panel.
2. Pull the lever in the direction of the arrow in Figure 8.1.
3. Pull out the battery connector from the front panel back.
4. Pull the battery pack.

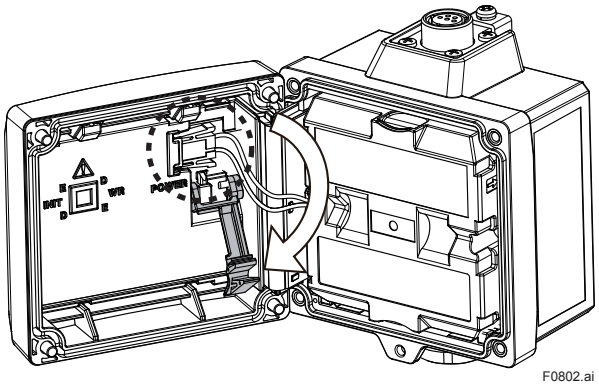



**Figure 8.1 Removing the Battery Pack**

**CAUTION**

After pulling out the battery connector, remove the battery pack.

### ■ Remounting

1. Insert the new battery pack. The orientation of the battery pack, “PART NO.” display is the front and connector cable is left side.
2. Plug the battery connector into the terminal on the front panel back. Connect facing down the white surface of the connector. Push the connector until it touches the back of the front panel then slide it to the left.
3. Push the lever in the direction of the arrow in Figure 8.2.
4. Close the front panel and tighten the four screws to a torque of 0.7 N • m.

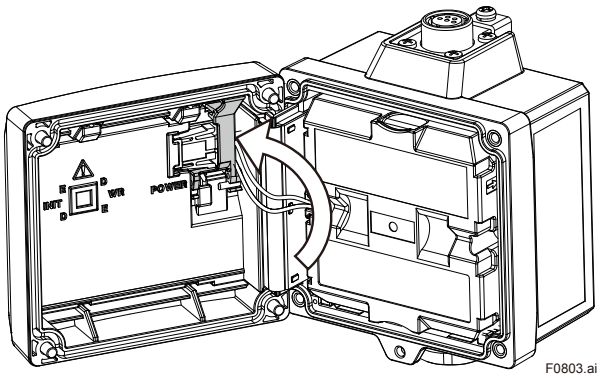



**Figure 8.2 Remounting the Battery Pack**

## 8.4 Replacing the Batteries

The batteries in the battery pack can be replaced. Batteries are not installed when shipped from the factory. Assemble the battery pack as follows.

**WARNING**

Be sure to replace the batteries or open and close the battery pack in a non-hazardous area. Doing so in a hazardous area could cause an explosion.

**CAUTION**

When replacing the batteries, be sure to replace the two batteries at the same time and do not use an old and a new battery together. The type of the two batteries should be the same.

### ■ Disassembling

1. Loosen a battery case fixing screw.
2. Remove old batteries. Remove the battery by pushing up the negative side of the battery as shown in Figure 8.3.

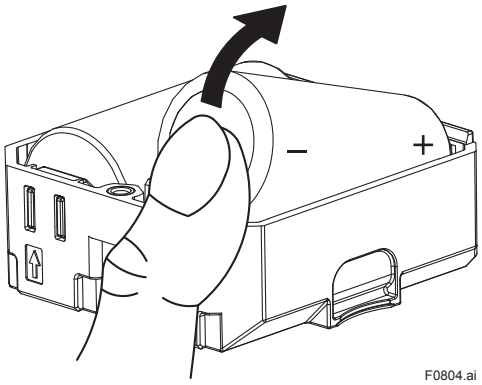



**Figure 8.3 Remove Batteries**

### ■ Assembling

1. Insert new batteries into the battery case. Check the orientation of the battery and push straight.
2. As shown in Figure 8.4, engage the hooks on the opposite side of the screw.
3. Tighten the screw to a torque of 0.7 N • m.

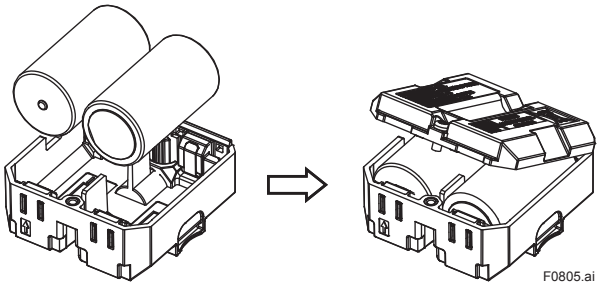



**Figure 8.4 Assembling the Battery Pack**

## 8.5 Handling Batteries

This battery pack uses two primary lithium-thionyl chloride batteries. Each battery contains approximately 5 grams of lithium, for a total of 10 grams in each pack. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Protect the electrode of the battery pack to avoid rapid electrical discharge. Discharged a battery may lead to fluid leakage and excessive heat. Batteries should be stored in a clean and dry area. For maximum battery life, storage temperature should not exceed 30°C.

### WARNING

**Handling the battery pack**

The following precautions must be observed in order to safely and effectively use a battery pack. Improper use may lead to fluid leakage, excessive heat, ignition, or explosion.

- Never charge it.
- Do not short-circuit it.
- Do not disassemble, transform, or modify it.
- Do not heat it or throw it into a fire.
- Do not soak it in fresh water or seawater.

### CAUTION

Observe the following precautions for the safe disposal of batteries.

- Do not incinerate the battery, and do not expose it to a high temperature of 100°C or more. This may lead to fluid leakage or explosion.
- Dispose of the battery according to laws and regulations.

Use the following dedicated parts for the battery pack and batteries.

**■ Battery Pack**

Part number: F9090FD *1 (with batteries)
Part number: F9090GD *2 (without batteries)

*1: If you need F9090FC, please purchase F9090FD. F9090FD is a set of F9090FC and instruction manual.
*2: If you need F9090GC, please purchase F9090GD. F9090GD is a set of F9090GC and instruction manual.

**■ Batteries**

Part number: F9915NR
Alternatively, following batteries may be purchased and used.

- Tadiran TL-5930/S or SL-2780/S
- VITZROCELL SB-D02

### CAUTION

When replacing the batteries, be sure to replace the two batteries at the same time and do not use an old and a new battery together. The type of the two batteries should be the same.

**Transportation of products containing lithium batteries**

Batteries used for this product contain lithium. Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), and the European Ground Transportation of Dangerous Goods (ARD). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping. When transporting this product with the battery pack inserted, keep it in deep sleep mode in order to conserve battery power. For details on how to switch to deep sleep mode, refer to subsection 7.3.9 “Switching to Deep Sleep Mode”.

