User's
Manual

Vortex Flowmeter VY Series
FOUNDATION™ Fieldbus
Communication Type

IM 01F07A02-02EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01F07A02-02EN
1st Edition

Vortex Flowmeter VY Series
FOUNDATION Fieldbus Communication Type

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Contents

1st Edition: Oct. 2023

1. Introduction

This manual explains basic operations of the Vortex Flowmeter VY Series with FOUNDATION™ Fieldbus protocol.
For items which are not covered in this manual, read the applicable user's manuals listed in "Table 1.1 Manual and General Specifications List" in the VY Series Installation Manual. These documents can be downloaded from the YOKOGAWA website. To ensure the correct use of the product, read these manuals thoroughly and fully understand how to operate the product before operating it. To confirm the model name and specifications of the product, refer to the general specifications.
Website address: https://www.yokogawa.com/library/

■ Precautions related to the protection, safety, and alteration of the product

The following safety symbol marks are used in this manual and the product.

WARNING

A WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the product or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

The following symbols are used in the product and the manual to indicate the accompanying safety precautions:

⏚ Functional grounding terminal

(This terminal should not be used as a protective grounding terminal.)

⎓ Direct current

⚠ Caution

This symbol indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the product.

For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that are stated in user's manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection function of the product may be damaged or impaired, or may not be fully demonstrated. In such a case, YOKOGAWA does not guarantee the quality, performance, function, or safety of the product.

■ Regarding this user's manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- 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 questions arise or errors are found, or if any information is missing from this manual, inform the nearest YOKOGAWA sales office or agent from which the customer has purchased this product.
- 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.
- Note that changes in the specifications, construction, or component parts of the 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.
- This manual is intended for the following personnel:

  Engineers responsible for the installation and wiring of the product.

  Personnel responsible for the normal daily device operation after this product starts running (operator).
- To ensure correct use, read this manual and the applicable manuals thoroughly before starting operation. Read the general specifications for specifications of the product.

■ Trademarks

- All the brands or names of Yokogawa Electric's products used in this manual are either trademarks or registered trademarks of Yokogawa Electric Corporation.
- All other company and product names mentioned in this manual are trade names, trademarks or registered trademarks of their respective companies.
- In this manual, trademarks and registered trademarks are not marked with "™" or "®".
- "FOUNDATION" in "FOUNDATION Fieldbus" is a registered trademark of FieldComm Group.

1.1 For Safe Use of Product

For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that are stated in user's manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection function of the product may be damaged or impaired. In such a case, YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the product.

■ General

WARNING

- Do not open the cover in wet weather or humid environment. When the cover is open, the stated enclosure protection is not applicable.
- When opening the cover, wait for more than 20 minutes after turning off the power. Only an expert engineer or skilled personnel is permitted to open the cover.

■ Operation

WARNING

Be sure to enable the write lock function to prevent parameters from being overwritten after finishing parameter setting.
Read the installation manual for the hardware write lock function, and Section 6.16 for the software write lock function.

■ Maintenance

WARNING

Maintenance of this product should be implemented in a maintenance service shop where necessary devices and environment condition are provided. The required environmental condition is that the ambient temperature should be 5 to 40 °C (humidity of which maximum relative humidity is 80% for temperatures 5 to 31 °C, and of which relative humidity linearly decreases to 50% at a temperature of 40 °C when the temperature is over 31 °C).

1.2 Warranty

- The warranty shall cover the period described in the quotation presented to the purchaser at the time of purchase. Problems that may occur during the warranty period shall be repaired free of charge.
- In case of problems, the customer should contact the YOKOGAWA representative from which the product was purchased or the nearest YOKOGAWA office.
- If a problem arises with this product, please inform YOKOGAWA of the nature of the problem and the circumstances under which the problem developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible part for repair costs of the problems shall be determined by YOKOGAWA based on our investigation.
- The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Failure due to improper and/or inadequate maintenance by the purchaser.
  - Failure or damage due to improper handling, use, or storage which does not conform to design conditions.
  - Use of the product in question in a location not conforming to the standards specified by YOKOGAWA, or problems 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/lightning, or other natural disasters, as well as disturbances, riots, warfare, or radioactive contamination.

2. Operation by Display unit

This chapter describes the basic configuration of the display and how to set parameters from the display.

2.1 Basic Operating Procedures

The parameter settings can be changed by using the three switches [SET], [SHIFT] and [INC] on the display.
This product can be also operated by using the dedicated handheld terminal or the FieldMate (Versatile Device Management Wizard). For details about the setting procedure, see Chapter 4.

WARNING

Be sure to enable the write lock function to prevent parameters from being overwritten after finishing parameter setting.
Refer to the Installation Manual for the hardware write lock function, and Section 6.16 for the software write lock function.

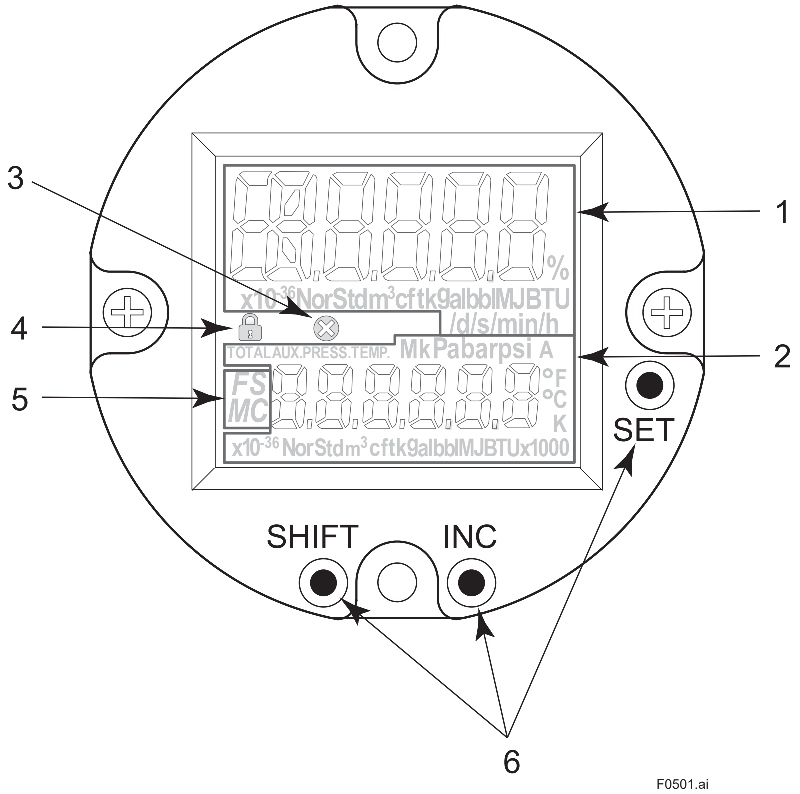
NOTE

Only parameters related to the display can be set and displayed on the display. Parameters that cannot be set and displayed on the display should be set and checked using the FOUNDATION Fieldbus configuration tool.

2.2 Configuration and Functions of the Display

The display of the integral flowmeter and remote transmitter has the following functions.

2.2.1 Configuration of Display



1 Upper display	:	This displays the instantaneous flow rate data and other setting item Nos.
2 Lower display	:	This displays the total data, temperature data, process data acquired by MAO function block, and alarm No.
3 Alarm icon	:	This displays if a serious alarm has occurred. Serious alarms are system alarms and process alarms.
4 Write lock icon	:	This displays the write lock status.
5 NE107 category icon	:	This displays the NE107 category of the target alarm when the alarm No. is displayed.
6 SET switch	:	This switch is used to change the flow rate data indication and the content of setting data.

- **Basic operation of switches**

The basic operations of the display are done by the three switches [SET], [SHIFT], and [INC]. Switch functions change by holding down two switches in different combinations.

Switch operation	Functions
SET	• Moves to the setting mode • Applies parameters and data • Moves to next menu
SHIFT	• Sets/resets multiple selectable options (Select type parameter) • Moves the cursor right (Numeric type parameter)
INC	• Moves the cursor down (Select type parameter) • Increment value (Numeric type parameter) • Changes the position of the decimal point (Numeric type parameter)
SHIFT + SET	• Cancels a setting • Returns to the previous menu

2.3 Display Items in Display Area

Display Items are categorized into the following three items.

NOTE

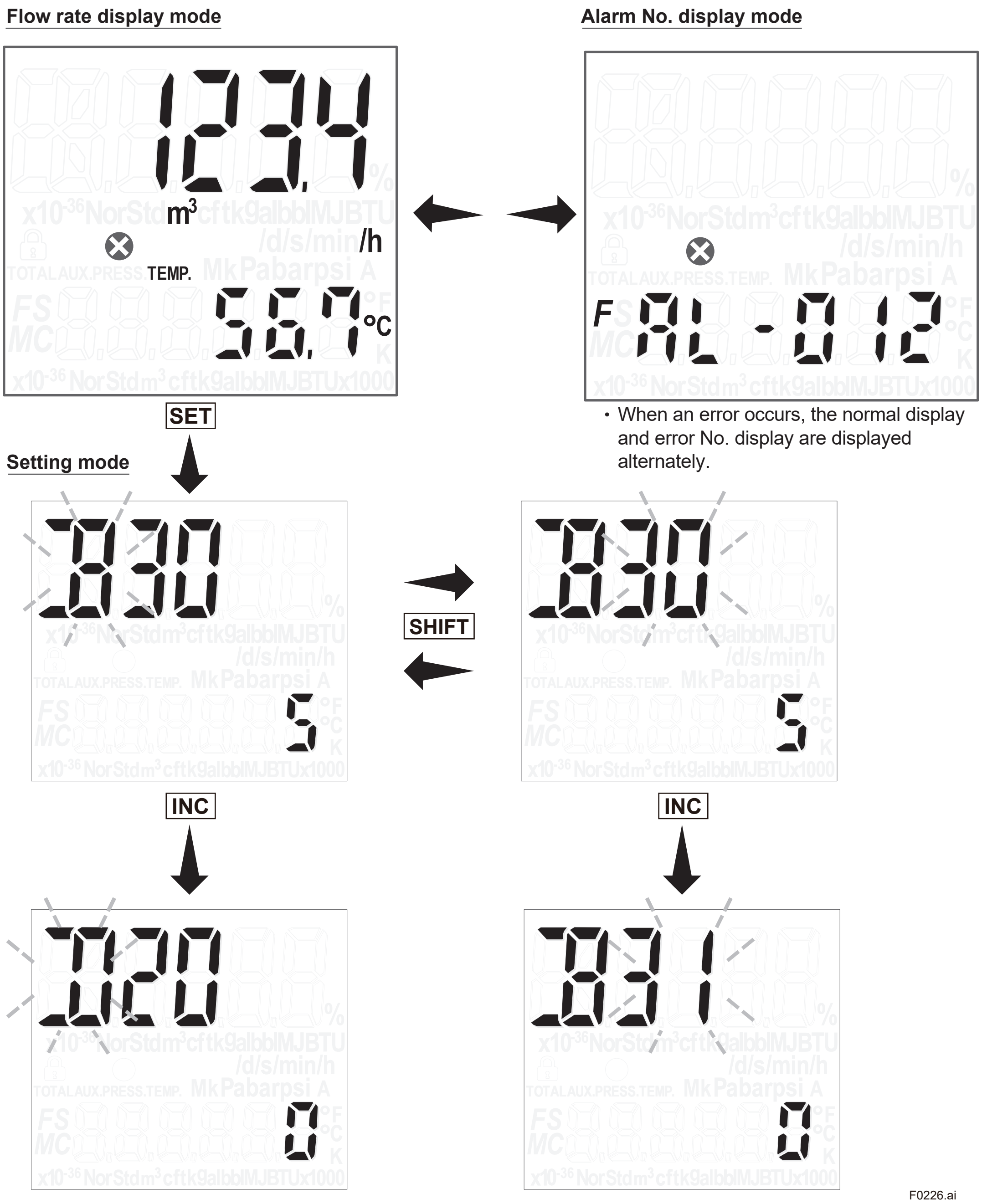
There are some influence by changing the setting of display period, see the follows.

Mode Name	Display Content
Flow rate display mode	In this mode, the instantaneous flow rate and totalized value are displayed.
Setting mode	In this mode, the content of parameters is checked in the setting area and data is overwritten. Pressing the [SET] switch in the flow rate display mode moves the display to the setting mode.
Alarm No. display mode	When an alarm occurs in the flow rate display mode, the display alternates between the number indicating the content of the alarm and the normal data display.*1

*1: The display time of the display mode will vary depending on the display period.

Display period	Flow rate display mode	Alarm No. display mode
0.25s	4s	2s
0.5s	8s	4s
1s	16s	8s
2s	32s	16s
4s	64s	32s
8s	128s	64s

(Display example)



- The display enters the setting mode by pressing the [SET] switch in the flow rate display mode.

  When operation levels are enabled, the pass code must be entered before moving to the setting screen.
- To toggle between item setting and No. setting, use the [SHIFT] switch.
- The item or No. to set can be changed by the [INC] switch.

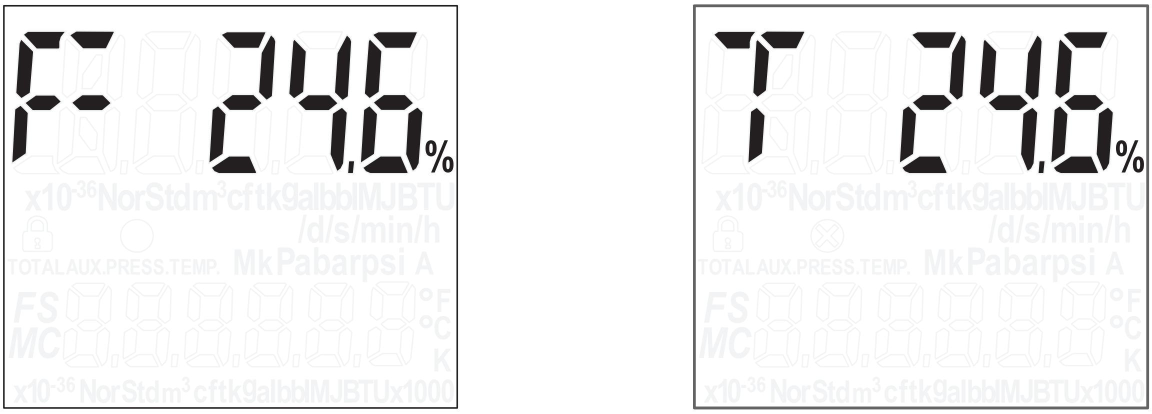
2.4 Display Mode

In this mode, the instantaneous flow rate and flow rate totalized values are displayed.
The following items can be displayed.

Display Item	Description	Upper display	Lower display
Flow rate % display	The instantaneous flow rate is displayed as a % of the span. In addition to the % display, “F” indicating flow rate is displayed at the top left of the display area. (See figure below.)	○	x
Engineering unit flow rate display	The instantaneous flow rate is displayed by engineering unit.	○	x
Flow rate total display	The flow rate totalized value is displayed.	x	○
Temperature % display*1	The measured temperature is displayed as a % of the span. In addition to the % display, “T” indicating the temperature is displayed at the top left of the display area. (See figure below.)	○	x
Temperature engineering unit display*1	The measured temperature is displayed.	x	○
AIFB1 OUT display*2	The OUT.Value of AI function block 1 is displayed.	○	x
AIFB1 OUT (%) display	The OUT.Value of AI function block 1 is displayed as a % of OUT_SCALE. In addition to the % display, a letter indicating the process value assigned to the channel is displayed at the top left of the display area. (See figure below.)	○	x
AIFB2 OUT (%) display	The OUT.Value of AI function block 2 is displayed as a % of OUT_SCALE. In addition to the % display, a letter indicating the process value assigned to the channel is displayed at the top left of the display area. (See figure below.)	○	x
AIFB3 OUT (%) display	The OUT.Value of AI function block 3 is displayed as a % of OUT_SCALE. In addition to the % display, a letter indicating the process value assigned to the channel is displayed at the top left of the display area. (See figure below.)	○	x
External input display*3	The value obtained by the MAO function block is displayed.	x	○
AIFB2 OUT display*2	The OUT.Value of AI function block 2 is displayed.	x	○
AIFB3 OUT display*2	The OUT.Value of AI function block 3 is displayed.	x	○
ITFB OUT display	The OUT.Value of the IT function block is displayed.	x	○

*1: Only when equipped with built-in temperature sensor
*2: The unit will not be displayed if the following settings are configured.
- The AIFB1 OUT:AIFB1 channel is set to anything other than Flow rate
- The AIFB2 OUT:AIFB2 channel is set to Flow rate
- The AIFB3 OUT:AIFB3 channel is set to Flow rate

*3: Displayed value differs depending on the compensation type.
The unit will not be displayed if the compensation type is set to A-in density.