**Procedure to replace and dispose of the batteries of the product**

Below an explanation about the new EU Battery Directive (DIRECTIVE 2006/66/EC). This directive is only valid in the EU.
Batteries are used for this product. When you remove batteries from this product and dispose them, discard them in accordance with domestic law concerning disposal.
Take a right action on waste batteries, because the collection systems in the EU on waste batteries are regulated.
Battery type: Primary lithium-thionyl chloride battery
Crossed-out dustbin symbol



**NOTE**

The symbol (see above), which is marked on the batteries, means they shall be sorted out and collected as ordained in ANNEXII in DIRECTIVE 2006/66/EC.

**Procedure to remove the batteries safely**
Refer to subsection 8.3 “Replacing the Battery Pack” and subsection 8.4 “Replacing the Batteries”.

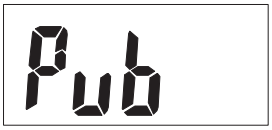
## 8.6 Switching LCD Display

The process value and the wireless communication status are displayed on the LCD by touching a magnet to the magnet switch1. The contents of the display changes as follows every two seconds.

1. Wireless Communication Status. See Table 8.2.
2. Object Name (AI1)
3. Process Value of AI1 block
4. Object Name (AI2)
5. Process Value of AI2 block
6. Object Name (AI3)
7. Process Value of AI3 block
8. Object Name (AI4)
9. Process Value of AI4 block
10. Tag No. (If specified when ordering)

After display, return to normal display contents.

**Table 8.2 Wireless Status**

| Integral Indicator | Description |
|---|---|
|  F0806.ai | Searching for Backbone Router or Router to connect. It is not connected to the field wireless network. |
|  F0807.ai | Discovering the connection destination, and is doing the Join process. It is not connected to the field wireless network. |
|  F0808.ai | Complete the Join process and is doing the Publish settings. |
|  F0809.ai | The publish setting is complete and has been sent the PV value to the field wireless network. |
|  F0810.ai | Silence Mode. For more information about silence mode, refer to subsection 7.3.10 “Switching to the Silence Mode”. |

## 8.7 Replacing the FN110

This subsection describes the procedure for replacing the FN110. Replace the FN110 as follows.

1. Back up the configuration of the FN310.
2. Remove the battery pack.
3. Remove the FN110, and install a new FN110.
4. Remounting the battery pack.
5. Restore the backed up configuration of the FN310.
6. Performing provisioning work.
7. Update the configuration of field wireless gateway.

To back up the configuration, use the device configuration tool, such as FieldMate.
Performing provisioning work is necessary when replacing the FN110. Update the configuration information of the target device by using field wireless configuration tool. For details of provisioning, refer to subsection 6.3 “Connecting to the Field Wireless Network”.

## 8.8 Replacing the FN310

This subsection describes the procedure for replacing the FN310. Replace the FN310 as follows.

One-to-one Connection

1. Back up the configuration of the FN310.
2. Remove the battery pack.
3. Remove the FN110 and the HART device, and install them to the new FN310.
4. Remounting the battery pack.
5. Restore the backed up configuration of the FN310.

4-20mA Loop Connection

1. Back up the configuration of the FN310.
2. Switch off the power supplies of the 4-20 mA loop.
3. Remove the battery pack.
4. Remove the FN310 from the 4-20 mA loop and remove the FN110.
5. Install FN110 to the new FN310 and connect FN310 to the 4-20 mA loop.
6. Supply power to the 4-20 mA loop.
7. Remounting the battery pack.
8. Restore the backed up configuration of the FN310.

## 8.9 Replacing the HART Device

This subsection describes the procedure for replacing the HART device.
Replace the HART device as follows.
One-to-one Connection

1. Remove the battery pack.
2. Disconnect the HART device from the FN310.
3. Connect the new HART device to the FN310. If necessary, configure the HART device before installing.
4. Remounting the battery pack.

4-20 mA Loop Connection

1. Switch off the power supplies of the 4-20 mA loop.
2. Remove the battery pack.
3. Replace the HART device. If necessary, configure the HART device before installing.
4. Supply power to the 4-20 mA loop.
5. Remounting the battery pack.

When replacing the HART device to different models, configure the new HART device to the FN310. For details about the settings, refer to subsection 6.1 “Preparation for Starting Operation”.

## 8.10 Troubleshooting

If any abnormality appears in the measured values, use the troubleshooting flow chart below to isolate and resolve the problem. Since some problems have complex causes, these flow charts may not identify all. If you have difficulty isolating or correcting a problem, contact Yokogawa service personnel.

### 8.10.1 Basic Troubleshooting Flow

First determine whether the process variable is actually abnormal or a problem exists in the measurement system. If the problem is in the measurement system, isolate the problem and decide what corrective action to take.
FN310 is equipped with a self-diagnostic function which will be useful in troubleshooting, and this product is equipped with an integral indicator and it will show an alarm code as a result of self-diagnosis.
See subsection 8.10.3 “Errors and Countermeasures” for the list of alarms.

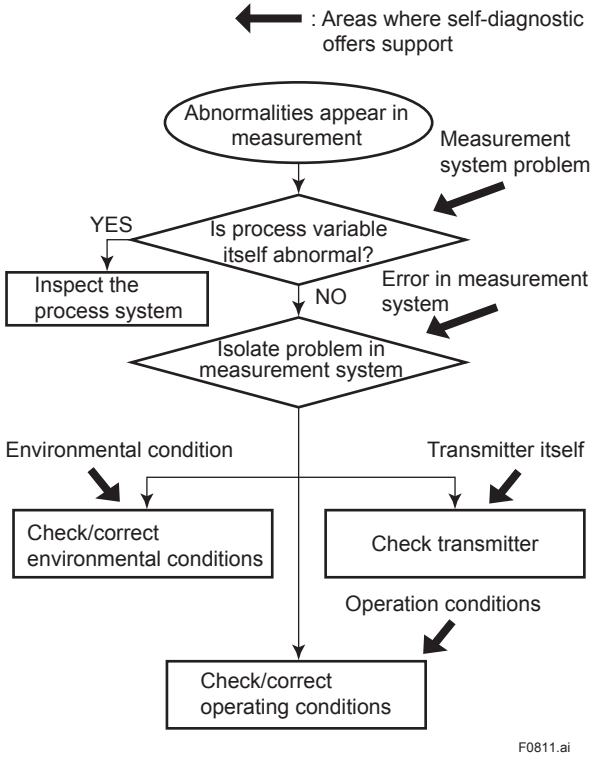



**Figure 8.5 Basic Troubleshooting Flow**

### 8.10.2 Example of Troubleshooting Flow

The following shows an example of the flow for troubleshooting.
Refer to this example and Table 8.3. Locate the problem and take the corresponding countermeasure.

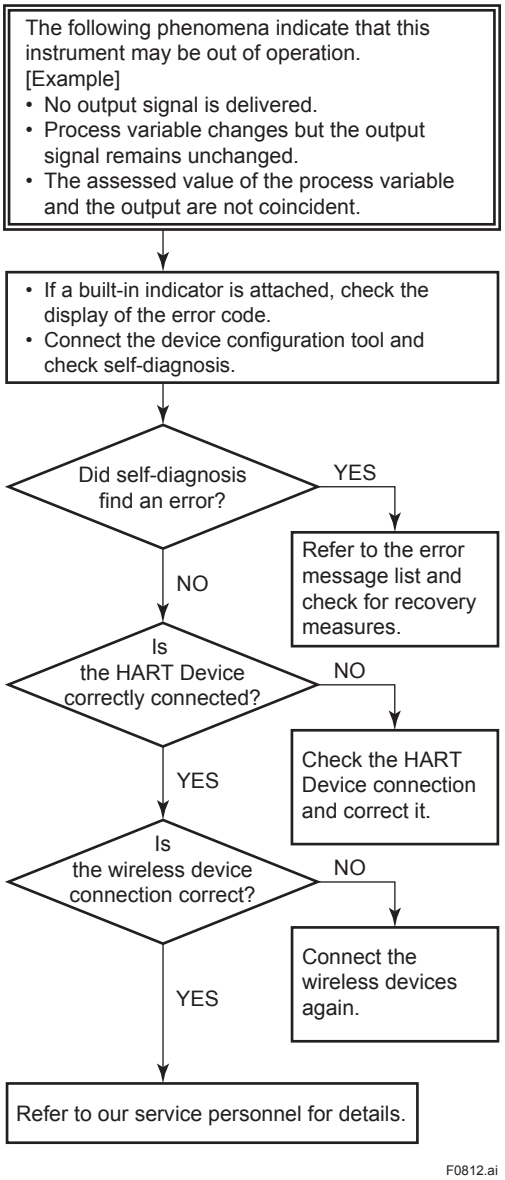



**Figure 8.6 Example of Troubleshooting Flow**

**Table 8.3 Cause and Countermeasure**

| Observed Problems | Possible Cause | Countermeasure | Related Parameter |
|---|---|---|---|
| Outputs fixed current. | The simulation function is set to ON. | Set the simulation function to OFF. | • Simulate Switch |
| Parameters cannot be changed. | This product is in write protect status. | Release write protect. | • UAP Option<br>• Hardware Write Protect |

## 8.10.3 Errors and Countermeasures

**Table 8.4 Error Message Summary**

| Integral indicator | NAMUR NE107 category *1 | Bit | Diagnostic Status | Diagnostic Status Detail | Cause | Release/ recovery conditions (except restart) *2 | Output Operation | Action |
|---|---|---|---|---|---|---|---|---|
| AL.01 *3 | F | 27 | Faults in electronics | ADAPTER FAIL | FN310 failure | None | Output value: Hold previous value Output status: BAD Device Failure | Contact Yokogawa service personnel. |
| AL.02 *3 | | | | ANTENNA FAIL | FN110failure | None | | Contact Yokogawa service personnel. |
| AL.03 *3 | | | | INTERNAL BUS FAIL | Communication failure between FN110 and FN310 | None | --- | Contact Yokogawa service personnel. |
| AL.10 | F | 26 | Faults in sensor or actuator element | SENSOR FAIL | Disconnection or communication error, between the HART device and FN310 | None | Output value: Hold previous value Output status: BAD Sensor Failure | Check the installation environment of HART devise and connecting method of HART devices and FN310. |
| AL.20 | M | 20 | Power is critical low: maintenance need short-term | CRITICAL LOWBAT | Low remaining battery voltage | None | Normal action | Replace the batteries. |
| | | 19 | Power is low: maintenance need mid-term | LOWBAT ALM | Low remaining battery voltage | None | Normal action | Replace the batteries. |
| AL.45 | O | 22 | Environmental conditions out of device specification | ADAPTER TEMP HI | FN310 temperature is above +85°C | Recovers when the temperature returns to +85°C below | Normal action | Check the ambient temperature of the FN310 |
| | | | | ADAPTER TEMP LO | FN310 temperature is below -40°C | Recovers when the temperature returns to -40°C or more | Normal action | Check the ambient temperature of the FN310 |
| | | | | ANTENNA TEMP HI | FN110 temperature is above +85°C | Recovers when the temperature returns to +85°C below | Normal action | Check the ambient temperature of the FN110 |
| | | | | ANTENNA TEMP LO | FN110 temperature is below -40°C | Recovers when the temperature returns to -40°C or more | Normal action | Check the ambient temperature of the FN110 |

| Integral indicator | NAMUR NE107 category *1 | Bit | Diagnostic Status | Diagnostic Status Detail | Cause | Release/ recovery conditions (except restart) *2 | Output Operation | Action |
|---|---|---|---|---|---|---|---|---|
| AL.50 | C | 25 | Installation, calibration problem | DEVICE CONNECTION ERR | Connection error between the HART device and FN310 | None | Output value: Hold previous value Output status: BAD Configuration Err | • Check the power consumption of the start-up of the HART device is 21mA or less<br>• Check the HART device's Polling Address is 1<br>• Check the wiring between the HART device and FN310 |
| AL51 | | | | DEVICE ADDRESS ERR | Address error of HART device that is connected to the FN310 | None | Output value: Hold previous value Output status: BAD Configuration Err | • Change the Polling Address of HART device connected to the FN310. After changing, restart the FN310<br>• Check the wiring between the HART device and FN310 |
| AL.52 | | | | BURST MODE | Detect a Burst Mode of HART device that is connected to the FN310 | None | Output value: Hold previous value Output status: BAD Configuration Err | Change to disable the Burst Mode of HART device connected to the FN310. After setting, restart the FN310 |
| AL.53 | | | | BOOT TIME ERR | Boot Time setting error of HART device that is connected to the FN310 | None | Output value: Hold previous value Output status: BAD Configuration Err | Change to an appropriate value of IFO. Boot Strap Time. After setting, restart the FN310 |