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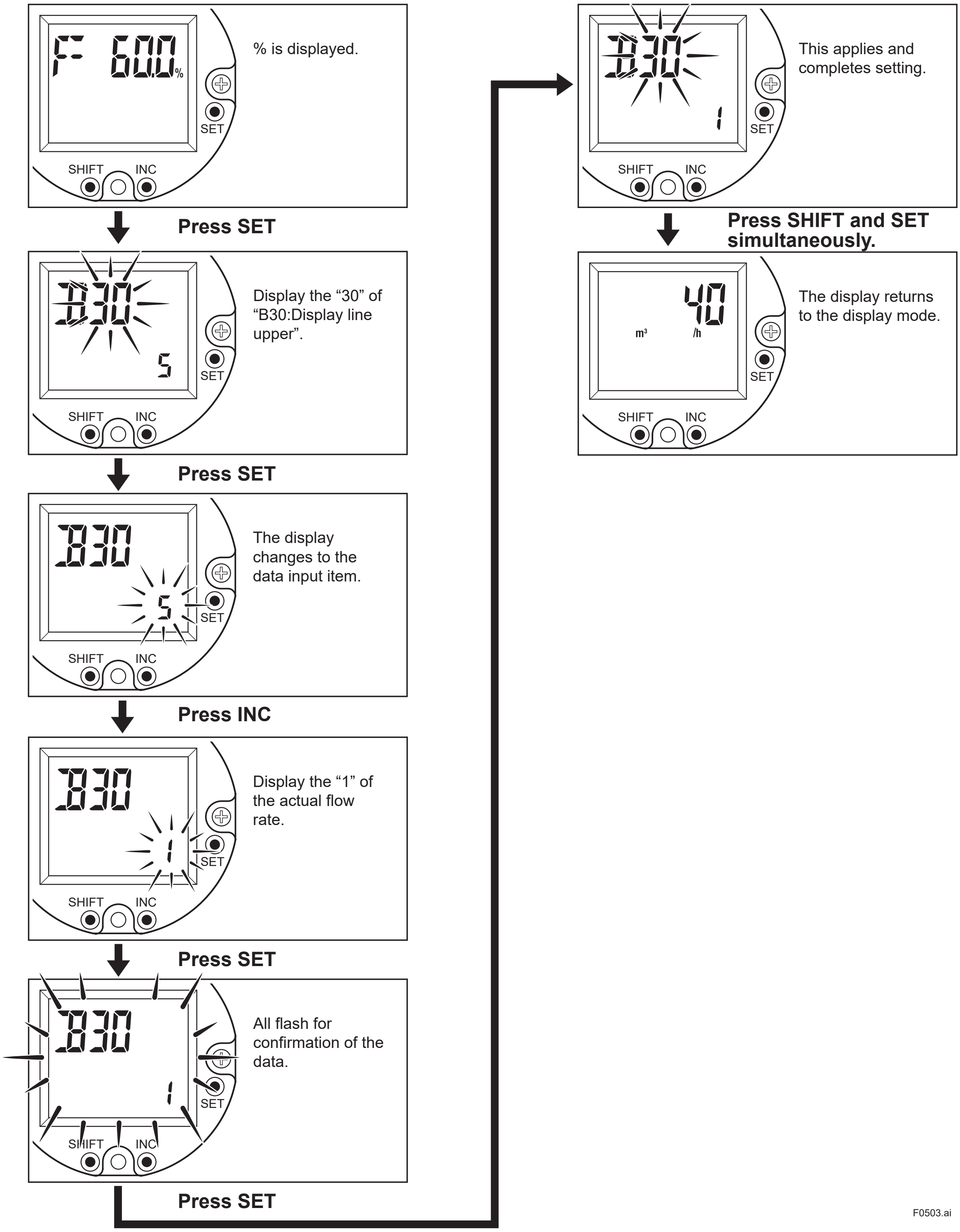
For details, see 6.12.1 Setting Display Items.

2.4.1 Changing from % Display to Actual Flow Rate Display

The following describes how to change the display content on the upper display of the select type parameters on the display.



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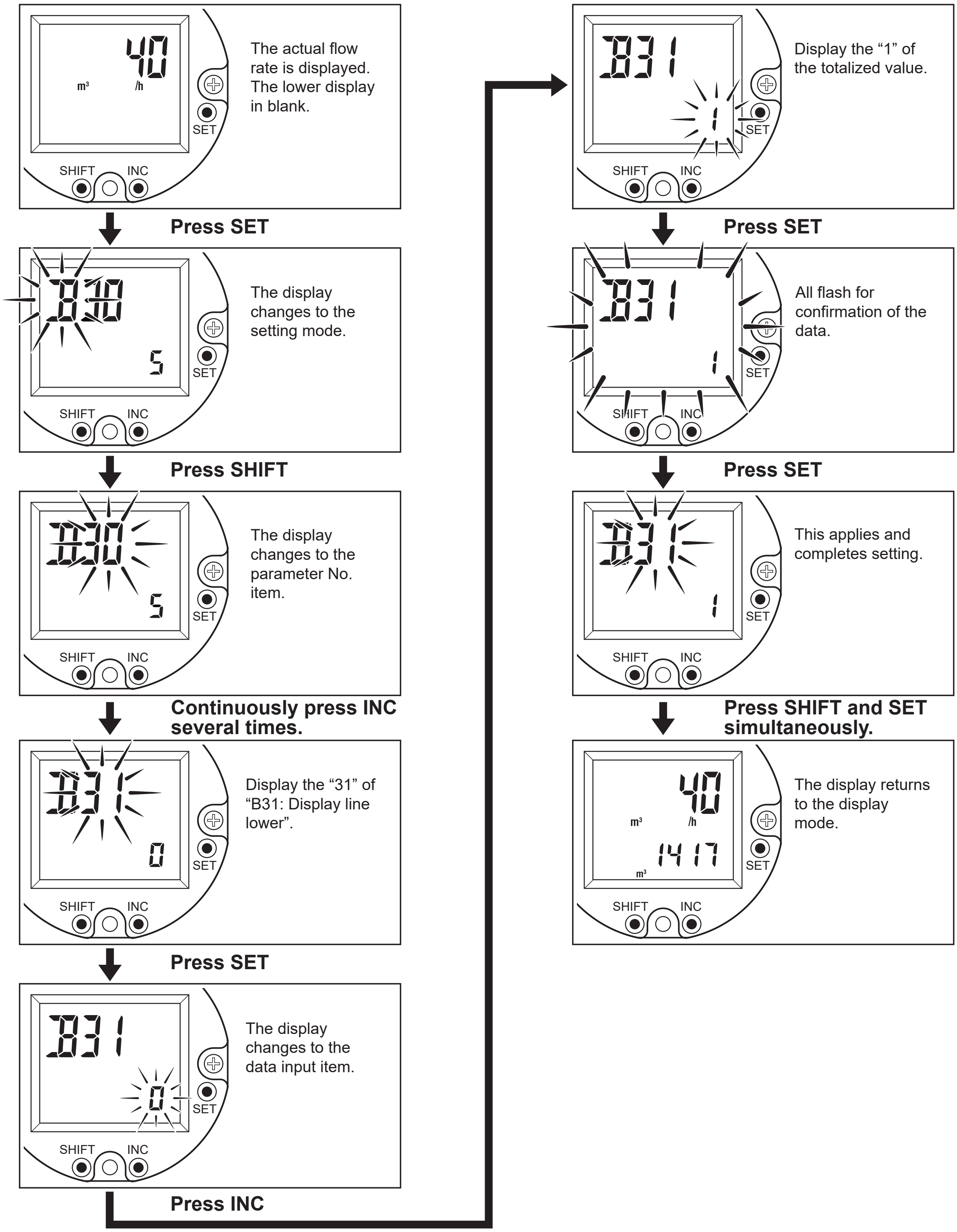
IMPORTANT

If this product is turned off before 30 seconds after setting the parameters, the settings will not be stored correctly. Keep the product turned on for over 30 seconds after setting the parameters.

2.4.2 Displaying Totalized Values on the Lower Display



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IMPORTANT

If this product is turned off before 30 seconds after setting the parameters, the settings will not be saved correctly. Keep the product turned on for over 30 seconds after setting the parameters.

2.5 Display Items on Display Setting Screen

The setting screen on the display can be used to check process values and change parameters related to the display.
The parameters that can be changed are listed below.

Category	No.	Name	Description
A	A10	Flow rate(%)	The instantaneous flow rate is displayed as a % of the span
	A20	Flow rate	The instantaneous flow rate is displayed in the engineering unit
	A30	Total	The flow rate totalized value is displayed
	A40	Temperature(%)	The measured temperature is displayed as a % of Temperature URV,LRV
	A41	Temperature	The measured temperature is displayed in the engineering unit
B	B30	Display line upper	The content displayed in the upper part of the display is set
	B31	Display line lower	The content displayed in the lower part of the display is set
D	D20	Display period	The update interval of the process value on the display is set
	D21	Display startup	The startup screen is set
	D22	Display NE107	The NAMUR NE107 classification display is set
	D23	Display format flow	The decimal point position of the instantaneous flow rate value is set
	D24	Display format temperature	The decimal point position of the fluid temperature, or the external temperature value and external temperature difference (external input), is set
	D25	Display format pressure	The decimal point position of the external pressure value (external input) is set
J	J45	Display test	The display test is executed

3. About Fieldbus

3.1 Overview

Fieldbus is a widely used bi-directional digital communication protocol for field devices that enable the simultaneous output to many types of data to the process control system.

The VY Series Fieldbus communication type employs the specifications standardized by FieldComm Group, and provides interoperability between Yokogawa devices and those produced by other manufacturers. Fieldbus comes with software consisting of AI, DI, IT, AR, PID and MAO function blocks that enable the flexible implementation of systems.

For information on other features, engineering, design, construction work, startup and maintenance of Fieldbus, refer to “Fieldbus Technical Information” (TI 38K03A01-01E).

3.2 Internal Structure

This product contains two Virtual Field Devices (VFD) that share the following functions.

3.2.1 System/network Management VFD

- Sets node addresses and Physical Device tags (PD Tag) necessary for communication.
- Controls the execution of function blocks.
- Manages operation parameters and communication resources (Virtual Communication Relationship: VCR).

3.2.2 Function Block VFD

(1) Resource block (RB)

- Manages the status of hardware.
- Automatically informs the host of any detected faults or other problems.

(2) Sensor transducer block (STB)

- Calculates the flow rate, fluid temperature, and totalized value from a sensor output.
- Transfers the calculated process value to the AI function block.
- Transfers limit switch signals to the DI function block.
- Obtains a temperature value, pressure value, and density value from the MAO function block.

(3) Local Display transducer block (LTB)

- Controls the display.

(4) Maintenance transducer block (MTB)

- Is related to settings for detailed device information and manufacturing.
- Has functions to display device information (detailed version of the device, serial No. information, etc.), information related to event management (backup/restore), application for service/factory/expert (for debugging, manufacturing), alarm/error log and software download results.

(5) AI function block (AIFB) (3)

- Outputs various flow rates, the fluid temperature, fluid pressure, and totalized value.
- Performs processing such as the SIMULATE function, damping (first-order lag filter), scaling, etc.

(6) DI function block (DIFB) (2)

- Performs discrete output for the process value, alarm and warning of STB.

(7) PID function block

- Performs the PID control computation based on the deviation of the measured value from the setpoint.

(8) MAO function block

- Inputs a temperature value, pressure value, and density value from another device.

(9) IT function block

- Adds two main inputs and integrates them for output.

(10) AR function block

- Switches two main inputs of different measurement ranges bumplessly and combines the result with three auxiliary inputs through the selected compensation function to calculate the output.

Indexes of each block are shown below:

Block	Start Index
Resource block	1000
Sensor transducer block	2000
Local Display transducer block	2500
Maintenance transducer block	3000
AI1 function block	4000
AI2 function block	4100
AI3 function block	4200
DI1 function block	6000
DI2 function block	6100
PID function Block	8000
MAO function block	10000
IT function block	16000
AR function block	17500

3.3 Logical Structure of Each Block

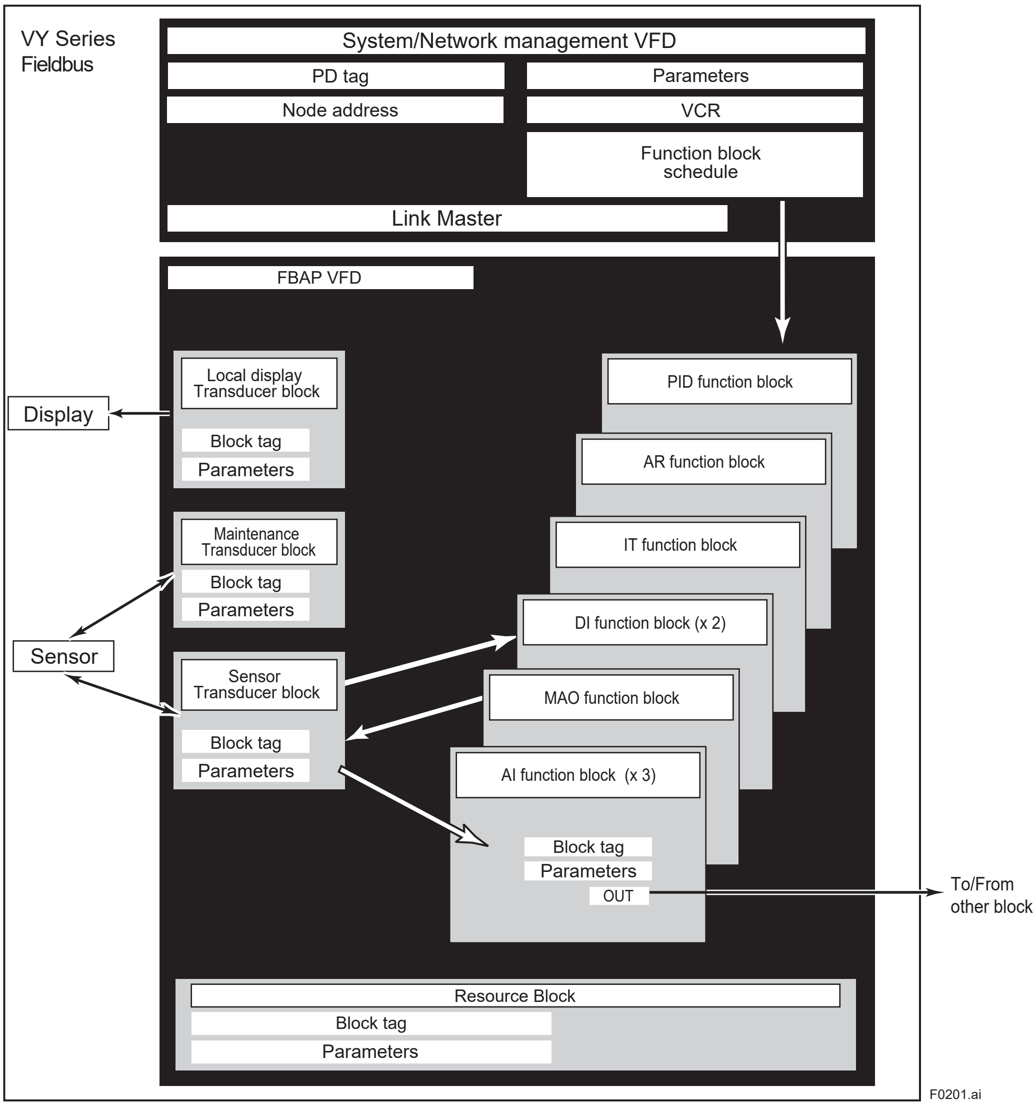


Figure 3.1 Logical Structure of Each Block

Setting of various parameters, node address, and PD Tag (Physical device tag) shown in Figure 3.1 is required before starting operation. For setting method, refer to “Getting Started” in Chapter 4 and later.

4. Getting Started

Fieldbus fully adopts digital communication protocol and differs in operation from conventional 4 to 20 mA transmission protocol. It is recommended that those novice users who use field devices for the first time should use the device in accordance with the procedures described in this section. The procedures assume that field devices will be set up on a bench.

4.1 Connection of Devices

The following devices are required to use Fieldbus devices:

- **Power supply:**

  Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). The conventional 4 -20 mA DC current cannot be used as is.

- **Terminator:**

  Fieldbus requires two dedicated terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field device:**

  Connect the Fieldbus communication type product. This product or other devices can be connected.

  In order to smoothly start Fieldbus, please use the devices that has passed the interoperability test of the Fieldbus Foundation.