| Integral indicator | NAMUR NE107 category *1 | Bit | Diagnostic Status | Diagnostic Status Detail | Cause | Release/ recovery conditions (except restart) *2 | Output Operation | Action |
|---|---|---|---|---|---|---|---|---|
| AL.60 | C | 24 | Out of service | AI1 OUT OF SERVICE | AI1 block is O/S mode | Recover when the mode target of alert block is other than O/S | Output value: Hold previous value Output status: BAD Configuration Err | Check the AI1 block setting |
| | | | | AI2 OUT OF SERVICE | AI2 block is O/S mode | | | A Check the AI2 block setting |
| | | | | AI3 OUT OF SERVICE | AI3 block is O/S mode | | | Check the AI3 block setting |
| | | | | AI4 OUT OF SERVICE | AI4 block is O/S mode | | | Check the AI4 block setting |
| AL.61 | C | 17 | Simulation is active | AI1 SIMULATION ACTIVE | Simulate Switch of AI1 block is enabled | Recover when the Simulate Switch of target block is set to disable | Output Simulate Value of AI1 block | Check the AI1 block setting |
| | | | | AI2 SIMULATION ACTIVE | Simulate Switch of AI2 block is enabled | | Output Simulate Value of AI2 block | Check the AI2 block setting |
| | | | | AI3 SIMULATION ACTIVE | Simulate Switch of AI3 block is enabled | | Output Simulate Value of AI3 block | Check the AI3 block setting |
| | | | | AI4 SIMULATION ACTIVE | Simulate Switch of AI4 block is enabled | | Output Simulate Value of AI4 block | Check the AI4 block setting |
| AL.80 | F | 8 | Connected device Failure | HART DEVICE MALFUCTIONED | Detect HART Status Device Malfunctioned *4 | Check the status of the HART device, and take measures according to the manual | Output value: Normal Output status: BAD non-specific | Check the setting of the HART device connected to the FN310 |
| AL.81 | C | 7 | Connected device Function Check | HART DEVICE CONFIGURATION CHANGED | Detect HART Status Configuration Changed*4 | Reset the Configuration changed flag of the HART device | Normal action | Check the setting of the HART device connected to the FN310 |
| AL.82 | | | | HART DEVICE COLD START | Detect HART Status Cold Start*4 | Check the status of the HART device, and take measures according to the manual | Normal action | Check the setting of the HART device connected to the FN310 |
| AL.83 | | | | HART DEVICE MORE STATUS AVAILABLE | Detect HART Status More Status Available*4 | | Normal action | Check the setting of the HART device connected to the FN310 |
| AL.84 | | | | HART DEVICE LOOP CURRENT FIXED | Detect HART Status Loop Current Fixed*4 | | Output value: Normal Output status: Uncertain substituted or manual Entry | Check the setting of FN310 |

| Integral indicator | NAMUR NE107 category *1 | Bit | Diagnostic Status | Diagnostic Status Detail | Cause | Release/ recovery conditions (except restart) *2 | Output Operation | Action |
|---|---|---|---|---|---|---|---|---|
| AL.85 | O | 6 | Connected device Out of Specification | HART DEVICE LOOP CURRENT SATURATED | Detect HART Status Loop Current Saturated*4 | Check the status of the HART device, and take measures according to the manual | Output value: Normal Output status: BAD non-specific | Check the setting of the HART device connected to the FN310 |
| AL.86 | | | | HART NON PRIMARY VARIABLE OUT OF LIMIT | Detect HART Status Non Primary Variable out of limits*4 | | Output value: Normal Output status: Uncertain range limits exceeded | Check the setting of the HART device connected to the FN310 |
| AL.87 | | | | HART DEVICE PRIMARY VARIABLE OUT OF LIMIT | Detect HART Status Primary Variable out of limits*4 | | Output value: Normal Output status: Uncertain range limits exceeded | Check the setting of the HART device connected to the FN310 |

*1: “NAMUR NE107 category” refers to the four categories (C: Function check, M: Maintenance required, F: Failure, and O: Out of specification) according to NAMUR NE107 “Self-Monitoring and Diagnosis of Field Devices”.
*2: Except for the restart
*3: When the device detects “AL.01”, “AL.02”, and “AL.03”, integral indicator displays regardless of the LCD Mode.
*4: The device status that is obtained from the HART device connected.

# 9. Parameter Summary

**Table 9.1 Parameter Summary**

<table>
<tr><th>Object ID</th><th>Attribute ID</th><th>Label</th><th>Description</th><th>Default value</th><th>Handling *1</th></tr>
<tr><td rowspan="10">1. UAPMO block</td><td>1</td><td>Version Revision</td><td>Indicates the application revision of FN310. This revision changes when the application software is downloaded.</td><td>---</td><td>R</td></tr>
<tr><td>10</td><td>Static Revision</td><td>Indicates the revision level of the fixed parameters of UAP. Used, for example, to check whether parameters have been changed. This attribute is updated when information of HART devices is obtained.</td><td>---</td><td>R</td></tr>
<tr><td>64</td><td>Identification Number</td><td>Indicates the vendor ID, model ID, and revision of the device.</td><td>---</td><td>R</td></tr>
<tr><td>65</td><td>CTS Version</td><td>Indicates the version of the communication stack test system (CTS).</td><td>0</td><td>R</td></tr>
<tr><td>66</td><td>ITS Version</td><td>Indicates the version of the interoperability test system (ITS).</td><td>0</td><td>R</td></tr>
<tr><td>67</td><td>Diagnostic Status</td><td>Indicates the diagnostic results of the device based on the NAMUR NE107 *2 model.<br>Setting Enable diagnostic status configuration in UAP Option to Enable allows turning OFF and ON the display of the diagnostic results for each summary, and changing Categorize.</td><td>---</td><td>R</td></tr>
<tr><td>68</td><td>UAP Option</td><td>Allows setting the Diagnostic Status and write protection of UAP.<br>1. Software write protect<br>1: On, 0: Off (default)<br>2. Enable hardware write protect<br>1: Enable, 0: Disable (default)<br>3. Enable diagnostic status configuration<br>1: Enable, 0: Disable (default)<br>The following table shows the relationship between the hardware write protection and software write protection.
<table>
<tr><th>Enable hardware write protect</th><th>Hardware write protect</th><th>Software write protect</th><th>Write protect</th></tr>
<tr><td>Disable</td><td>Off or On</td><td>Off</td><td>No</td></tr>
<tr><td>Disable</td><td>Off or On</td><td>On</td><td>Protected</td></tr>
<tr><td>Enable</td><td>Off</td><td>Off or On</td><td>No</td></tr>
<tr><td>Enable</td><td>On</td><td>Off or On</td><td>Protected</td></tr>
</table></td><td>1. Off<br>2. Disable<br>3. Disable</td><td>W(P)</td></tr>
<tr><td>69</td><td>Diagnostic Switch</td><td>Allows setting On/Off for each summary of Diagnostic Status when Enable diagnostic status configuration in UAP Option is set to Enable.</td><td>On</td><td>W(P)</td></tr>
<tr><td>70</td><td>Diagnostic Configuration</td><td>Allows Categorize for each summary of Diagnostic Status when Enable diagnostic status configuration in UAP Option is set to Enable.<br>0x08: F:Failure status<br>0x04: C:Function check status<br>0x02: O:Out of specification status<br>0x01: M:Maintenance required status</td><td>Refer to Table 9.2.</td><td>W(P)</td></tr>
<tr><td>71</td><td>Find Device</td><td>When set a value other than 0, FN310 displays “Squ.” on the LCD. The value means the display duration. After displaying, this value returns to 0.<br>Unit: second<br>Range: 0 to 60</td><td>0</td><td>W</td></tr>
</table>

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 1. UAPMO block (continued) | 102 | Diagnostic Status Detail | Detailed information on Diagnostic Status. | Refer to Table 9.2 | W |
| | 103 | Energy Left | Indicates the number of days of remaining battery life assuming ambient temperature condition as 23 degrees Celsius.<br>Unit: day | --- | R |
| | 104 | Reset Energy Left | Resets the remaining battery power calculation to restore it to a remaining battery power calculation which is based on new batteries.<br>0: Continue<br>1: Reset | 0 (reading value is always 0) | W(P) |
| | 105 | Power Supply Status | Indicates remaining battery life and power supply of device.<br>0: line powered<br>1: battery powered, greater than 75% remaining capacity<br>2: battery powered, between 25% and 75% remaining capacity<br>3: battery powered, less than 25% remaining capacity | --- | R |
| | 106 | Energy Harvest Type | Available to write note into this parameter. | --- | W(P) |
| | 107 | Power Supply Voltage | Indicates the measured power supply voltage (V). | --- | R |
| | 110 | Hardware Write Protect | Indicates the status of the hardware write protection switch.<br>0: Off<br>1: On | --- | R |
| | 111 | Antenna Temperature | Indicates the temperature of the FN110. | --- | R |
| | 112 | Adapter Temperature | Indicates the temperature of the FN310. | --- | R |
| | 113 | Temperature Unit | Selects the temperature unit to be indicated on Antenna Temperature and Adapter Temperature.<br>1000: K<br>1001: °C (default)<br>1002: °F<br>1003: °R | °C | W(P) |
| | 131 | Connected Device Maintenance Alert | The On/Off or priority for Connected Device Maintenance Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 132 | Connected Device Function Check Alert | The On/Off or priority for Connected Device Function Check Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 133 | Connected Device Out Of Specification Alert | The On/Off or priority for Connected Device Out Of Specification Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 134 | Connected Device Failure Alert | The On/Off or priority for Connected Device Failure Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 1. UAPMO block (continued) | 135 | Other Faults Alert | The On/Off or priority for Other Faults Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 136 | Faults Non-compliance Alert | The On/Off or priority for Faults Non-compliance Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 137 | Faults Process Influence Alert | The On/Off or priority for Faults Process Influence Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 138 | Simulation Active Alert | The On/Off or priority for Simulation Active Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 139 | Soft Update Incomplete Alert | The On/Off or priority for Soft Update Incomplete Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 140 | Power Low Alert | The On/Off or priority for Power Low Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 141 | Power Critical Low Alert | The On/Off or priority for Power Critical Low Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 142 | Fault Prediction Alert | The On/Off or priority for Fault Prediction Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 143 | Environmental Conditions Alert | The On/Off or priority for Environmental Conditions Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 144 | Outside Sensor Limits Alert | The On/Off or priority for Outside Sensor Limits Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 145 | Out of Service Alert | The On/Off or priority for Out of Service Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 146 | Calibration Problem Alert | The On/Off or priority for Calibration Problem Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 1. UAPMO block (continued) | 147 | Faults Sensor or Actuator Alert | The On/Off or priority for Faults Sensor or Actuator Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| | 148 | Faults Electronics Alert | The On/Off or priority for Faults Electronics Alert can be set.<br>1. On/Off setting<br>0: On, 255: Off (default)<br>2. Alert report priority: 0 to 15 (default: 15) | 1. Off<br>2. 15 | W(P) |
| 2. UDO block | 2 | DESCRIPTION | Indicates the version and model information of the downloaded data. | --- | R |
| | 3 | STATE | Indicates the status of UAP block.<br>0: Idle<br>1: Downloading<br>3: Applying<br>4: DL Complete<br>6: DL Error | --- | R |
| | 5 | MAX_BLOCK_SIZE | Maximum block size. This value is smaller than the maximum data size of APDU. | --- | R |
| | 14 | LAST_BLOCK_DOWNLOADED | Indicates the last downloaded block number. 0 means that no block has been downloaded. | --- | R |
| | 16 | ERROR_CODE | Indicates the error codes for DL Error.<br>0: no Error<br>1: Timeout<br>2: Client Abort<br>64: Apply failure | --- | R |
| 3. CO block | 1 | REVISION | Indicates the revision number such as COMM_ENDPOINT, etc. | --- | R |
| | 2 | COMM_ENDPOINT | Indicates the Endpoint information. The following shows the components.<br>1. Network address of remote endpoint<br>2. Transport layer port at remote endpoint<br>3. Object ID at remote endpoint<br>4. Stale data limit<br>5. Data publication period<br>6. Ideal publication phase<br>7. Publish Auto Retransmit<br>8. Configuration status | --- | W |
| | 3 | COMM_CONTRACT | Indicates the Contract information. The following shows the components.<br>1. ContractID<br>2. Contract_Status<br>3. Actual_Phase | --- | R |
| | 4 | PUB_ITEM_MAX | Maximum PUB_ITEM value. | --- | R |
| | 5 | PUB_ITEM_NUM | PUB_ITEM number. | --- | R |
| | 6 | PUB_ITEM | Indicates the PUB_ITEM information. The following shows the components.<br>1. ObjectID<br>2. AttributeID<br>3. AttributeIndex<br>4. Size | --- | W |