- **Host:**

  Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For the operation of the host, refer to the instruction manual for each host. No other details on the host are given in this manual. At least one device with the bus control function is necessary.

- **Cable:**

  Used for connecting devices. Refer to “Vortex Flowmeter VY Series Installation Manual” (IM 01F07A01-01EN) for details of instrumentation cabling. For laboratory or other experimental use, a twisted pair cable two to three meters in length (a cross section 0.9mm^2 (AWG #18) or more and a cycle period of within 5 cm (2 inches)) may be used. Termination processing depends on the type of device being deployed. For this product, use an M4 screw terminal claw. Some hosts require a connector.

Contact Yokogawa when making arrangements to purchase the recommended devices.

Connect devices as shown in Figure 4.1. Connect the terminators at both ends of the trunk, with the minimum length of the spur laid for connection. The polarity of signal and power must be maintained.

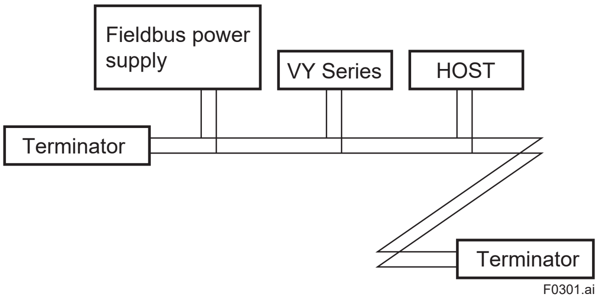


Figure 4.1 Connection of Devices

NOTE

No CHECK terminal is used for this product. Do not connect the field indicator and check meter.

IMPORTANT

If the flowmeter is connected with a parameter-setting tool, such as a PC, while being connected with the upper system, it may disturb the communication operation on the bus, and cause the operational failure of the system. Use the parameter-setting tool after taking preventive measures of setting the related loop offline in advance.

4.2 Host Setting

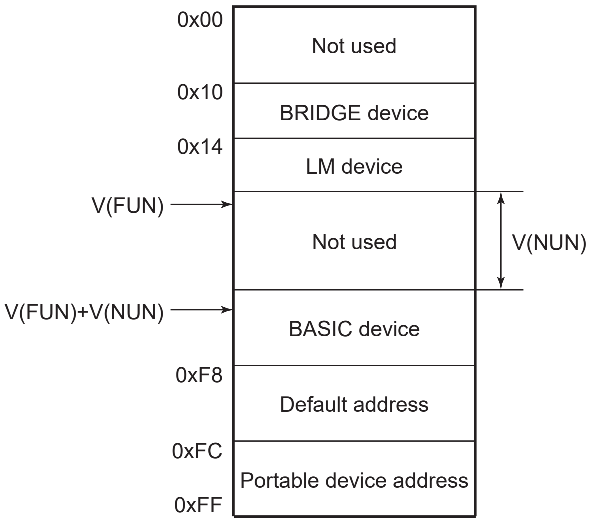
To activate Fieldbus, the following settings are required for the host. Particularly, pay attention so that the address range to use includes setting values of this product.

IMPORTANT

Do not turn off the power immediately after setting.
To improve the reliability of the device, processing to store data to EEPROM is duplexing.
If the power is turned off within 30 seconds after setting is made, the modified parameters are not saved, and the settings may return to the original values.

Table 4.1 Operation Parameters

Symbol	Parameter Name	Description and Setting
V(ST)	Slot-Time	Indicates the time necessary for the immediate reply of the device. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For this product, set a value of 4 or greater.
V(MID)	Minimum-Inter-PDU- Delay	Indicates the minimum value of communication data intervals to start reply. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For this product, set a value of 4 or greater.
V(MRD)	Maximum-Response-Delay	Indicates the worst-case time elapsed until a reply is received. Since the unit is Slot-time, set the value so that V (MRD) x V (ST) is the maximum value of the specifications for all devices. For this product, set V(MRD) x V(ST) to a value of 12 or greater.
V(FUN)	First-Unpolled-Node	Indicates the address next to the address range used by the host. Set 14 or more in hexadecimal notation.
V(NUN)	Number-of-consecutive-Unpolled-Node	Unused address range. If a large value is set, it reduces the communication load of the bus.



Note 1: BRIDGE device: A linking device which brings data from one or more H1 networks.
Note 2: LM device: with bus control function (Link Master function)
Note 3: BASIC device: without bus control function

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Figure 4.2 Available Address Range

4.3 Bus Power ON

Turn on the power of the host, the bus, and this product. If this product is equipped with a display, first all segments are lit, and then the display begins to operate. If the display is not turned on, or abnormal current flows, check the polarity of power.
Using the host device display function, check that this product is in operation on the bus.
The device information, including the PD tag, Node address, and Device ID, is described on the sheet (see Figure 4.3) attached to the device. The same device information is given at two locations on this sheet.

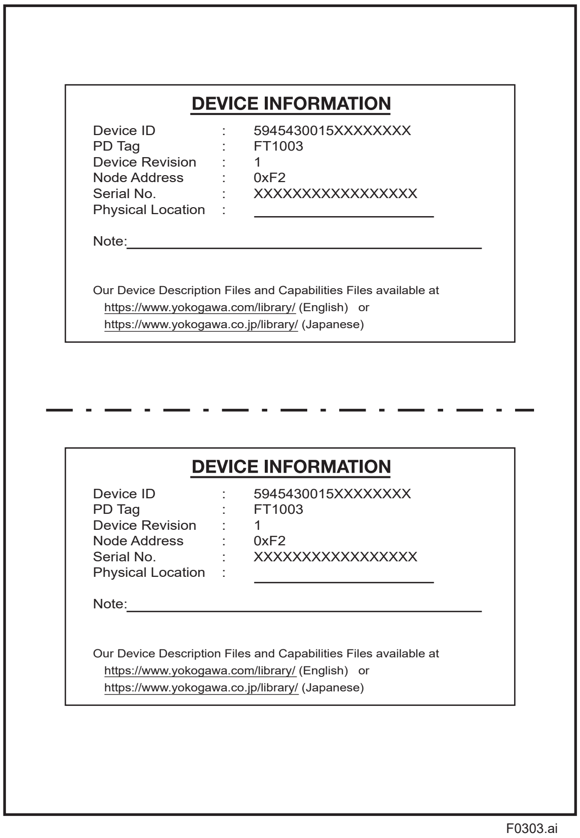


Figure 4.3 Device Information Attached to This Product.

If this product is not detected, check the address range in use and the polarity of power. If the node address and PD tag are not specified when ordering, the default value (0xF2) is factory set. If two or more devices with the same node address are connected at the same time, one device retains its factory-set address, while the other devices have default addresses of 0xF8 or later. In such a case, set an individual address.

4.4 Integration of DD

If the host supports DD (Device Description), the DD of this product needs to be specified. Check if the host has the following directory under the directory to specify DD.

594543¥0015

(594543 is the manufacturer number of Yokogawa Electric Corporation, and 0015 is the device type for VY Series.)

If the directory is not found, the DD of this product has not been included. Create the above directory and copy the DD file of this product (0m0n.ff5, 0m0n.sy5 (m, n is a numeral)) (separately supplied) into the directory.
Here, '0m' in the file name shows the device revision, and '0n' shows the DD revision.
Once the DD is installed in the directory, the name and attribute of all parameters of this product are displayed.
Also, off-line configuration is possible by using capabilities files (CFF).

If you do not have the DD or capabilities files, you can download them from Yokogawa's web page: Access the following web site, or contact your sales agent where you purchased this product.
https://www.yokogawa.com/library/

4.5 Reading the Parameters

Select the AI block of this product from the host screen, and read the OUT parameter. The measured value assigned to the present AI is displayed. Check that MODE_BLK of the function block and resource block is set to AUTO, change the input signal being measured, and read the parameter again. A new designated value will be displayed.

4.6 Continuous Record of Values

If the host has a function that continuously records the indications, use the function to record the indications (values). Depending on the host being used, it is necessary to set the schedule of Publish (function to transmit the indication to the bus on a periodic basis).

4.7 Generation of Alarm

The block alarm, out-of-range alarm of the output parameter (OUT) and update alarm at setting change can be generated from this product. When generating alarm, a Link Object and a VCR Static Entry need to be set. For details of Link Object and VCR Static Entry, refer to Subsection 5.6.1 Link object and Subsection 5.5.1 VCR Setting.

5. Configuration

This chapter describes how to adapt the function and performance of this product to suit specific applications. Because multiple devices are connected to Fieldbus, it is important to carefully consider the device requirements and settings when configuring the system. Specifically, the following steps must be taken.

(1) Network design

Determine the devices to be connected to Fieldbus and check the capacity of the power supply.

(2) Network definition

Determine the PD tag and node addresses for all devices.

(3) Definition of combining function blocks

Determine how function blocks are combined.

(4) Setting tags and addresses

Set the PD Tag and node addresses for each device.

(5) Communication setting

Set the link between communication parameters and function blocks.

(6) VFD parameter configuration

Set the parameter for function block VFD.

The following section describes each step of the procedures in this order. The use of a dedicated configuration tool significantly simplifies the procedures below. This chapter explains procedures that enable the user to configure even hosts that have relatively simple functions. Refer to Appendix 5 when the device is used as Link Master.

5.1 Network Design

- **Power supply:**

  Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current of 4 - 20 mA cannot be used as is.

- **Terminator:**

  Fieldbus requires two dedicated terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field device:**

  Connects the field devices necessary for instrumentation. This product has passed the interoperability test conducted by the FieldComm Group. In order to smoothly start Fieldbus, it is recommended that the devices used satisfy the requirements of the above test.

- **Host:**

  Used for access to field devices and advanced control. At least one device with the bus control function is necessary.

- **Cable:**

  Used for connecting devices. Refer to "Vortex Flowmeter VY Series Installation Manual" (IM 01F07A01-01EN) for details of instrumentation cabling. For field branch cabling, use terminal boards or a connection box as required.

First, check the capacity of the power supply. The power supply capacity must be greater than the sum of the maximum current consumed by all devices to be connected to Fieldbus. The maximum current consumed (power supply voltage 9V to 32V) for this product is 15 mA.
The cable used for the spur must be of the minimum possible length.

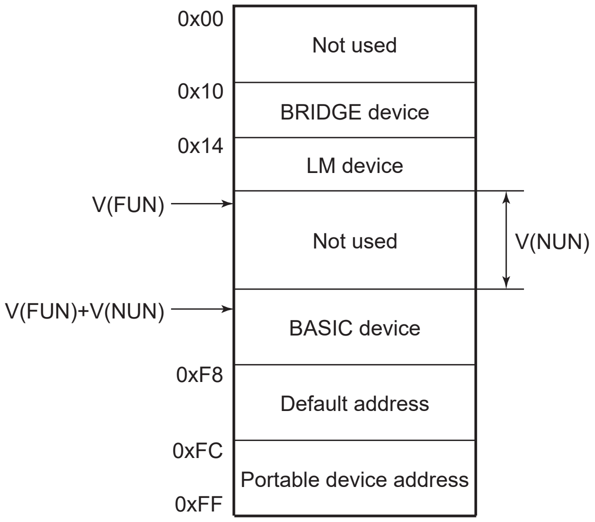
5.2 Network Definition

Before connecting devices with Fieldbus, define the Fieldbus network. Allocate the PD tag and node addresses to all devices (excluding such passive devices as terminators).
The PD tag is the same as the conventional one used for the device. Up to 32 alphanumeric characters may be used for definition. Use a hyphen as a delimiter as required.
The node address is used to specify devices for communication purposes. Because this data is too long for the PD Tag, the host uses the node address in place of the PD Tag for communication. The range of 20 to 247 (or from 14 to F7 in hexadecimal notation) can be set.
The device (LM device) with bus control function (Link Master function) is allocated from a smaller address number (20) side, and other devices (BASIC device) without bus control function allocated from a larger address number (247) side respectively. Set the range of addresses to be used to the LM device. Set the following parameters.

Table 5.1 Parameters for Setting Address Range

Symbol	Parameter Name	Description
V(FUN)	First-Unpolled-Node	Sets the address next to the address range used for the host or other LM device.
V(NUN)	Number-of-consecutive-Unpolled-Node	Unused address range.

The devices within the address range written as “Not used” in Figure 5.1 cannot be used on Fieldbus. For other address ranges, the range is periodically checked to identify when a new device is mounted. Care must be taken to keep the unused device range as narrow as possible so as to lessen the load on Fieldbus.



Note 1: BRIDGE device: A linking device which brings data from one or more H1 networks.
Note 2: LM device: with bus control function (Link Master function)
Note 3: BASIC device: without bus control function

F0401.ai

Figure 5.1 Available Range of Node Addresses

To ensure stable operation of Fieldbus, determine the operation parameters and set them to the LM devices. When the parameters in Table 5.2 are to be set, the worst-case value of all the devices to be connected to the same Fieldbus must be used. Refer to the specifications of each device for details. Table 5.2 lists specification values of this product.

Table 5.2 Operation Parameter Values of This Product to be Set to LM Devices

Symbol	Parameter Name	Description and Setting
V(ST)	Slot-Time	Indicates the time necessary for the immediate reply of the device. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For this product, set a value of 4 or greater.
V(MID)	Minimum-Inter-PDU-Delay	Indicates the minimum value of communication data intervals to start reply. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For this product, set a value of 4 or greater.
V(MRD)	Maximum-Response-Delay	Indicates the worst-case time elapsed until a reply is received. Since the unit is Slot-time, set the value so that V (MRD) x V (ST) is the maximum value of the specifications for all devices. For this product, set V(MRD) x V(ST) to a value of 12 or greater.

5.3 Definition of Combining Function Blocks

The input/output parameters for function blocks are combined. Specifically, see "VFD Parameter Configuration" in Section 5.6 for the details though the setting is written to the link object of this product. It is also possible to read values from the host at proper intervals instead of connecting the block output of this product to other blocks.

The combined blocks need to be executed synchronously with other blocks on the communications schedule. In this case, change the schedule of this product as shown in Table 5.3.

Table 5.3 Execution Schedule of the Function Blocks

Index	Parameter Name	Setting (Enclosed is factory-setting)
269(SM)	MACROCYCLE_ DURATION	Cycle (MACROCYCLE) period of control or measurement. Unit is 1/32 ms. (32000 = 1s)
351(SM)	FB_START_ENTRY.1	Function block startup time. Offset time from the start of MACROCYCLE specified in 1/32 ms. (0 = 0 s)
352~381(SM)	FB_START_ENTRY.2 to FB_START_ENTRY.31	No settings

The maximum of 20 ms is taken to execute the AI block. For scheduling of communications for combination with the next function block, arrange the schedule so that the execution starts after a lapse of longer than this time. Do not make settings so that function blocks of this product are executed at the same time (execution time is overlapped).
Figure 5.3 shows the execution schedule example of the function block like the loop shown in Figure 5.2.

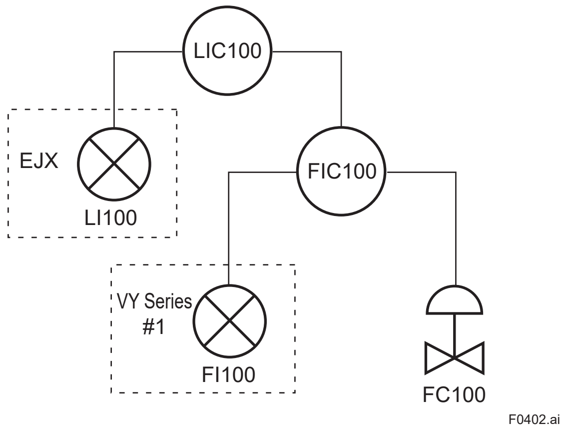


Figure 5.2 Example of Loop Connecting Function Block of This Product with Other Devices

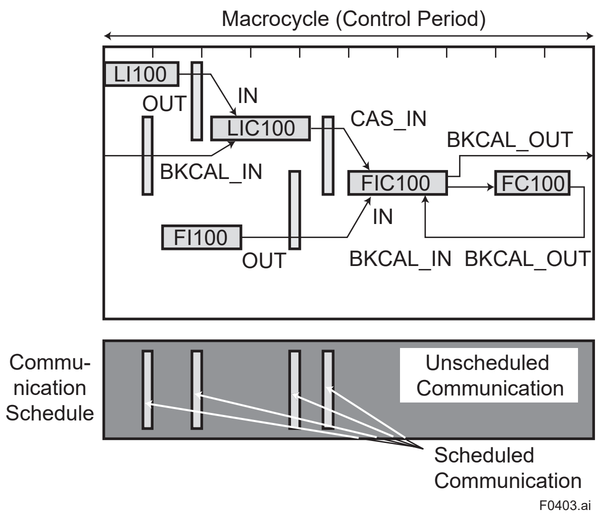


Figure 5.3 Function Block Schedule and Communication Schedule

When the control period (macro cycle) is set to more than 4 seconds, set the following intervals to be more than 1% of the control period.