<table>
<tr><th>Object ID</th><th>Attribute ID</th><th>Label</th><th>Description</th><th>Default value</th><th>Handling *1</th></tr>
<tr><td rowspan="11">4.<br>TRANSDUCER block</td><td>1</td><td>Tag Description</td><td>Memo field available to write anything.</td><td>Transducer</td><td>W(P)</td></tr>
<tr><td>2</td><td>Model</td><td>Indicates the model name of the FN310.</td><td>---</td><td>R</td></tr>
<tr><td>3</td><td>Serial Number</td><td>Indicates the serial number of the FN310.</td><td>---</td><td>R</td></tr>
<tr><td>4</td><td>Display Selection</td><td>Select PV Value displaying on the integral indicator.<br>0: AI1 (default)<br>1: AI2<br>2: AI3<br>3: AI4</td><td>AI1</td><td>W(P)</td></tr>
<tr><td>5</td><td>LCD Intermittent Time</td><td>Select the off time of the integral indicator.<br>0: Continuous mode<br>1: Intermittent mode<br>(off: 5 seconds, display: 2 seconds)<br>2: Intermittent mode<br>(off: 10 seconds, display: 2 seconds)<br>3: Intermittent mode<br>(off: 30 seconds, display: 2 seconds)<br>4: Intermittent mode (default)<br>(off: 60 seconds, display: 2 seconds)<br>5: Off mode</td><td>Intermittent mode (off: 60 seconds, display: 2 seconds)</td><td>W(P)</td></tr>
<tr><td>6</td><td>LCD Exp Mode</td><td>Select the notation of the integral indicator.<br>0: radix notation (default)<br>1: exponential notation</td><td>radix notation</td><td>W(P)</td></tr>
<tr><td>7</td><td>Wireless Status</td><td>Indicates the wireless communication status.
<table>
<tr><th>Bits</th><th>Contents</th><th>Value</th></tr>
<tr><td>Bit7-3</td><td>reserved</td><td>---</td></tr>
<tr><td>Bit2</td><td>Contract status (Client/Server)</td><td>0: Not established<br>1: Established</td></tr>
<tr><td>Bit1</td><td>Contract status (Publish)</td><td>0: Not established<br>1: Established</td></tr>
<tr><td>Bit0</td><td>Join status</td><td>0: Idle<br>1: Joined</td></tr>
</table></td><td>---</td><td>R</td></tr>
<tr><td>8</td><td>Measurement Rate</td><td>Indicates the publish period.<br>Unit: second</td><td>---</td><td>R</td></tr>
<tr><td>10</td><td>Special Cmd</td><td>Special function parameter.<br>0: Normal mode (default)<br>1: Deep-sleep mode</td><td>Normal mode</td><td>W</td></tr>
<tr><td>11</td><td>Sensor Type</td><td>Select the type of sensor to be connected to the FN310.<br>0: HART device (default)<br>1: Not Used</td><td>HART device</td><td>W(P)</td></tr>
<tr><td rowspan="4">8.<br>IFO block</td><td>64</td><td>Unique ID</td><td>Indicates the long address of HART device connected to the FN310. 0 means that no HART device is connected.</td><td>0</td><td>R</td></tr>
<tr><td>65</td><td>Long Tag Name</td><td>Indicates the Long Tag Name fields contained in the HART command 20 response. This is converted according to the Table 7.2.</td><td>---</td><td>R</td></tr>
<tr><td>66</td><td>Tag Name</td><td>Indicates the Tag Name fields contained in the HART command 13 response. This is converted according to the Table 7.2.</td><td>---</td><td>R</td></tr>
<tr><td>67</td><td>Description</td><td>Indicates the Device Description fields contained in the HART command 13 response. This is converted according to the Table 7.2.</td><td>---</td><td>R</td></tr>
</table>

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 8. IFO block (continued) | 68 | Date Code | Indicates the Date Code fields contained in the HART command 13 response.<br>Format: ddmmyy<br>dd: Day (Hexadecimal, 2 digit)<br>mm: Month (Hexadecimal, 2 digit)<br>yy: Year (Hexadecimal, 2 digit minus 1900) | 0 | R |
| | 69 | Transmitter Status | Indicates the Transmitter Status fields contained in the HART command 3 response by mapping to the Bit. Bit definitions are as following.<br>0: Primary Variable out of limits<br>1: Non Primary Variable out of limits<br>2: Loop Current Saturated<br>3: Loop Current Fixed<br>4: More Status Available<br>5: Cold Start<br>6: Configuration Changed<br>7: Device Malfunctioned | 0x00 | R |
| | 70 | Transmitter mA | Indicates the Transmitter mA fields contained in the HART Command 3 response. | 0.0 | R |
| | 71 | Primary Value | Indicates the Primary Variable fields contained in the HART Command 3 response. | 0.0 | R |
| | 72 | Primary Value Units | Indicates the Primary Variable Units fields contained in the HART Command 3 response. | 0 | R |
| | 73 | Secondary Value | Indicates the Secondary Variable fields contained in the HART Command 3 response. | 0.0 | R |
| | 74 | Secondary Value Units | Indicates the Secondary Variable Units fields contained in the HART Command 3 response. | 0 | R |
| | 75 | Tertiary Value | Indicates the Tertiary Variable fields contained in the HART Command 3 response. | 0.0 | R |
| | 76 | Tertiary Value Units | Indicates the Tertiary Variable Units fields contained in the HART Command 3 response. | 0 | R |
| | 77 | Quaternary Value | Indicates the Quaternary Variable fields contained in the HART Command 3 response. | 0.0 | R |
| | 78 | Quaternary Value Units | Indicates the Quaternary Variable Units fields contained in the HART Command 3 response. | 0 | R |
| | 79 | Polling Address | Indicates the Polling Address of the HART device. | 0 | R |
| | 100 | Manufacturer Code | Indicates the Manufacturer Code fields contained in the HART Command 0 response. | 0 | R |
| | 101 | Device Type | Indicates the Device Tag fields contained in the HART Command 0 response. | 0 | R |
| | 102 | HART Revision | Indicates the HART Revision fields contained in the HART Command 0 response. | 0 | R |
| | 103 | Device Revision | Indicates the Device Revision fields contained in the HART Command 0 response. | 0 | R |
| | 104 | Software Revision | Indicates the Software Revision fields contained in the HART Command 0 response. | 0 | R |
| | 105 | Hardware Revision | Indicates the Hardware Revision fields contained in the HART Command 0 response. | 0 | R |
| | 107 | PV Alarm Select | Indicates the PV Alarm Selection fields contained in the HART Command 15. | 0 | R |
| | 108 | PV Transfer Function | Indicates the PV Transfer Function fields contained in the HART Command 15. | 0 | R |
| | 109 | PV Range Units | Indicates the PV Range Units fields contained in the HART Command 15. | 0 | R |
| | 110 | PV Upper Range | Indicates the PV Upper Range fields contained in the HART Command 15. | 0 | R |
| | 111 | PV Lower Range | Indicates the PV Lower Range fields contained in the HART Command 15. | 0 | R |