- Interval between "end of block execution" and "start of sending CD from LAS"
- Interval between "end of the block execution" and "start of the next block execution"

5.4 Setting Tag and Address

This section describes the procedures to set PD Tag and node address in this product. There are three states of the Fieldbus devices as shown in Figure 5.4, and if the state is other than the lowest SM_OPERATIONAL state, no function block is executed. This product must be transferred to this state when a tag or address of this product is changed.

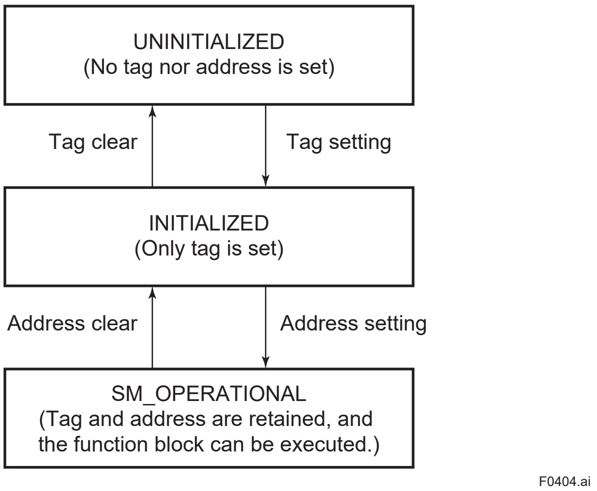


Figure 5.4 Status Transition by Setting PD Tag and Node Address

This product (unless otherwise specified) has the PD Tag (FT1003) and node address (242, or F2 in hexadecimal notation) that are set at shipment from the factory unless otherwise specified. To change only the node address, clear the address once and then set a new node address. To set the PD Tag, first clear the node address and clear the PD Tag. Then, reset the PD tag and node address.
Devices whose node addresses have been cleared will have the default address (randomly chosen from a range of 248 to 251, or from F8 to FB in hexadecimal notation). At the same time, it is necessary to specify the device ID in order to correctly specify the device. The device ID of VY Series is 5945430015xxxxxxxx. (xxxxxxxx is 8-digit alphanumeric characters.)

5.5 Communication Setting

To set the communication function, it is necessary to change the database residing in SM-VFD.

5.5.1 VCR Setting

Set VCR (Virtual Communication Relationship), which specifies the called party for communication and resources. This product has 38 VCRs whose application can be changed, except for the first VCR, which is used for management. This product has VCRs of four types:

Server (QUB) VCR

A Server responds to requests from a host. This communication needs data exchange. This type of communication is called QUB (Queued User- triggered Bidirectional) VCR.

Source (QUU) VCR

A Source multicasts alarms or trends to other devices. This type of communication is called QUU (Queued User-triggered Unidirectional) VCR.

Publisher (BNU) VCR

The output of the function block is sent to the function block of other device. This type of communication is called BNU (Buffered Network-triggered Unidirectional) VCR.

Subscriber (BNU) VCR

The output of the function block of other device is received by the function block of this product. This type of communication is called BNU (Buffered Network-triggered Unidirectional) VCR.

Each VCR has the parameters listed in Table 5.4. Parameters must be changed together for each VCR because modification of individual parameters may cause inconsistent operation.

Table 5.4 VCR Static Entry

Sub-index	Parameter Name	Description
1	FasArTypeAndRole	Indicates the type and role of communication (VCR). The following 4 types are used for this product. 0x32: Server Server (Responds to requests from host.) 0x44: Source Source (Transmits alarm or trend.) 0x66: Publisher (The output of the function block is sent to the function block of other device.) 0x76: Subscriber (The output of the function block of other device is received by the function block of this product.)
2	FasDllLocalAddr	Sets the address (DLSAP or DLCEP) to specify VCR in this product. The range from 20 to F7 in hexadecimal notation is used.
3	FasDllConfigured RemoteAddr	Sets the node address of the called party for communication and the address (DLSAP or DLCEP) used to specify VCR in that address. For DLSAP or DLCEP, a range from 20 to F7 in hexadecimal notation is used. Addresses in Subindex 2 and 3 need to be set to the same contents of the VCR as the called party (local and remote are reversed).
4	FasDllSDAP	Specifies the quality of communication. Usually, set one of the following four types. 0x2B: Server 0x01: Source (Alert) 0x03: Source (Trend) 0x91: Publisher/Subscriber
5	FasDllMaxConfirm DelayOnConnect	To establish connection for communication, set the maximum wait time for the called party’s response in ms. Typical setting at factory shipping is 60 seconds (60,000).
6	FasDllMaxConfirm DelayOnData	For request of data, set the maximum wait time for the called party’s response in ms. Typical setting at factory shipping is 60 seconds (60,000).

Sub-index	Parameter Name	Description
7	FasDllMaxDlsduSize	Specifies maximum DL Service Data unit Size (DLSDU). Set 256 for Server and Trend VCR, and 64 for other VCRs.
8	FasDllResidualActivity Supported	Specifies whether connection is monitored. Set TRUE (0xff) for Server. This parameter is not used for other communication.
9	FasDllTimelinessClass	Not used.
10	FasDllPublisherTime WindowSize	Not used.
11	FasDllPublisherSynchronizaing Dlcep	Not used.
12	FasDllSubsriberTime WindowSize	Not used.
13	FasDllSubscriberSynchronization Dlcep	Not used.
14	FmsVfdId	Indicates VFD of this product to be used. (0x1: System/ network management VFD, 0x1234: Function block VFD)
15	FmsMaxOutstanding ServiceCalling	Set 0 to Server. It is not used for other applications.
16	FmsMaxOutstanding ServiceCalled	Set 1 to Server. It is not used for other applications.
17	FmsFeaturesSupported	Indicates the type of services in the application layer. In this product, it is automatically set in accordance with specific applications.

5.5.2 Function Block Execution Control

In accordance with the instructions given in Section 5.3, set the execution cycle of the function blocks and schedule of execution.

5.5.3 Mode Transition

When the function block mode is changed to O/S, the function block pauses and a block alarm is issued.
When the function block mode is changed to Manual, the function block suspends updating of output values. In this case alone, it is possible to write a value to the OUT parameter of the block for output. Note that no parameter status can be changed.

5.6 VFD Parameter Configuration

Set the parameter for function block VFD.

5.6.1 Link Object

A link object combines the data voluntarily sent by the function block with the VCR. This product has 45 link objects. A single link object specifies one combination. Each link object has the parameters listed in Table 5.5. Parameters must be changed collectively for each VCR because the modifications made to each parameter may cause inconsistent operation.

Table 5.5 Link Object Parameters

Sub-index	Parameter Name	Description
1	LocalIndex	Sets the index of function block parameters to be combined. Set “0” for Trend and Alert.
2	VcrNumber	Sets the index of VCR to be combined. If set to “0”, this link object is not used.
3	RemoteIndex	Not used. Set to “0”.
4	ServiceOperation	Set one of the following. Set only one each for link object for Alert or Trend. 0: Undefined 2: Publisher 3: Subscriber 6: Alert 7: Trend
5	StaleCountLimit	If data is not updated at the time of Subscribe, this is the count value until the input status is made to Bad. To avoid the careless mode transition caused when the data is not correctly received by a subscriber, set this parameter to “2” or more.

Forty-five link objects are not set at factory shipping.

5.6.2 Alert Object

This product can report the following alarms or events.

Analog Alerts (Generated when a process value exceeds the threshold)

AI Block: Hi-Hi Alarm, Hi Alarm, Low Alarm, Low-Low Alarm

PID block: Hi-Hi Alarm, Hi Alarm, DV_Hi Alarm, DV_Low Alarm, Low Alarm, Low-Low Alarm

Discrete Alerts (Generated when an abnormal condition is detected)

Resource Block: Block Alarm, Write Alarm

Transducer block: Block alarm

AI, DI, IT, AR, PID and MAO Blocks: Block Alarm

Update Alerts (Generated when an important (restorable) parameter is updated)

Resource Block: Update Event

Transducer Block: Update Event

AI, DI, IT, AR, PID and MAO block: Update Event

Field diagnosis alert (Generated when an error is found in the device status.)

Resource block:
Check alarm, error detection alarm, maintenance alarm and out-of-specification alarm

The alert consists of elements listed in Table 5.6.

Table 5.6 Alert Object

Subindex				Parameter Name	Description
Analog Alert	Discrete Alert	Update Alert	Field Diagnosis Alert		
1	1	1	1	Block Index	Index of block from which alert is generated
2	2	2	2	Alert Key	ALERT_KEY copied from the block
3	3	3	3	Standard Type	Type of the alert
4	4	4	4	Mfr Type	Alert Name identified with manufacturer specific DD
5	5	5	5	Message Type	Reason of alert notification
6	6	6	6	Priority	Priority of the alarm. By sending with priority information being added in communication frame when the alert is issued, for example, the alert is used to apply a filter to ignore values below the specified priority on the host side.
7	7	7	7	Time Stamp	Time when this alert is first detected
8	8		8	Subcode	Subcode indicating cause of alert
9	9		9	Value	Value of referenced data
10	10		10	Relative Index	Relative index of referenced data
		8		Static Revision	Value of the static revision (ST_REV) of the block
11	11	9		Unit Index	Unit code of referenced data
			11	Source Block Index	Relative index of block causing alarm generation

5.6.3 Trend Object

It is possible to set the parameter so that the function block automatically transmits Trend. This product has ten Trend objects, eight of which are used for Trend in analog mode parameters and two is used for Trend in discrete mode parameter. A single Trend object specifies the trend of one parameter.
Each Trend object has the parameters listed in Table 5.7. The first four parameters are the items to be set. Before writing to a Trend object, it is necessary to release the WRITE_LOCK parameter.

Table 5.7 Parameters for Trend Objects

Sub-index	Parameter Name	Description
1	Block Index	Sets the leading index of the function block that takes a trend.
2	Parameter Relative Index	Sets the index of parameters taking a trend by a value relative to the beginning of the function block. For example, the following three types of trends are possible in the AI block of this product. 7: PV 8: OUT 19: FIELD_VAL
3	Sample Type	Specifies how trends are taken. Choose one of the following two types: 1: Sampled upon execution of a function block. 2: The average value is sampled.
4	Sample Interval	Specifies sampling intervals in units of 1/ 32ms. Set the integer multiple of the function block execution.
5	Last Update	The last sampling time.
6 to 21	List of Status	Status part of a sampled parameter.
21 to 37	List of Samples	Data part of a sampled parameter.

Ten trend objects are factory-set as shown Table 5.8.

Table 5.8 Factory Setting for Trend Objects

Index	Parameter Name	Factory Settings
32000 to 32007	TREND_FLT.1 to TREND_FLT.8	No setting
32008 to 32009	TREND_DIS.1 to TREND_DIS.2	No setting

5.6.4 View Object

This object forms a group of parameters in a block. One advantage brought by forming groups of parameters is the reduction of load for data transactions. For contents of View Object, refer to Tables 5.10 to 5.14. Roles of VIEW_1 to VIEW_4 are shown in Table 5.9.

Table 5.9 Purpose of Each View Object

Parameter Name	Description
VIEW_1	Set of dynamic parameters required by the operator for plant operation. (PV, SV, OUT, Mode, etc.)
VIEW_2	Set of static parameters which need to be collectively shown to the plant operator. (Range etc.)
VIEW_3	Set of all the dynamic parameters.
VIEW_4	Set of static parameters for configuration or maintenance.

Table 5.10 View Object for Resource Block

Relative Index	Parameter Name	View 1	View 2	View 3	View 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	RS_STATE	1		1	
8	TEST_RW				
9	DD_RESOURCE				
10	MANUFAC_ID				4
11	DEV_TYPE				2
12	DEV_REV				1
13	DD_REV				1
14	GRANT_DENY		2		
15	HARD_TYPES				2
16	RESTART				
17	FEATURES				2
18	FEATURE_SEL		2		
19	CYCLE_TYPE				2
20	CYCLE_SEL		2		
21	MIN_CYCLE_T				4
22	MEMORY_SIZE				2
23	NV_CYCLE_T		4		
24	FREE_SPACE		4		
25	FREE_TIME	4		4	
26	SHED_RCAS		4		
27	SHED_ROUT		4		
28	FAULT_STATE	1		1	
29	SET_FSTATE				
30	CLR_FSTATE				
31	MAX_NOTIFY				1
32	LIM_NOTIFY		1		
33	CONFIRM_TIME		4		
34	WRITE_LOCK		1		
35	UPDATE_EVT				
36	BLOCK_ALM				
37	ALARM_SUM	8		8	
38	ACK_OPTION				2
39	WRITE_PRI				1
40	WRITE_ALM				
41	ITK_VER				2
42	COMPATIBILITY_REV				
43	CAPABILITY_LEV				
44	FD_VER				2
45	FD_FAIL_ACTIVE	4		4	
46	FD_OFFSPEC_ACTIVE	4		4	
47	FD_MAINT_ACTIVE	4		4	
48	FD_CHECK_ACTIVE	4		4	
49	FD_FAIL_MAP				4
50	FD_OFFSPEC_MAP				4
51	FD_MAINT_MAP				4
52	FD_CHECK_MAP				4
53	FD_FAIL_MASK				4
54	FD_OFFSPEC_MASK				4
55	FD_MAINT_MASK				4
56	FD_CHECK_MASK				4
57	FD_FAIL_ALM				
58	FD_OFFSPEC_ALM				
59	FD_MAINT_ALM				
60	FD_CHECK_ALM				
61	FD_FAIL_PRI				1
62	FD_OFFSPEC_PRI				1
63	FD_MAINT_PRI				1
64	FD_CHECK_PRI				1
65	FD_SIMULATE			9	
66	FD_RECOMMEN_ACT	2		2	
67	FD_EXTENDED_ACTIVE_1				
68	FD_EXTENDED_ACTIVE_2				
69	FD_EXTENDED_ACTIVE_3				
70	FD_EXTENDED_ACTIVE_4				
71	FD_EXTENDED_ACTIVE_5				
72	FD_EXTENDED_ACTIVE_6				
73	FD_EXTENDED_ACTIVE_7				
74	FD_EXTENDED_ACTIVE_8				
75	FD_EXTENDED_MAP_1				
76	FD_EXTENDED_MAP_2				
77	FD_EXTENDED_MAP_3				
78	FD_EXTENDED_MAP_4				
79	FD_EXTENDED_MAP_5				
80	FD_EXTENDED_MAP_6				
81	FD_EXTENDED_MAP_7				
82	FD_EXTENDED_MAP_8				
83	DEVICE_CONDITION_ACTIVE_1				
84	DEVICE_CONDITION_ACTIVE_2				
85	DEVICE_CONDITION_ACTIVE_3				
86	DEVICE_CONDITION_ACTIVE_4				
87	DEVICE_CONDITION_ACTIVE_5				
88	DEVICE_CONDITION_ACTIVE_6				
89	DEVICE_CONDITION_ACTIVE_7				
90	DEVICE_CONDITION_ACTIVE_8				
91	SOFTWARE_REV				
92	WRITE_LOCK_LEVEL				
	Total	40	30	49	69

Table 5.11 View Object for Transducer Block

Relative Index	Parameter Name	View								
		1	2	3-1	3-2	4-1	4-2	4-3	4-4	4-5
1	ST_REV	2	2	2	2	2	2	2	2	2
2	TAG_DESC									
3	STRATEGY					2				
4	ALERT_KEY					1				
5	MODE_BLK	4		4						
6	BLOCK_ERR	2		2						
7	UPDATE_EVT									
8	BLOCK_ALM									
9	TRANSDUCER_DIRECTORY									
10	TRANSDUCER_TYPE	2	2	2		2				
11	TRANSDUCER_TYPE_VER					2				
12	XD_ERROR	1		1						
13	COLLECTION_DIRECTORY									
14	PRIMARY_VALUE_TYPE		2			2				
15	PRIMARY_VALUE	5		5						
16	PRIMARY_VALUE_RANGE		11			11				
17	SECONDARY_VALUE_TYPE		2			2				
18	SECONDARY_VALUE	5		5						
19	SECONDARY_VALUE_UNIT		2			2				
20	XD_OPTS		4			4				
21	SENSOR_TYPE		2			2				
22	SENSOR_RANGE		11			11				
23	SENSOR_CAL_METHOD					1				
24	SENSOR_CAL_LOC					32				
25	SENSOR_CAL_DATE					7				
26	SENSOR_CAL_WHO					32				
27	BLOCK_ERR_DESC_1	4		4						
28	TERTIARY_VALUE_TYPE		2				2			
29	TERTIARY_VALUE	5		5						
30	TERTIARY_VALUE_UNIT		2				2			
31	LIMSW_1_VALUE_D	2		2						
32	LIMSW_1_TARGET								1	
33	LIMSW_1_SETPOINT								4	
34	LIMSW_1_ACT_DIRECTION								1	
35	LIMSW_1_HYSTERESIS								4	
36	LIMSW_1_UNIT								2	
37	LIMSW_2_VALUE_D	2		2						
38	LIMSW_2_TARGET								1	
39	LIMSW_2_SETPOINT								4	
40	LIMSW_2_ACT_DIRECTION								1	
41	LIMSW_2_HYSTERESIS								4	
42	LIMSW_2_UNIT								2	
43	FLOW_RATE_VALUE	5		5						
44	TEMP_RATE_VALUE	5		5						
45	PRESS_RATE_VALUE	5		5						
46	TOTAL_VALUE	5		5						
47	DENSITY			4						
48	DENSITY_RATIO			4						
49	ENTHALPY			4						
50	DELTA_TEMP			4						
51	DELTA_ENTHALPY			4						
52	VORTEX_FREQUENCY			4						
53	FLOW_VELOCITY			4						
54	CALC_TEMPERATURE			4						