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 8. IFO block (continued) | 112 | PV Damping | Indicates the PV Damping in seconds fields contained in the HART Command 15. | 0 | R |
| | 113 | PV Flags | Indicates the PV Flags fields contained in the HART Command 15. | 0 | R |
| | 114 | Write Protect | Indicates the Write Protection Flag fields contained in the HART Command 15. | 0 | R |
| | 115 | Distributor Code | Indicates the Private Label Distributor Code fields contained in the HART Command 0 response. | 0 | R |
| | 117 | Transmitter Status Alert Mask | The device status to detect when Transmitter Status has changed can be set. When enabled, it sends an Alert when it detects the state of the target. It is disabled by setting the Bit each of the following.<br>Bit7: Device Malfunction<br>Bit6: Configuration Changed<br>Bit5: Cold Start<br>Bit4: More Status Available<br>Bit3: Loop Current Fixed<br>Bit2: Loop Current Saturated<br>Bit1: Non-Primary Variable Out of Limits<br>Bit0: Primary Variable Out of Limits | 0x28 | W(P) |
| | 118 | Transmitter Message | Indicates the Message fields contained in the HART command 12 response. This is converted according to the Table 7.2. | --- | R |
| | 128 | Power Source | Select the method of supplying power to the HART device.<br>0: Battery (default)<br>1: Line Powered | Battery | W(P) |
| | 129 | Boot Strap Time | Set the time until the HART device can acquire the process value stable after starts up. When the Boot Strap Time is longer than the Publish period, in order to supply continuous power to the HART device, battery life will be shorter.<br>Unit: second<br>Range: 1 to 3500 | 5 | W(P) |
| | 130 | Configuration Saving Time | Set the time until the HART device save the setting after change settings.<br>Unit: second<br>Range: 0 to 300 | 30 | W(P) |
| | 141 | HART Master Mode | Select the Master Mode of FN310<br>1: Primary (default)<br>0: Secondary | Primary | W(P) |
| | 142 | HART Preamble | Set the number of the Preamble to be added to the top of the HART frame when starting to transmit the HART Command by FN310.<br>Range: 0 to 20 | 5 | W(P) |
| | 143 | HART Retry Count | Indicates the integrated value of the number of retries when HART communication error has occurred. | 3 | R |

| Object ID | Attribute ID | Label | Description | Default value | Handling *1 |
|---|---|---|---|---|---|
| 20. AI1 block 21. AI2 block 22. AI3 block 23. AI4 block | 1 | Process Value | AI1, AI2, AI3, and AI4 are output object.<br>1. Value: output value of the object.<br>2. Status: indicates the status of the object's output value. | 1. ---<br>2. --- | R |
| | 2 | Block Mode | Select the block's operation status. O/S and Auto can be selected.<br>1. Target: Specify object mode of the object.<br>2. Actual: Indicates current mode of the object.<br>3. Permitted: Indicates the mode selected by Target of the object.<br>4. Normal: Indicate normal status mode of the object. | 1.Auto<br>2. Auto<br>3. Auto<br>4. Auto | W(P) |
| | 3 | Concentrator OID | Indicates the Concentrator object value that corresponds to the data update of the PV value. | --- | R |
| | 4 | Scale | Allows specifying the upper or lower limit for the PV scaling, unit code, etc.<br>1. EU at 100%: Indicate the upper limit of the PV value<br>2. EU at 0%: Indicate the lower limit of the PV value<br>3. Units Index: Indicate the setting unit used for the PV value<br>4. Decimal: Indicate the digit number below the decimal point displayed in the integral indicator | 1. 100<br>2. 0<br>3. %<br>4. 2 | W(P) |
| | 102 | Tag Description | A universal parameter to store the comment that describes the tag. | AI1: AI1<br>AI2: AI2<br>AI3: AI3<br>AI4: AI4 | W(P) |
| | 103 | Simulate Switch | A simulation function switch for the object.<br>1: Disable (default)<br>2: Enable | Disable | W(P) |
| | 104 | Simulate Value | When Simulate Switch is set to Enable, this value is used as the input value for the object. The input value can be changed. | 0 | W(P) |
| | 106 | PV Energy Left Enable | Allows assign the Energy Left to AI1.PV.Value when Sensor Type in TRANSDUCER block is set to "no sensor".<br>0: Disable (default)<br>1: Enable | Disable | W(P) |

*1: R: Read only, W: Read and Write, (P): Target of the write protection
*2: NAMUR NE 107 "Self-Monitoring and Diagnosis of Field Devices"