Relative Index	Parameter Name	View								
		1	2	3-1	3-2	4-1	4-2	4-3	4-4	4-5
55	CALC_PRESSURE			4						
56	BUILT_IN_TEMP			4						
57	BUILT_IN_PRESS			4						
58	SENSOR_BOARD_TEMP				4					
59	EXTERNAL_TEMP_VALUE			5						
60	EXTERNAL_PRESS_VALUE			5						
61	EXTERNAL_DENSITY_VALUE			5						
62	FLUID		1				1			
63	FLOW_SELECT		1				1			
64	STEAM_TYPE		1				1			
65	COMPENSATION_TYPE		1				1			
66	TEMP_SELECT				1					
67	PRESS_SELECT				1					
68	AUX_INPUT_SELECT				1					
69	FLOW_NAVI_SELECT		1				1			
70	FLOW_SPAN		4				4			
71	FLOW_ZERO		4				4			
72	FLOW_DAMPING		4				4			
73	FLOW_RATE_LOWCUT		4				4			
78	TEMP_URV								4	
79	TEMP_LRV								4	
80	TEMP_DAMPING								4	
81	FIXED_TEMP						4			
82	BASE_TEMP						4			
83	TEMP_GAIN								4	
84	TEMP_OFFSET								4	
85	BUILT_IN_TEMP_OPTION						1			
86	PRESS_URV								4	
87	PRESS_LRV								4	
88	PRESS_DAMPING								4	
89	FIXED_PRESS						4			
90	BASE_PRESS						4			
91	ATM_PRESS						4			
92	AIR_PRESSURE_UNIT						1			
93	PRESS_GAIN								4	
94	PRESS_OFFSET								4	
95	BUILT_IN_PRESS_OPTION						1			
96	TOTAL_START_STOP		1				1			
97	TOTAL_RESET									
98	TOTAL_PRESET_VALUE		4					4		
99	TOTAL_UNIT		2					2		
100	TOTAL_RATE							4		
101	TOTAL_RATE_UNIT		1					1		
102	TOTALIZER_RESET_MODE							1		
103	K_FACTOR_UNIT							1		
104	K_FACTOR							4		
105	EXEC_TUNING_AT_ZERO									
106	TUNING_STATUS				1					
107	FLOW_RATE_GAIN							4		
108	INSTRUMENT_ERR_ADJ							1		
109	ADJ_VORTEX_FREQ									
110	ADJ_VORTEX_VALUE									
111	REYNOLDS_ADJ							1		
112	VISCOSITY							4		
113	VISCOSITY_UNIT							1		

Relative Index	Parameter Name	View								
		1	2	3-1	3-2	4-1	4-2	4-3	4-4	4-5
114	REYNOLDS_NUM				4					
115	ADJ_REYNOLDS_NUM									
116	ADJ_REYNOLDS_VALUE									
117	EXP_FACTOR_ADJ							1		
118	PIPE_SCHEDULE_ADJUST							1		
119	STRAIGHT_PIPE_ADJUST							4		
120	DENSITY_ENTHALPY_SEL				1					
121	DENSITY_UNIT							2		
122	FIXED_DENSITY							4		
123	BASE_DENSITY							4		
124	DRYNESS							4		
125	DEVIATION							4		
126	FIRST_TEMP_COEF							4		
127	SECOND_TEMP_COEF							4		
128	ENTHALPY_UNIT							1		
129	FIXED_ENTHALPY							4		
130	HEAT_DIFF_TEMP_SEL							1		
131	HEAT_DIFF_CNV_UNIT							1		
132	HEAT_DIFF_CNV_FACTOR							4		
133	ADV_DENSITY_COEF									
134	ADV_DENSITY_UPDATE_PIN									
135	ADV_DENSITY_UPDATE_SUM									
136	ADV_DENSITY_UPDATE_WHO									
137	ADV_DENSITY_UPDATE_DATE									
138	ADV_DENSITY_UPDATE_REV									
139	NOMINAL_SIZE								1	
140	BODY_TYPE								1	
141	VORTEX_SENSOR_TYPE								1	
142	CABLE_LENGTH								4	
143	SIGNAL_BAND				1					
144	SIGNAL_LEVEL									4
145	TLA_MODE									1
146	TLA_THRESHOLD_VAL									4
147	NOISE_BALANCE_MODE									1
148	NOISE_RATIO_AUTO				4					
149	NOISE_RATIO_MANUAL									4
150	SPAN_VELOCITY				4					
151	LOWCUT_VELOCITY				4					
152	VORTEX_FREQ				4					
153	SPAN_FREQ				4					
154	LOWCUT_FREQ				4					
155	LOWCUT_LIMIT				4					
156	FLUCTUATING									4
157	TRANSIENT									1
158	HIGH_VIBRATION_SELECT									1
159	HIGH_VIBRATION_TIME									1
160	CRITICAL_VIBRATION_ACTION									1
161	CRITICAL_VIBRATION_LEVEL									4
162	CRITICAL_VIBRATION_TIME									1
163	CLOGGING_TIME									1
164	SENSOR_CIRCUIT_THRESHOLD									2
165	SNSR_CAP_THRESHOLD									4
166	SNSR_RES_THRESHOLD									4
167	SIM_ENABLE_MSG									
168	SIM_MODE									

Relative Index	Parameter Name	View								
		1	2	3-1	3-2	4-1	4-2	4-3	4-4	4-5
169	SIM_VORTEX_FREQ_VALUE				4					
170	SIM_VORTEX_FREQ_HW_VALUE				4					
171	SIM_BUILTIN_TEMP_VALUE				4					
172	SIM_BUILTIN_PRESS_VALUE				4					
173	SIM_AUTO_RELEASE_TIME									1
174	FLOW_SENSOR_ALARM_ACTION									1
175	TEMPERATURE_SENSOR_ ALARM_ACTION									1
176	PRESSURE_SENSOR_ALARM_ ACTION									1
177	AUX_INPUT_ALARM_ACTION									1
178	AUX_INPUT_OPTION									1
179	FIRST_TEMP_COEF_UNIT				1					
180	SECOND_TEMP_COEF_UNIT				1					
	Total	54	71	113	62	115	51	73	73	46

Table 5.12 View Object for Display Transducer Block

Relative Index	Parameter Name	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	UPDATE_EVT				
8	BLOCK_ALM				
9	TRANSDUCER_DIRECTORY				
10	TRANSDUCER_TYPE	2	2	2	2
11	TRANSDUCER_TYPE_VER				2
12	XD_ERROR	1		1	
13	COLLECTION_DIRECTORY				
14	UPPER_DISPLAY_MODE				1
15	LOWER_DISPLAY_MODE				1
16	DISPLAY_PERIOD				1
17	DISPLAY_STARTUP				1
18	DISPLAY_NE107				1
19	DISPLAY_FLOW_RATE_DIGIT				1
20	DISPLAY_TEMP_DIGIT				1
21	DISPLAY_PRESS_DIGIT				1
22	LCD_TEST			1	
23	SQUAWK			1	
24	DISPLAY_INST_OPTION				
	Total	11	4	13	17

Table 5.13 View Object for Maintenance Transducer Block

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
0	MAINTENANCE_TB																
1	ST_REV	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	TAG_DESC																
3	STRATEGY									2							
4	ALERT_KEY									1							
5	MODE_BLK	4		4													
6	BLOCK_ERR	2		2													
7	UPDATE_EVT																
8	BLOCK_ALM																
9	TRANSDUCER_ DIRECTORY																
10	TRANSDUCER_TYPE	2	2	2						2							
11	TRANSDUCER_ TYPE_VER									2							
12	XD_ERROR	1		1													
13	COLLECTION_ DIRECTORY																
14	OPERATION_TIME	16		16													
15	CURRENT_DATE	7		7													
16	SYSTEM_ALARM_1	1		1													
17	SYSTEM_ALARM_2	1		1													
18	PROCESS_ALARM_1	1		1													
19	PROCESS_ALARM_2	1		1													
20	SETTING_ALARM_1	1		1													
21	SETTING_ALARM_2	1		1													
22	WARNING_1	1		1													
23	WARNING_2	1		1													
24	ALARM_STATUS_ SELECT		1								1						
25	ALARM_RECORD_ SELECT		1								1						
26	CLEAR_ALARM_ RECORD			1													
27	ALARM_AUTO_ DELETE_TIME		2								2						
28	SENSOR_BACKUP_ RESTORE			1													
29	SENSOR_BACKUP_ RESTORE_RESULT			1													
30	SOFTWARE_DESC			32													
31	SOFTDL_PROTECT										1						
32	SOFTDL_ERROR			2													
33	SOFTDL_COUNT			2													
34	SOFTDL_ACT_AREA			1													
35	MODEL											16					
36	MEMO_1										16						
37	MEMO_2										16						
38	MEMO_3										16						
39	DISTRIBUTOR											16					
40	DEVICE_ID											32					
41	SENSOR_MS_CODE_1												16				
42	SENSOR_MS_CODE_2												16				
43	SENSOR_MS_CODE_3												16				
44	SENSOR_MS_CODE_4												16				
45	SENSOR_MS_CODE_5												16				

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
46	SENSOR_MS_CODE_6												16				
47	SENSOR_STYLE_CODE											16					
48	TRANSMITTER_MS_CODE_1											16					
49	TRANSMITTER_MS_CODE_2													16			
50	TRANSMITTER_MS_CODE_3													16			
51	TRANSMITTER_MS_CODE_4													16			
52	TRANSMITTER_MS_CODE_5													16			
53	TRANSMITTER_MS_CODE_6													16			
54	TRANSMITTER_STYLE_CODE													16			
55	SPECIAL_ORDER_NUM_1														16		
56	SPECIAL_ORDER_NUM_2														16		
57	SIZING_NUMBER														16		
58	NAME_PLATE_TAG_NUMBER														16		
59	IM_NUMBER															16	
60	MANUFAC_DATE										7						
61	SENSOR_SERIAL_NUM															16	
62	TRANSMITTER_SN															16	
63	HARD_REV															16	
64	SENSOR_EEP_VER										1						
65	MAIN_BOARD_ASSY_ID_NO															16	
66	MAIN_BOARD_ASSY_PN																16
67	SENSOR_BOARD_ASSY_PN																16
68	SENSOR_ASSY_PN																16
69	DISPLAY_ASSY_PN																16
70	GASKET_PN																16
71	PRESSURE_PN																16
72	INTEGRAL_OR_REMOTE										1						
73	MAX_TEMP										4						
74	MAX_PRESS										4						
75	COMM_TYPE										1						
76	SI_CONTROL_CODES										1						
77	ALLIANCE_SENSOR_OPTION										1						
78	DUAL_BOLTED_OPTION										1						
79	CRYOGENIC_OPTION										1						
80	VERIFICATION_OPTION										1						
81	PREDICTION_FUNCTION										1						
82	OPTION_BWC										1						
83	ALARM_RECORD_1				1												

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
84	ALARM_RECORD_1_DATE				7												
85	ALARM_RECORD_1_OP_TIME				16												
86	ALARM_RECORD_2				1												
87	ALARM_RECORD_2_DATE				7												
88	ALARM_RECORD_2_OP_TIME				16												
89	ALARM_RECORD_3				1												
90	ALARM_RECORD_3_DATE				7												
91	ALARM_RECORD_3_OP_TIME				16												
92	ALARM_RECORD_4				1												
93	ALARM_RECORD_4_DATE				7												
94	ALARM_RECORD_4_OP_TIME				16												
95	ALARM_RECORD_5					1											
96	ALARM_RECORD_5_DATE					7											
97	ALARM_RECORD_5_OP_TIME					16											
98	RECENT_ALARM_1					1											
99	RECENT_ALARM_1_DATE					7											
100	RECENT_ALARM_1_OP_TIME					16											
101	RECENT_ALARM_2					1											
102	RECENT_ALARM_2_DATE					7											
103	RECENT_ALARM_2_OP_TIME					16											
104	RECENT_ALARM_3					1											
105	RECENT_ALARM_3_DATE					7											
106	RECENT_ALARM_3_OP_TIME					16											
107	RECENT_ALARM_4						1										
108	RECENT_ALARM_4_DATE						7										
109	RECENT_ALARM_4_OP_TIME						16										
110	RECENT_ALARM_5						1										
111	RECENT_ALARM_5_DATE						7										
112	RECENT_ALARM_5_OP_TIME						16										
113	EXEC_BUILTIN_VF																
114	BUILTIN_VF_TARGET									1							
115	BUILTIN_VF_PROGRESS							1									
116	BUILTIN_VF_SWITCH									1							
117	BUILTIN_VF_DATE							7									
118	BUILTIN_VF_OPERATION_TIME							16									
119	BUILTIN_VF_RESULT							1									

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
120	SENSOR_CIRCUIT_RESULT							1									
121	SIGNAL_PROC_CIRCUIT_RESULT							1									
122	CALC_CIRCUIT_RESULT							1									
123	ALARM_STATUS_RESULT							1									
124	ALARM_RECORD_RESULT							1									
125	LATCH_EXE																
126	LATCH_SWITCH									1							
127	LATCHED_STATUS							1									
128	LATCHED_DATE							7									
129	LATCHED_OPERATION_TIME							16									
130	LATCHED_VORTEX_FREQ							4									
131	LATCHED_FLOW_VELOCITY							4									
132	LATCHED_MAX_BAND							1									
133	LATCHED_NOISE_RATIO							4									
134	LATCHED_NR_CAL_BAND_1							1									
135	LATCHED_NR_CAL_BAND_2							1									
136	LATCHED_TLA							4									
137	LATCHED_BASIC_BAND							1									
138	LATCHED_AMP_0																
139	LATCHED_AMP_1																
140	LATCHED_AMP_2																
141	LATCHED_AMP_3																
142	LATCHED_AMP_4																
143	LATCHED_AMP_5																
144	LATCHED_AMP_6																
145	LATCHED_AMP_7																
146	LATCHED_AMP_8																
147	LATCHED_P_SIGNAL																
148	LATCHED_TP2_SIGNAL_1																
149	LATCHED_TP2_SIGNAL_2																
150	LATCHED_TP2_SIGNAL_3																
151	LATCHED_TP2_SIGNAL_4																
152	LATCHED_TP2_SIGNAL_5																
153	LATCHED_TP2_SIGNAL_6																
154	LATCHED_TP2_SIGNAL_7																
155	LATCHED_TP2_SIGNAL_8																
156	LATCHED_TP2_SIGNAL_9																

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
157	LATCHED_TP2_SIGNAL_10																
158	PREDICTION_EXE		1							1							
159	PREDICTION_SEL		1							1							
160	PREDICTION_PERIOD		2							2							
161	PREDICTION_START_DATE		7							7							
162	PREDICTION_STOP_DATE		7							7							
163	PREDICTION_LEVEL		4							4							
164	PREDICTION_ALARM_TIME		2							2							
165	PREDICTION_ESTIMATE_TIME								2								
166	PREDICTION_RESULT								1								
167	PREDICTION_TYPE		1							1							
168	PREDICT_X1_DATA_COEF								4								
169	PREDICT_X1_DATA_1																
170	PREDICT_X1_DATA_2																
171	PREDICT_X1_DATA_3																
172	PREDICT_X1_DATA_4																
173	PREDICT_X1_DATA_5																
174	PREDICT_X1_DATA_6																
175	PREDICT_X1_DATA_7																
176	PREDICT_X1_DATA_8																
177	PREDICT_X1_DATA_9																
178	PREDICT_X1_DATA_10																
179	PREDICT_X2_DATA_COEF								4								
180	PREDICT_X2_DATA_1																
181	PREDICT_X2_DATA_2																
182	PREDICT_X2_DATA_3																
183	PREDICT_X2_DATA_4																
184	PREDICT_X2_DATA_5																
185	PREDICT_X2_DATA_6																
186	PREDICT_X2_DATA_7																
187	PREDICT_X2_DATA_8																
188	PREDICT_X2_DATA_9																
189	PREDICT_X2_DATA_10																
190	VORTEX_COEFF								4								
191	VORTEX_DATA_1																
192	VORTEX_DATA_2																
193	VORTEX_DATA_3																
194	VORTEX_DATA_4																
195	VORTEX_DATA_5																
196	VORTEX_DATA_6																
197	VORTEX_DATA_7																
198	VORTEX_DATA_8																
199	VORTEX_DATA_9																
200	VORTEX_DATA_10																
201	A_COEFF								4								
202	A_DATA_1																
203	A_DATA_2																

Relative Index	Parameter Name	View															
		1	2	3-1	3-2	3-3	3-4	3-5	3-6	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
204	A_DATA_3																
205	A_DATA_4																
206	A_DATA_5																
207	A_DATA_6																
208	A_DATA_7																
209	A_DATA_8																
210	A_DATA_9																
211	A_DATA_10																
212	B_COEFF								4								
213	B_DATA_1																
214	B_DATA_2																
215	B_DATA_3																
216	B_DATA_4																
217	B_DATA_5																
218	B_DATA_6																
219	B_DATA_7																
220	B_DATA_8																
221	B_DATA_9																
222	B_DATA_10																
223	C_COEFF								4								
224	C_DATA_1																
225	C_DATA_2																
226	C_DATA_3																
227	C_DATA_4																
228	C_DATA_5																
229	C_DATA_6																
230	C_DATA_7																
231	C_DATA_8																
232	C_DATA_9																
233	C_DATA_10																
234	WAVE_FORM_EXECUTION																
235	WAVE_FORM_TARGET																
236	WAVE_FORM_ALARM								1								
237	WAVE_FORM_DATE								7								
238	WAVE_FORM_OPERATION_TIME								16								
239	WAVE_FORM_VORTEX_FREQUENCY								4								
240	WAVE_FORM_VELOCITY								4								
241	WAVE_FORM_SAMPLING_FREQUENCY								4								
242	TEMP_UNIT_REF								2								
243	PRESS_UNIT_REF								2								
244	SENSOR_RESET																
	Total	42	33	82	98	98	50	76	69	37	80	98	98	98	66	82	98

Table 5.14 View Object for AI Function Block

Relative Index	Parameter Name	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	OUT	5		5	
9	SIMULATE				
10	XD_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	L_TYPE				1
17	LOW_CUT				4
18	PV_FTIME				4
19	FIELD_VAL	5		5	
20	UPDATE_EVT				
21	BLOCK_ALM				
22	ALARM_SUM	8		8	
23	ACK_OPTION				2
24	ALARM_HYS				4
25	HI_HI_PRI				1
26	HI_HI_LIM				4
27	HI_PRI				1
28	HI_LIM				4
29	LO_PRI				1
30	LO_LIM				4
31	LO_LO_PRI				1
32	LO_LO_LIM				4
33	HI_HI_ALM				
34	HI_ALM				
35	LO_ALM				
36	LO_LO_ALM				
37	BLOCK_ERR_DESC_1				
	Total	31	26	31	46

Table 5.15 View Object for DI Function Block

Relative Index	Parameter Name	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV_D	2		2	
8	OUT_D	2		2	
9	SIMULATE_D				
10	XD_STATE		2		
11	OUT_STATE		2		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	PV_FTIME				4
17	FIELD_VAL_D	2		2	
18	UPDATE_EVT				
19	BLOCK_ALM				
20	ALARM_SUM|ALARM_SUM_DI	8		8	
21	ACK_OPTION				2
22	DISC_PRI				1
23	DISC_LIM				1
24	DISC_ALM				
	Total	22	8	22	19

Table 5.16 View Object for PID Function Block

Relative Index	Parameter Name	View 1	View 2	View 3	View 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	SP	5		5	
9	OUT	5		5	
10	PV_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	CONTROL_OPTS				2
14	STATUS_OPTS				2
15	IN			5	
16	PV_FTIME				4
17	BYPASS		1		
18	CAS_IN	5		5	
19	SP_RATE_DN				4
20	SP_RATE_UP				4
21	SP_HI_LIM		4		
22	SP_LO_LIM		4		
23	GAIN				4
24	RESET				4
25	BAL_TIME				4
26	RATE				4
27	BKCAL_IN			5	
28	OUT_HI_LIM		4		
29	OUT_LO_LIM		4		
30	BKCAL_HYS				4
31	BKCAL_OUT			5	
32	RCAS_IN			5	
33	ROUT_IN			5	
34	SHED_OPT				1
35	RCAS_OUT			5	
36	ROUT_OUT			5	
37	TRK_SCALE				11
38	TRK_IN_D	2		2	
39	TRK_VAL	5		5	
40	FF_VAL			5	
41	FF_SCALE				11
42	FF_GAIN				4
43	UPDATE_EVT				
44	BLOCK_ALM				
45	ALARM_SUM	8		8	
46	ACK_OPTION				2
47	ALARM_HYS				4
48	HI_HI_PRI				1
49	HI_HI_LIM				4
50	HI_PRI				1
51	HI_LIM				4
52	LO_PRI				1
53	LO_LIM				4
54	LO_LO_PRI				1
55	LO_LO_LIM				4
56	DV_HI_PRI				1
57	DV_HI_LIM				4
58	DV_LO_PRI				1
59	DV_LO_LIM				4
60	HI_HI_ALM				
61	HI_ALM				
62	LO_ALM				
63	LO_LO_ALM				
64	DV_HI_ALM				
65	DV_LO_ALM				
	Total	43	43	83	104

Table 5.17 View Object for MAO Function Block

Relative Index	Parameter Name	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	CHANNEL				2
8	IN_1	5		5	
9	IN_2	5		5	
10	IN_3	5		5	
11	IN_4	5		5	
12	IN_5	5		5	
13	IN_6	5		5	
14	IN_7	5		5	
15	IN_8	5		5	
16	MO_OPTS				2
17	FSTATE_TIME				4
18	FSTATE_VAL1				4
19	FSTATE_VAL2				4
20	FSTATE_VAL3				4
21	FSTATE_VAL4				4
22	FSTATE_VAL5				4
23	FSTATE_VAL6				4
24	FSTATE_VAL7				4
25	FSTATE_VAL8				4
26	FSTATE_STATUS	2		2	
27	UPDATE_EVT				
28	BLOCK_ALM				
	Total	50	2	50	45

Table 5.18 View Object for IT Function Block

Relative Index	Parameter Name	View 1	View 2	View 3	View 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	TOTAL_SP	4		4	
8	OUT	5		5	
9	OUT_RANGE		11		
10	GRANT_DENY		2		
11	STATUS_OPTS				2
12	IN_1	5		5	
13	IN_2	5		5	
14	OUT_TRIP	2		2	
15	OUT_PTRIP	2		2	
16	TIME_UNIT1		1		
17	TIME_UNIT2		1		
18	UNIT_CONV				4
19	PULSE_VAL1				4
20	PULSE_VAL2				4
21	REV_FLOW1	2		2	
22	REV_FLOW2	2		2	
23	RESET_IN	2		2	
24	STOTAL			4	
25	RTOTAL	4		4	
26	SRTOTAL			4	
27	SSP			4	
28	INTEG_TYPE				1
29	INTEG_OPTS				2
30	CLOCK_PER				4
31	PRE_TRIP				4
32	N_RESET	4		4	
33	PCT_INCL	4		4	
34	GOOD_LIM				4
35	UNCERT_LIM				4
36	OP_CMD_INT	1		1	
37	OUTAGE_LIM				4
38	RESET_CONFIRM	2		2	
39	UPDATE_EVT				
40	BLOCK_ALM				
41	ACCUM_TOTAL				
	Total	52	17	64	42

Table 5.19 View Object for AR Function Block

Relative Index	Parameter Name	View 1	View 2	View 3	View 4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	OUT	5		5	
9	PRE_OUT	5		5	
10	PV_SCALE		11		
11	OUT_RANGE		11		
12	GRANT_DENY		2		
13	INPUT_OPTS				2
14	IN			5	
15	IN_LO			5	
16	IN_1			5	
17	IN_2			5	
18	IN_3			5	
19	RANGE_HI				4
20	RANGE_LO				4
21	BIAS_IN_1				4
22	GAIN_IN_1				4
23	BIAS_IN_2				4
24	GAIN_IN_2				4
25	BIAS_IN_3				4
26	GAIN_IN_3				4
27	COMP_HI_LIM				4
28	COMP_LO_LIM				4
29	ARITH_TYPE				1
30	BAL_TIME				4
31	BIAS				4
32	GAIN				4
33	OUT_HI_LIM				4
34	OUT_LO_LIM				4
35	UPDATE_EVT				
36	BLOCK_ALM				
	Total	23	26	48	68

Table 5.20 Indexes of VIEW for Each Block

Block Name	VIEW			
	1	2	3	4
Resource block	40100	40101	40102	40103
Sensor transducer block	40200	40201	40202 to 40203	40204 to 40208
Display transducer block	40250	40251	40252	40253
Maintenance transducer block	40300	40301	40302 to 40307	40308 to 40315
AI1 function block	40400	40401	40402	40403
AI2 function block	40410	40411	40412	40413
AI3 function block	40420	40421	40422	40423
DI1 function block	40600	40601	40602	40603
DI2 function block	40610	40611	40612	40613
PID function block	40800	40801	40802	40803
MAO function block	41000	41001	41002	41003
IT function block	41600	41601	41602	41603
AR function block	41750	41751	41752	41753

5.6.5 Function Block Parameters

Function block parameters can be read or set from the host. For the list of the parameters of the Resource block, Transducer block, AI block, DI block and MAO block, refer to “Parameter Lists” in Chapter 7. For details about function blocks other than the AI, DI and MAO blocks, the LM function, and the software download function, refer to Appendices 1 to 6.

6. Functions

This chapter describes the functions of the product. The following is an overview of each function.

NOTE

This product inherits many of the parameter numbers of the A items (display items), B items (standard setting items), D items (additional setting items), and J items (test items) of the display parameter numbers that were defined on the previous product digital YEWFLO series vortex flowmeter. Note, however, that the setting method on this product differs from the setting method on the previous product. Also, new item names are defined for newly added functions.
As temperature and pressure correction functions have been enhanced on this product, the names of parameter items and method of use vary considerably with display parameter number F items (temperature setting items) on the previous product.
In consideration of the above, set the parameters on this product while referring to this document.

■ Flow rate measurement function

Fluids that can be measured are liquid, gas, water, and steam. As measured flow rate options, volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference can be measured.
The measured flow rate can be displayed on the display as the instantaneous flow rate. The flow rate unit, flow rate span, damping time constant, and lowcut function can be set for the measured flow rate.
For details about how to check measured results and the setting procedure, see Section 6.1.

■ Totalization function

With this function, instantaneous flow rate values can be totaled. The product has a function for resetting the totalized value and a totalization preset function for starting totalization from a preset value.
For details about how to check the totalized flow rate and setting procedure, see Section 6.2.

■ Temperature measurement function

On a type with built-in temperature gauge, fluid temperature can be measured by the built-in temperature gauge. This measured temperature can be displayed on the display. On an external input type, the measured temperature value can be acquired from the temperature transmitter connected to the external input and displayed on the display.
For details about how to check the temperature measurement function and setting procedure, see Section 6.3.

■ Pressure measurement function

The measured pressure value can be acquired from the pressure transmitter connected to the external input. This measured pressure can be displayed on the display.
For details about how to check the pressure measurement function and setting procedure, see Section 6.4.

■ Density measurement function

The measured density value can be acquired from the density transmitter connected to the external input. This measured density can be displayed on the display.
For details about how to check the density measurement function and setting procedure, see Section 6.5.

■ External input function

Three external inputs are available. Measured temperature, pressure or density values can be acquired from the temperature transmitter, pressure transmitter or density transmitter connected to the external input.
For details about setting procedures for the external input, see Section 6.6.

■ Sensor information

Diameter, sensor type, maximum temperature, maximum pressure, and other sensor information can be checked.
For details about how to check the sensor information, see Section 6.8.

■ Alarms

A detected error can be notified as an alarm or warning. The error status can be displayed in accordance with NAMUR NE107 matched to parameter settings. Display method, etc. when an alarm occurs can be selected. It is also possible to store alarms that occurred in the past as an alarm history, and mask unnecessary alarms so that they are hidden on the display.
For details about contents and setting procedures, see Section 6.11.

■ Display functions

In the flow rate display mode, instantaneous flow rate, totalized values, and other information is displayed. In the setting mode, parameter content is displayed. When an alarm occurs, a number indicating the content of the alarm is displayed.
For details about display settings, see Section 6.12.

■ Device information

With this function, the parameters specified at the time of order, model code, and suffix code of this product can be checked.
For details about how to check the device information, see Section 6.13.

■ Self-diagnostics

The self-diagnostics function can be used to diagnose product failures or process status. For example, this function is useful for diagnosing disconnections on the piezo electric device, diagnosing insulation deterioration, and diagnosing the health of the product by using the verification function.
For details about the self-diagnostics function, see Section 6.14.

■ Predictive diagnostic function

By using the predictive diagnosis mode, the maintenance timing can be predicted based on the trend of the detection signal from the piezo electric device.
For details about the predictive diagnostic function, see Subsection 6.14.6.

■ Frequency analysis function

For details about the frequency analysis function, see Subsection 6.14.8.

■ Test/simulation function

With this function, the internal measured value of a vortex flowmeter and the input value of the function block can be arbitrarily set to test a response from the device.
For details about the test/simulation function, see Section 6.15.

■ Write lock function

Two parameter write lock functions are available and can be changed by using the hardware write lock switch and the parameter settings (software write lock).
For details about the hardware write lock switch, refer to the Startup Manual. For details about the software write lock function, see Section 6.16.

NOTE

Only display related parameters required for use of this product can be set and displayed on the display. Parameters that cannot be set and displayed on the display should be set and checked using the FOUNDATION Fieldbus configuration tool.

6.1 Flow Rate Measurement Function

NOTE

The parameters that need setting vary according to the measured fluid and measured flow rate settings.
Parameters can be set easily by executing FOUNDATION Fieldbus communication method functions.

6.1.1 Connection of Process Value to AI Function

The process values calculated by STB are output to a specific channel, respectively. By selecting the channel used in the AI function block, a process value is obtained from STB.
The relation of the channel for each process value and the channel which can be selected from each AI function block is shown in the figure below.

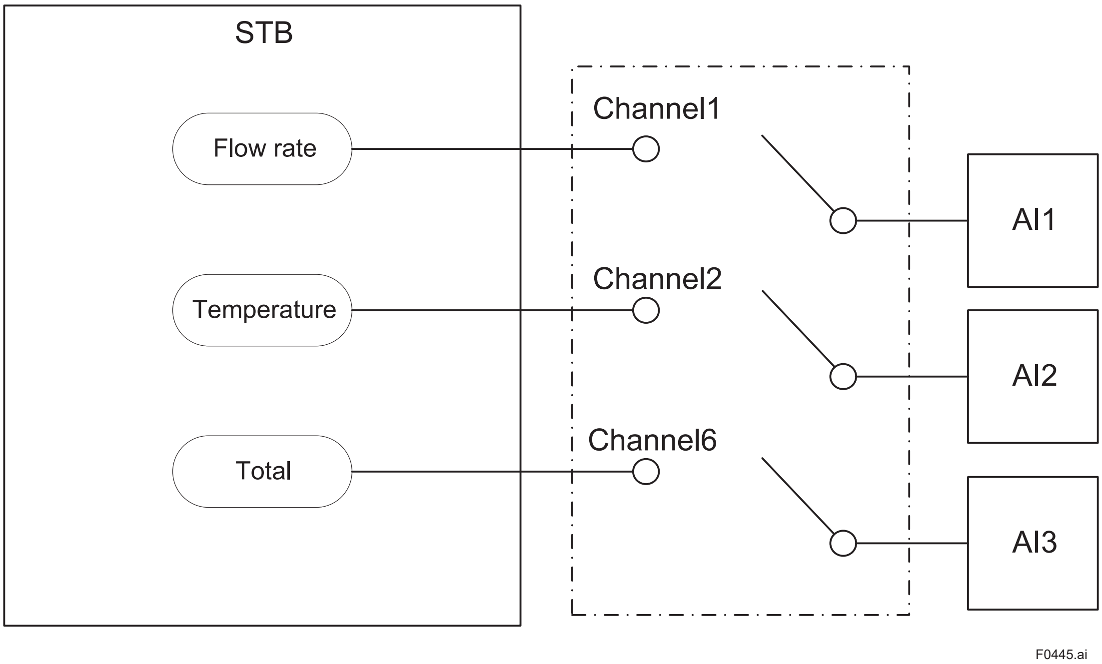


Figure 6.1 Relation of Process Value of STB and AI Function Block

The information of the figure above can be organized below.