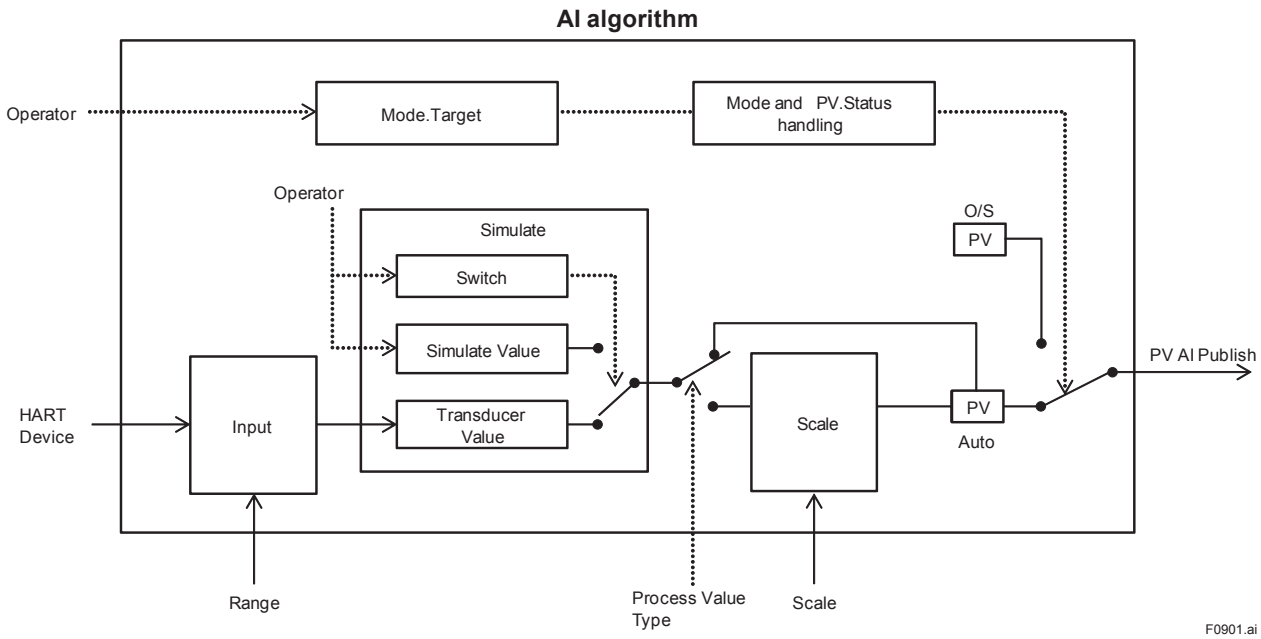



**Figure 9.1 Example Schema of Analog Input Object**

**Table 9.2 Diagnostic Status Detail**

| Bit | Diagnostic Status Detail | Description | Diagnostic status assignment bit | NAMUR NE107 Category * |
|---|---|---|---|---|
| Diagnostic Status Detail.1 | | | | |
| 31 | ADAPTER FAIL | FN310 failure | Bit27 | F |
| 30 | ANTENNA FAIL | FN110 failure | Bit27 | F |
| 28 | INTERNAL BUS FAIL | Communication failure between FN110 and FN310 | Bit27 | F |
| 27 | SENSOR FAIL | Disconnection or communication error, between the HART device and FN310 | Bit26 | F |
| 15 | DEVICE CONNECTION ERR | Connection error between the HART device and FN310 | Bit25 | C |
| 14 | DEVICE ADDRESS ERR | Address error of the HART device | Bit25 | C |
| 13 | BURST MODE | Detect a Burst Mode of the HART device | Bit25 | C |
| 12 | BOOT TIME ERR | Boot Time setting error of the HART device | Bit25 | C |
| 9 | LOWBAT_ALM | Low remaining battery voltage | Bit19 | M |
| 8 | CRITICAL LOWBAT | Low remaining battery voltage | Bit20 | M |
| 7 | ADAPTER TEMP HI | FN310 temperature is above +85°C | Bit22 | O |
| 6 | ADAPTER TEMP LO | FN310 temperature is below -40°C | Bit22 | O |
| 5 | ANTENNA TEMP HI | FN110 temperature is above +85°C | Bit22 | O |
| 4 | ANTENNA TEMP LO | FN310 temperature is below -40°C | Bit22 | O |
| Diagnostic Status Detail.2 | | | | |
| 31 | AI1 OUT OF SERVICE | AI1 O/S Mode | Bit24 | C |
| 30 | AI2 OUT OF SERVICE | AI2 O/S Mode | Bit24 | C |
| 29 | AI3 OUT OF SERVICE | AI3 O/S Mode | Bit24 | C |
| 28 | AI4 OUT OF SERVICE | AI4 O/S Mode | Bit24 | C |
| 15 | AI1 SIMULATION ACTIVE | AI1 Simulate Mode | Bit17 | C |
| 14 | AI2 SIMULATION ACTIVE | AI2 Simulate Mode | Bit17 | C |
| 13 | AI3 SIMULATION ACTIVE | AI3 Simulate Mode | Bit17 | C |
| 12 | AI4 SIMULATION ACTIVE | AI4 Simulate Mode | Bit17 | C |
| Diagnostic Status Detail.3 | | | | |
| 31 | HART DEVICE MALFUNCTIONED | Detect HART Status Device Malfunctioned | Bit8 | F |
| 30 | HART DEVICE CONFIGURATION CHANGED | Detect HART Status Configuration Changed | Bit7 | C |
| 29 | HART DEVICE COLD START | Detect HART Status Cold Start | Bit7 | C |
| 28 | HART DEVICE MORE STATUS AVAILABLE | Detect HART Status More Status Available | Bit7 | C |
| 27 | HART DEVICE LOOP CURRENT FIXED | Detect HART Status Loop Current Fixed | Bit7 | C |
| 26 | HART DEVICE LOOP CURRENT SATURATED | Detect HART Status Loop Current Saturated | Bit6 | O |
| 25 | HART DEVICE NON PRIMARY VARIABLE OOL | Detect HART Status Non Primary Variable out of limits | Bit6 | O |
| 24 | HART DEVICE PRIMARY VARIABLE OOL | Detect HART Status Primary Variable out of limits | Bit6 | O |

*: NAMUR NE 107 “Self-Monitoring and Diagnosis of Field Devices”

# 10. General Specifications

Please refer to the following General Specifications sheet for the specifications, model, suffix and option codes, and external dimensions of each product.
The General Specifications can be downloaded from the website of Yokogawa.
Website address: https://www.yokogawa.com/solutions/products-platforms/field-instruments/

## ■ General Specifications List

| Model | Document Title | Document No. |
|---|---|---|
| YFGW410 | Field Wireless Management Station | GS 01W02D01-01EN |
| YFGW610 | Field Wireless Media Converter | GS 01W02D02-01EN |
| YFGW510 | Field Wireless Access Point | GS 01W02E01-01EN |
| YFGW520 | Field Wireless Access Point | GS 01W02E02-01EN |
| FN110 | Field Wireless Communication Module | GS 01W03B01-01EN |
| FN310 | Field Wireless Multi-Protocol Module | GS 01W03D01-01EN |
| FN510 | Field Wireless Multi-Function Module | GS 01W03E01-01EN |
| LN01 | Piezoelectric Accelerometer (for FN series) | GS 01W03H01-01EN |
| LN90 | Interface Adapter | GS 01W03L01-01EN |
| YTMX580 | Multi-Input Temperature Transmitter | GS 04R01B01-01EN |

If you cannot find it on our website, please contact YOKOGAWA office.

# Revision Information

**Title : FN310 Field Wireless Multi-Protocol Module (HART Protocol)**

**Manual No. : IM 01W03D01-01EN**

| Edition | Date | Page | Revised item |
|---|---|---|---|
| 1st | July 2014 | — | New Publication |
| 2nd | Dec. 2014 | 2-1 | Add Table 2.1<br>Add Bundled items |
| 3rd | May 2015 | 3-1, 5-1, 5-6, 5-7, 6-2, 7-7, 8-4, 10-1 | Add 4-20 mA loop connection |
| 4th | May 2016 | — | Add FM Approval (United States and Canada) and IECEx Certification. |
| 5th | July 2016 | — | Add ATEX Certifiation and Canadian Safety Standards |
| 6th | Apr. 2017 | — | Add section 1.3 and 1.5<br>Update CE Conformity (RoHS) |
| 7th | July 2021 | —<br>1-4<br>2-4<br>2-10<br>2-16<br>2-18<br>2-21<br>10-1 | Delete ATEX documentation.<br>1.4 Add the description for EU RoHS and China RoHS.<br>2.6.1 Update the description for FM Approval (United States).<br>2.6.2 Update the description for FM Approval (Canada).<br>2.6.3 Update the description for ATEX certification.<br>2.6.4 Update the description for IECEx certification.<br>Add 2.8.<br>10. Delete the description for general specifications and add the General Specifications list. |