Table 6.1 List of Relation of Process Value and AI Function Block

CHANNEL number	Selection	Corresponding function block
1	Flow rate	AI1, AI2, AI3
2	Temperature	AI1, AI2, AI3
6	Total	AI1, AI2, AI3

A channel can be selected in each AI function block with the following parameters. Please note that it needs to change to the O/S mode to change the channel.

Menu path

FOUNDATION Fieldbus	Device Configuration ► AI1* ► Device Configuration ► Configuration ► Basic Setting ► Channel
Display	-

*One from AI1 to 3.

The process value of the channel selected in AI can be checked with the following parameter.

Menu path

FOUNDATION Fieldbus	Process Variable ► STB ► Process Variables ► Dynamic Variables ► Device Variables ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Flow ► Primary Value. Status	-	The flow rate status is displayed (refer to “Flow select” for the measured flow rate setting)
Flow ► Primary Value. Value	-	The flow rate value is displayed
Temperature ► Secondary Value.Status	-	The temperature status is displayed
Temperature ► Secondary Value.Value	-	The temperature value is displayed
Totalizer ► Totalizer.Status	-	The totalization status is displayed
Totalizer ► Totalizer.Value	-	The totalized value is displayed

Setting example: When used by outputting the volumetric flow rate from AIx (where x is a value from 1 to 3) and setting the volumetric flow rate span at 100 m^3/h, set the parameters as shown below.

AIx:CHANNEL = “Flow rate”
STB:Flow select = “Volume”
AIx:Transducer Scale.Units Index = “m^3/h”
AIx:Transducer Scale.EU at 100% = “100.0”
AIx:Transducer Scale.EU at 100% = “0.0”

Setting example: When used by outputting the superheated steam mass flow rate from AIx (where x is a value from 1 to 3) and setting the mass flow rate span at 150 kg/h and the compensation type to external temperature & external pressure, set the parameters as shown below.

AIx:CHANNEL = “Flow rate”
STB:Flow select = “Mass”
STB:Fluid type = “Steam”
STB:Steam type = “Superheat steam”
STB:Compensation type = “A-in temp & A-in press”
AIx:Transducer Scale.Units Index = “kg/h”
AIx:Transducer Scale.EU at 100% = “150.0”
AIx:Transducer Scale.EU at 100% = “0.0”

6.1.2 Setting the Measured Fluid

Fluids that can be measured are liquid, gas, water, and steam. When the measured fluid is water and the Fluid type of this parameter is set to Water, temperature and pressure correction of the mass flow rate and heat are performed based on steam table.
Set the measured fluid by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Application Setup ► Fluid type
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Liquid	-	Liquid is set as the measured fluid
Gas	-	Gas is set as the measured fluid
Water	-	Water is set as the measured fluid
Steam	-	Steam is set as the measured fluid

NOTE

When Water is set as the measured fluid, flow rate calculation of water is performed based on the steam table. Just as on the previous product digital YEWFLO series vortex flowmeter, when performing flow rate measurement of water, set Liquid as the measured fluid.

NOTE

Use the Dryness setting fixed at 100 %.

6.1.3 Setting the Measured Flow Rate

As measured flow rate options, volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference can be measured.
Set the measured flow rate by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Application Setup ► Flow select
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Volume	-	Volumetric flow rate: This refers to the volume of fluid that flows through the measuring pipe per unit hour.
Mass	-	Mass flow rate: This refers to the mass of fluid that flows through the measuring pipe per unit hour. Mass is the value obtained by multiplying the volumetric flow rate by the fluid density.
Standard/Normal	-	Standard/Normal flow rate: This refers to the volume of the fluid in a standard or normal state that flows through the measuring pipe per unit hour.
Energy	-	Heat: This refers to the heat of the fluid that flows through the measuring pipe per unit hour. When the measured fluid is water or steam, this is the value obtained by multiplying the mass flow rate by the fluid specific enthalpy that is calculated according to IAPWS-IF97: IAPWS Industrial Formulation 1997.
Energy (Heat difference)	-	Heat difference: This refers to the heat difference of the fluid that flows through the measuring pipe per unit hour, and that uses the temperature difference between the upstream and downstream. When the measured fluid is water or steam, this is the value obtained by multiplying the mass flow rate by the difference in fluid specific enthalpy that is calculated according to IAPWS-IF97: IAPWS Industrial Formulation 1997. When the measured fluid is a liquid, this is the value obtained by multiplying the volumetric flow rate or mass flow rate by heat difference and heat conversion factor.

6.1.4 Engineering Unit Setting

The unit of the process value set for the AI channel (see 6.1.1) can be set with the following parameter.

Menu path

FOUNDATION Fieldbus	Device Configuration ► AI1* ► Device Configuration ► Configuration ► Scale ► Transducer Scale ► Transducer Scale.Units Index
Display	-

*One from AI1 to AI3.
The setting for this parameter is also reflected to the following parameters for STB.
(Only the unit of the process value selected in the AI channel is reflected.)

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Flow rate setup ► Flow unit & scale ► Primary Value Range.Units Index	-	The unit for flow rate is displayed
Temperature setup ► Temperature unit & scale ► Temperature Unit	-	The unit for temperature is displayed
Totalizer setup ► Totalizer unit	-	The totalization unit is displayed

NOTE

If there is inconsistency between the process value selected in the AI FB channel and the unit set with XD scale Units index, Bit1 in Block Error of the AI function block is set on.
Example:
AI Channel: 1 (flow rate), XD scale Units index (Transducer Scale.Units Index): 1001 (degC)

6.1.5 Setting the Span

The span of the process value set in AI Channel can be set.
Note, however, that the span unit is the unit set in section 6.1.4. When the unit has been changed, the span value is converted interlocked with the newly set unit.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ AI1* ▶ Device Configuration ▶ Configuration ▶ Scale ▶ Transducer Scale ▶ (see table below)
Display	-

*One from AI1 to AI3.

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Transducer Scale.EU at 100%	-	The upper limit value (100%) of the process value selected in the AI channel is set
Transducer Scale.EU at 0%	-	The lower limit value (0%) of the process value selected in the AI channel is set

● Measurable minimum flow velocity

The minimum flow velocity of each size varies according to the density of the fluid. Table 6.2 shows this relationship. Check the minimum flow velocity by size in the latest version of the sizing program. The volumetric flow rate that calculation is based on is restricted by the values in Table 6.2 when the flow rate is heat and heat difference, too.

Table 6.2 Relationship Between Minimum Velocity and Density (when two values are indicated, the larger one is the minimum velocity)

Model code - Type of body			Liquid		Gas, Steam	
			Type of shedder bar			
-0: General type -6: Dual-Sensor (Welded) General Type	-1: Reduced bore type (1 size reduction) -4: High pressure reduced bore type (1 size reduction)	-2: Reduced bore type (2 size reduction)	A, B, G, H, N, P: General type, E, S: Cryogenic type (*1) U, V: Long Neck Type	C, D, Q, R: High temperature type (*1)	A, B, G, H, N, P: General type, E, S: Cryogenic type (*1) U, V: Long Neck Type	C, D, Q, R: High temperature type (*1)
VY015-0 VY015-6	VY025-1 VY025-4	VY040-2	$\sqrt{250/\rho}$	-	$\sqrt{80/\rho}$ or 3	-
VY025-0 VY025-6	VY040-1 VY040-4	VY050-2	$\sqrt{122.5/\rho}$	$\sqrt{490/\rho}$	$\sqrt{45/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
VY040-0 VY040-6	VY050-1 VY050-4	VY080-2	$\sqrt{90/\rho}$	$\sqrt{302.5/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{90.3/\rho}$ or 2
VY050-0 VY050-6	VY080-1 VY080-4	VY100-2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
VY080-0 VY080-6	VY100-1 VY100-4	VY150-2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
VY100-0 VY100-6	VY150-1 VY150-4	VY200-2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
VY150-0 VY150-6	VY200-1	-	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
VY200-0 VY200-6	-	-	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ or 3	$\sqrt{80/\rho}$ or 3
VY250-0	-	-	$\sqrt{160/\rho}$	$\sqrt{360/\rho}$	$\sqrt{61.3/\rho}$ or 3	$\sqrt{125/\rho}$ or 3
VY300-0	-	-	$\sqrt{160/\rho}$	$\sqrt{360/\rho}$	$\sqrt{61.3/\rho}$ or 3	$\sqrt{125/\rho}$ or 3
VY400-0	-	-	$\sqrt{250/\rho}$	$\sqrt{490/\rho}$	$\sqrt{80/\rho}$ or 4	$\sqrt{125/\rho}$ or 4

(Unit: m/s)

ρ: Density at operating conditions (kg/m^3)
For liquid: 400 to 2000 kg/m^3
For gas and steam: 0.5 kg/m^3 or more

*1: The high pressure reduced bore type body cannot be combined with a high temperature type or cryogenic type shedder bar.

Measurable flow velocity

Table 6.3 shows the ranges of the measurable flow velocities.

Table 6.3 Range of Measurable Flow Velocities

<table>
<tr><th rowspan="3">Fluid</th><th colspan="3">Model code - Type of body</th><th rowspan="3">Minimum flow velocity</th><th rowspan="3">Maximum flow velocity</th></tr>
<tr><th rowspan="2">-0: General type
-6: Dual-Sensor (Welded) General Type</th><th>-1: Reduced bore type
(1 size reduction)</th><th rowspan="2">-2: Reduced bore type
(2 size reduction)</th></tr>
<tr><th>-4: High pressure reduced bore type
(1 size reduction)</th></tr>
<tr><td rowspan="2">Liquid</td><td rowspan="2">VY015-0 to VY400-0
VY015-6 to VY200-6</td><td>VY025-1 to VY200-1</td><td rowspan="2">VY040-2 to VY200-2</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 5000, whichever is greater.</td><td rowspan="2">10 m/s
(*1)</td></tr>
<tr><td>VY025-4 to VY150-4</td></tr>
<tr><td rowspan="2">Gas
Steam</td><td rowspan="2">VY015-0 to VY400-0
VY015-6 to VY200-6</td><td>VY025-1 to VY200-1</td><td rowspan="2">VY040-2 to VY200-2</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 5000, whichever is greater.</td><td rowspan="2">80m/s
(*2)</td></tr>
<tr><td>VY025-4 to VY150-4</td></tr>
</table>

When the flow velocity is lower than the minimum, both the analog output and the pulse output are displayed as “0”.

Maximum possible value for span setting: For liquid, a flow rate up to the equivalent of a flow velocity of 15 m/s can be specified.
For gas or steam, a flow rate up to the equivalent of a flow velocity of 120 m/s can be specified.

*1: When density $\rho > 1000$ kg/m^3, maximum flow velocity $V = \sqrt{[(1/\rho) * 10^5]}$

*2: When density $\rho > 15.6$ kg/m^3, maximum flow velocity $V = \sqrt{[(1/\rho) * 10^5]}$

Fixed accuracy flow velocity

Table 6.4 shows the range of the fixed accuracy flow velocities.

Table 6.4 Range of fixed accuracy flow velocity

<table>
<tr><th rowspan="3">Fluid</th><th colspan="3">Model code/Type of body</th><th rowspan="3">Minimum flow velocity</th><th rowspan="3">Maximum flow velocity</th></tr>
<tr><th rowspan="2">-0: General type
-6: Dual-Sensor (Welded) General Type</th><th>-1: Reduced bore type
(1 size reduction)</th><th rowspan="2">-2: Reduced bore type
(2 size reduction)</th></tr>
<tr><th>-4: High pressure reduced bore type
(1 size reduction)</th></tr>
<tr><td rowspan="4">Liquid</td><td rowspan="2">VY015-0 to VY100-0
VY015-6 to VY100-6</td><td>VY025-1 to VY150-1</td><td rowspan="2">VY040-2 to VY200-2</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 20000, whichever is greater.</td><td rowspan="4">10 m/s
(*1)</td></tr>
<tr><td>VY025-4 to VY150-4</td></tr>
<tr><td rowspan="2">VY150-0 to VY400-0
VY150-6 to VY200-6</td><td>VY200-1</td><td rowspan="2">-</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 40000, whichever is greater.</td></tr>
<tr><td>-</td></tr>
<tr><td rowspan="4">Gas
Steam</td><td rowspan="2">VY015-0 to VY100-0
VY015-6 to VY100-6</td><td>VY025-1 to VY150-1</td><td rowspan="2">VY040-2 to VY200-2</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 20000, whichever is greater.</td><td rowspan="4">80m/s
(*2) (*3)</td></tr>
<tr><td>VY025-4 to VY150-4</td></tr>
<tr><td rowspan="2">VY150-0 to VY400-0
VY150-6 to VY200-6</td><td>VY200-1</td><td rowspan="2">-</td><td rowspan="2">Flow velocity obtained from Table 6.2 or flow velocity at Reynolds number of 40000, whichever is greater.</td></tr>
<tr><td>-</td></tr>
</table>

*1: When density $\rho > 1000$ kg/m^3, maximum flow velocity $V = \sqrt{[(1/\rho) * 10^5]}$

*2: When density $\rho > 15.6$ kg/m^3, maximum flow velocity $V = \sqrt{[(1/\rho) * 10^5]}$

*3: When VY015-6 and VY025-6 is selected, the maximum flow velocity is limited up to 35 m/s.

NOTE

Set the flow rate span while paying attention to the following points.

- On lines with large changes in flow rate, set the maximum flow rate as the flow rate span. When a flow rate exceeding the flow rate span flows on the line, the error of flow rate (%) increases.
- On lines with a stable flow rate, as a guideline, set a flow rate approximately 1.5x to 2x the regular flow rate as the flow rate span.

NOTE

When the flow rate unit and span value are changed at the same time, be sure to change the flow rate unit first.

6.1.6 Setting the Damping Time Constant of the Instantaneous Flow Rate

The damping time constant (63.2% response) of volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference can be set. Change the damping time constant, for example, to suppress output oscillation or to alter the response speed (default 4.0 seconds).

This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow rate setup ► Flow damping
Display	-

6.1.7 Setting the Lowcut Function of Instantaneous Flow Rate

This function intentionally sets the low-flowrate range to zero based on the setting value of this parameter for the purpose of removing noise. The lowcut value of volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference can be set. Use of the lowcut function can disable output of the flow rate at the setting value or below. The lower limit value that can be set is the flow rate equivalent to the flow velocities in the table below.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow rate setup ► Flow lowcut
Display	-

Table 6.4 Lowcut setting lower limit flow velocity (m/s)

<table>
<tr><th colspan="3">Model code - Type of body</th><th>Liquid</th><th>Gas, Steam</th></tr>
<tr><td rowspan="2">-0: General type</td><td>-1: Reduced bore type (1 size reduction)</td><td rowspan="2">-2: Reduced bore type (2 size reduction)</td><td rowspan="2">Unit: m/s</td><td rowspan="2">Unit: m/s</td></tr>
<tr><td>-4: High pressure reduced bore type (1 size reduction)</td></tr>
<tr><td rowspan="2">VY015-0</td><td>VY025-1</td><td rowspan="2">VY040-2</td><td rowspan="2">0.17</td><td rowspan="2">1.50</td></tr>
<tr><td>VY025-4</td></tr>
<tr><td rowspan="2">VY025-0</td><td>VY040-1</td><td rowspan="2">VY050-2</td><td rowspan="2">0.12</td><td rowspan="2">1.00</td></tr>
<tr><td>VY040-4</td></tr>
<tr><td rowspan="2">VY040-0</td><td>VY050-1</td><td rowspan="2">VY080-2</td><td rowspan="2">0.10</td><td rowspan="2">1.00</td></tr>
<tr><td>VY050-4</td></tr>
</table>

Model code - Type of body			Liquid	Gas, Steam
VY050-0	VY080-1	VY100-2	0.10	1.00
	VY080-4			
VY080-0	VY100-1	VY150-2	0.10	1.00
	VY100-4			
VY100-0	VY150-1	VY200-2	0.10	1.00
	VY150-4			
VY150-0	VY200-1	-	0.10	1.50
VY200-0	-	-	0.12	1.50
VY250-0	-	-	0.14	1.50
VY300-0	-	-	0.14	1.50
VY400-0	-	-	0.17	2.00

NOTE

Be sure to set the lowcut value of the instantaneous flow rate after setting the diameter type.

NOTE

To change the lowcut flow rate and adjust items, change all applicable adjust items, and then set the lowcut value.

NOTE

You can check the lower limit of the lowcut flow rate in Device Configuration ► STB ► Device Configuration ► Configuration ► Flow rate setup ► Lowcut limit.

6.1.8 Basic Settings of Compensation in the Flow Rate Measurement Function

Mass flow rate refers to the mass of fluid that flows through the measuring pipe per unit hour, and is the value obtained by multiplying the volumetric flow rate by the fluid density.
Standard/Normal flow rate refers to the volume of the fluid in a standard or normal state that flows through the measuring pipe per unit hour when the measured fluid is a gas, and is the value obtained by multiplying the volumetric flow rate by the gas density ratio. Gas density ratio is the value obtained by dividing the fluid density calculated based on the temperature and pressure presently being measured by density in a standard or normal state.
Heat is the heat of fluid that flows through the measuring pipe per unit hour, and, when the measured fluid is water or steam, this is the value obtained by multiplying the mass flow rate by the fluid specific enthalpy that is calculated according to IAPWS-IF97: IAPWS Industrial Formulation 1997.
Heat difference refers to the heat of the fluid that flows through the measuring pipe per unit hour, and that uses the temperature difference between the upstream and downstream, and, when the measured fluid is water or steam, this is the value obtained by multiplying the mass flow rate by the difference in fluid specific enthalpy that is calculated according to IAPWS-IF97: IAPWS Industrial Formulation 1997. When the measured fluid is a liquid, this is the value obtained by multiplying the volumetric flow rate or mass flow rate by heat difference and heat conversion factor.

The density, pressure and temperature parameters must be set to these flow rate measurements.

■ Density basic setting

● Density unit

Set the density unit by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Density Calculation Items ► Density unit
Display	-

Selection	
FOUNDATION Fieldbus	**Display**
kg/m³	-
lb/cf	-
lb/USgal	-
lb/UKgal	-

● Fixed density

The setting value of this parameter is used when calculating the mass flow rate, heat and heat difference by fixed density. Set the fixed density by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Density Calculation Items ► Fixed density
Display	-

● Density of normal condition

The density of normal condition is set by the following parameters when the measured fluid (Fluid type) is a liquid other than water and mass flow rate and heat difference are selected for the measured flow rate (Flow select), and when the measured fluid (Fluid type) is gas and mass flow rate and Standard/Normal flow rate are selected for the measured flow rate (Flow select). Furthermore, when Standard/Normal flow rate is selected, density is set as the density value of a standard condition (1 atm, 0°C) or the density value of a normal condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Density Calculation Items ► Base density
Display	-

■ Temperature basic setting

● Temperature unit

Set the temperature unit by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Temperature setup ► Temperature unit & scale ► Temperature unit
Display	-

Selection	
FOUNDATION Fieldbus	**Display**
K	-
degC	-
degF	-

● Fixed temperature

The setting value of this parameter is used when calculating the mass flow rate, Standard/Normal flow rate and heat by fixed density. Set the fixed temperature by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Density Calculation Items ► Fixed temperature
Display	-

● Temperature of normal/standard condition

The temperature of normal condition is set by the following parameters when the measured fluid (Fluid type) is a liquid other than water and mass flow rate and heat difference are selected for the measured flow rate (Flow select), and when the measured fluid (Fluid type) is gas and mass flow rate and Standard/Normal flow rate are selected for the measured flow rate (Flow select). Furthermore, when Standard/Normal flow rate is selected, temperature is set as the temperature value of a standard condition (1 atm, 0°C) or the temperature value of a normal condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Flow Setup Additionals ▶ Density Calculation Items ▶ Base temperature
Display	-

■ Pressure basic setting

● Pressure unit

Set the pressure unit by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Pressure setup ▶ Pressure unit & scale ▶ Pressure unit
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
kPa A	-	The unit is set to absolute pressure kPa
MPa A	-	The unit is set to absolute pressure MPa
bar A	-	The unit is set to absolute pressure bar
psi A	-	The unit is set to absolute pressure psi
kPa G	-	The unit is set to gauge pressure kPa
MPa G	-	The unit is set to gauge pressure MPa
bar G	-	The unit is set to gauge pressure bar
psi G	-	The unit is set to gauge pressure psi

● Fixed pressure

The setting value of this parameter is used when the measured fluid (Fluid type) is gas or steam, and when calculating the mass flow rate, Standard/Normal flow rate and heat by fixed density. Set the fixed pressure by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Flow Setup Additionals ▶ Density Calculation Items ▶ Fixed Pressure
Display	-

● Pressure of normal/standard condition

The pressure of normal condition is set by the following parameters when the measured fluid (Fluid type) is gas and mass flow rate and Standard/Normal flow rate are selected for the measured flow rate (Flow select). Furthermore, when Standard/Normal flow rate is selected, pressure is set as the pressure value of a standard condition (1 atm, 0°C) or the pressure value of a normal condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Flow Setup Additionals ▶ Density Calculation Items ▶ Base Pressure
Display	-

■ Basic settings of specific enthalpy

● Specific enthalpy unit

Set the specific enthalpy unit by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Energy Calculation Items ► Enthalpy unit
Display	-

Selection	
FOUNDATION Fieldbus	**Display**
kJ/kg	-
MJ/kg	-
GJ/kg	-
TJ/kg	-
BTU/lb	-

● Fixed specific enthalpy

The setting value of this parameter is used when calculating the heat by fixed specific enthalpy. Set the fixed specific enthalpy by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Energy Calculation Items ► Fixed enthalpy
Display	-

■ Setting the temperature correction and pressure correction of fluid density and the specific enthalpy

Temperature correction and pressure correction can be performed on fluid density and specific enthalpy by using the temperature measurement function in Section 6.3 and the pressure measurement function in Section 6.4.

● Selection of steam type

Select the steam type when the measured fluid is steam. Perform mass flow rate calculation or heat flow rate calculation while referring to the steam table.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Additional Selection ► Steam type
Display	-

Selection		Description
FOUNDATION Fieldbus	**Display**	
Saturated steam	-	Saturated steam
Superheated steam	-	Superheated steam

Selection of compensation type

Set the measurement value to be used when performing temperature correction and pressure correction. For details on the temperature measurement function, see Section 6.3, for the pressure measurement function, see Section 6.4, and for the density measurement function, see Section 6.5.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Temp./Press. Compensation Select ► Compensation type
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Not used	-	Flow rate calculation based on fixed temperature, fixed pressure and fixed specific enthalpy is performed. Temperature correction and pressure correction are not performed.
Built-in temp.	-	Temperature correction based on the built-in temperature gauge is performed.
Built-in temp. & A-in press.	-	Temperature correction based on the built-in temperature gauge and pressure correction based on pressure measured by MAO function block are performed.
A-in temp.	-	Temperature correction based on temperature measured by MAO function block is performed.
A-in press.	-	Pressure correction based on pressure measured by MAO function block is performed.
A-in density	-	Density correction based on density measured by MAO function block is performed.
A-in temp. & A-in Press.	-	Temperature correction and pressure correction based on temperature and pressure masured by MAO function block are performed.

Checking he compensation method of density and specific enthalpy

The compensation method of density and enthalpy can be checked.

Menu path

FOUNDATION Fieldbus	Device Settings ► Detailed setup ► Compensation setup ► Calculation type
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Fixed	-	Flow rate calculation based on fixed temperature, fixed pressure, fixed density, and fixed specific enthalpy is performed. Temperature correction and pressure correction are not performed.
Aux input	-	The density measured value of external input is used when the measured fluid is liquid or gas, and the measured flow rate is mass flow rate or Standard/Normal flow rate.
Compensation T	-	Temperature correction of density is performed according to measured temperature when the measured fluid is liquid and the measured flow rate is mass flow rate and heat difference or when the measured fluid is water and the measured flow rate is mass flow rate, heat and heat difference.

Selection		Description
FOUNDATION Fieldbus	Display	
Compensation T/P	-	Temperature correction and pressure correction of density are performed according to measured temperature and measured pressure when the measured fluid is gas, and the measured flow rate is mass flow rate or Standard/ Normal flow rate.
Saturated steam T	-	When the measured fluid is saturated steam and water, density and specific enthalpy are calculated based on the measured temperature by using the built-in saturated steam table to calculate the mass flow rate and heat flow rate.
Saturated steam P	-	When the measured fluid is saturated steam, density and specific enthalpy are calculated based on the measured pressure by using the built-in saturated steam table to calculate the mass flow rate and heat flow rate.
Superheated steam T/P	-	When the measured fluid is saturated steam, density and specific enthalpy are calculated based on the measured temperature and measured pressure by using the built-in superheated saturated steam table to calculate the mass flow rate and heat flow rate.

● Setting the deviation factor when the measured fluid is a gas and the measured flow rate is mass flow rate or Standard/Normal flow rate

Set the deviation factor (ratio) for the density of the normal/standard condition. Set that ratio when the density of the normal/standard condition is different.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Density Calculation Items ► Deviation
Display	-

■ Basic settings when the measured flow rate is the heat difference

When the measured flow rate is heat difference, the fluid temperature at two measurement points is required. Set the measurement points. When the measured fluid is liquid, set the heat conversion factor.

● Selection of method of use of the temperature

Select the method of use of the fluid temperature at two measurement points.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Energy Calculation Items ► Heat difference temp. select
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Built-in(H)/Aux input(L)	-	The built-in temperature gauge is used as the fluid temperature value on the high-temperature side and external input is used as the fluid temperature value on the low-temperature side.
Aux input(H)/Built-in(L)	-	External input is used as the fluid temperature value on the high-temperature side and the built-in temperature gauge is used as the fluid temperature value on the low-temperature side.

Selection		Description
FOUNDATION Fieldbus	Display	
Aux input(delta T)	-	When the measured fluid is liquid, external input is used as the temperature difference value.

NOTE

A value smaller than “0” cannot be output as the heat difference. When the output value will be smaller than “0”, change the method of use of the temperature.

● Selection of the unit of heat conversion factor

Select the unit of heat conversion factor when the measured fluid is liquid.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Energy Calculation Items ► Heat diff. conv. factor unit
Display	-

Selection	
FOUNDATION Fieldbus	Display
(kJ/kg)/K	-
(MJ/m^3)/K	-
(BTU/cf)/degF	-
(BTU/USgal)/degF	-
(BTU/UKgal)/degF	-
(BTU/lb)/degF	-

● Setting the heat conversion factor

Set the heat conversion factor when the measured fluid is liquid.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Energy Calculation Items ► Heat difference conv. factor
Display	-

6.1.9 Checking the Density and Specific Enthalpy Used for Flow Rate Measurement

The result of measurement and density, specific enthalpy and other data used for flow rate measurement can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Process Variable ▶ STB ▶ Process Variables ▶ Dynamic Variables ▶ Device Variables ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Flow ▶ Primary Value. Status	-	The instantaneous flow rate status is displayed
Flow ▶ Primary Value. Value	-	The instantaneous flow rate value is displayed at the preset unit
Totalizer ▶ Totalizer.Status	-	The totalized flow rate status is displayed For details on the totalization function, see Section 6.2
Totalizer ▶ Totalizer.Value	-	The totalized flow rate value is displayed For details on the totalization function, see Section 6.2
Temperature ▶ Secondary Value.Status	-	The temperature status is displayed
Temperature ▶ Secondary Value.Value	-	The temperature value is displayed at the preset unit

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Flow Setup Additionals ▶ Monitor/Calculated Values ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Density	-	The density is displayed at the preset unit
Density ratio	-	The density ratio used for Standard/Normal flow rate measurement is displayed
Enthalpy	-	The specific enthalpy used for heat measurement is displayed at the set unit
Delta temperature	-	The temperature difference used for heat difference measurement is displayed at the set unit when the measured fluid is liquid
Delta enthalpy	-	The specific enthalpy difference used for heat difference measurement is displayed at the set unit when the measured fluid is steam or water

NOTE

Use the Dryness setting fixed at 100 %.

6.2 Totalization Function

With this function, instantaneous flow rate values can be totaled. Totalization of the instantaneous flow rate is performed by the unit set for the flow rate that is specified for the measured flow rate (Flow select). The product has a totalization switch function that compares the preset target value with the totalized value to output the result in the form of the status output. The product also has a function for resetting the totalized value and a totalization preset function for starting totalization from a preset value.

6.2.1 Checking the Totalization Unit

The preset unit can be checked by the following parameters. The measurement unit corresponding to the flow rate specified for the measured flow rate is displayed.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Totalizer setup ► Totalizer unit
Display	-

Selection							
FOUNDATION Fieldbus	Display	FOUNDATION Fieldbus	Display	FOUNDATION Fieldbus	Display	FOUNDATION Fieldbus	Display
m^3	-	kUKgal	-	k(N)m^3	-	M(S)cf	-
km^3	-	mbbl	-	M(N)m^3	-	kJ	-
l	-	bbl	-	(N)l	-	MJ	-
mcf	-	kbbl	-	(S)m^3	-	GJ	-
cf	-	kg	-	k(S)m^3	-	TJ	-
kcf	-	t	-	M(S)m^3	-	BTU	-
USgal	-	lb	-	(S)l	-	kBTU	-
kUSgal	-	klb	-	(S)cf	-	MBTU	-
UKgal	-	(N)m^3	-	k(S)cf	-		

6.2.2 Setting Start/Stop of the Totalization Function

Set start/stop of the totalization function by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Totalizer setup ► Totalizer start/stop
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Stop	-	The totalization function is stopped
Start	-	The totalization function is started

6.2.3 Reset/Preset Function for Totalized Values

Set the reset/preset function for totalized values by the following parameters. When reset is set, the totalized value is reset to “0”. When preset is set, the preset value (Totalizer preset value) is set to the totalized value.

■ Setting reset/preset

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Totalizer setup ► Totalizer Reset/Preset (method)
Display	-

Selection		Description
FOUNDATION Fieldbus	**Display**	
Not execute	-	The totalized value reset/preset function is not executed.
Reset	-	The totalized value is reset and “0” is set.
Preset	-	The totalized value is preset, and the preset value (Totalizer preset value) is set.

NOTE

Parameters are returned to “Not execute” after the totalized value reset/preset function is used.

NOTE

When totalized value preset is used, be sure to set both Totalizer rate and Totalizer preset value first.

■ Setting the preset value

The preset value for the totalized value of the instantaneous flow rate can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Totalizer setup ► Totalizer preset value
Display	-

6.2.4 Setting the Total Rate of the Totalization Function

An arbitrary factor can be set to the totalized value of the instantaneous flow rate by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Totalizer setup ▶ Totalizer rate
Display	-

NOTE

The totalized value (Total) that is displayed on the display acts differently according to the preset value.

- When the Totalizer rate value is one of 0.00001, 0.0001, 0.001, 0.01, 0.1, 1, 10, 100, or 1000
  The totalized value with unit appended is displayed.
- Other than the above
  The totalized value is displayed as the count value of the preset Totalizer rate.

6.2.5 Setting the Totalization Operation of the Totalization Function

Set operation when the totalized value Total on the display exceeds 999999 by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Totalizer setup ▶ Totalizer reset mode
Display	-

Selection		Description
FOUNDATION Fieldbus	**Display**	
Reset	-	Divide the totalized value by 1000000 and use the remainder for the new totalized value.*1 Totalization is continued.
Hold only display	-	Only the totalized value Total on the display is fixed (held). Totalization is continued.
Hold	-	The totalized value is is fixed (held).

*1: This operation is performed even when the Totalization function is stopped.

6.3 Temperature Measurement Function

6.3.1 Checking the Temperature Measurement Method

On a type with built-in temperature gauge, temperature can be measured by the built-in temperature gauge. The measured temperature value can be acquired from the temperature transmitter connected to the MAO function block.
The temperature measurement method can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Temp./Press. Compensation Select ► Temperature select
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Fixed	-	The fixed temperature set at Fixed Temperature is used
Built-in	-	The measured value of the built-in temperature gauge on the type with a temperature sensor is used
Aux input	-	The measured temperature value is acquired from the temperature transmitter connected to the MAO function block

6.3.2 Setting Scaling of Temperature Measurement

■ Setting the lower limit value (0%)

Set the temperature to be taken as 0% for when the % conversion value is displayed after scaling the measured temperature value of the built-in temperature gauge.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Temperature setup ► Temperature unit & scale ► Temperature LRV
Display	-

■ Setting the upper limit value (100%)

Set the temperature to be taken as 100% for when the % conversion value is displayed after scaling the measured temperature value of the built-in temperature gauge.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Temperature setup ► Temperature unit & scale ► Temperature URV
Display	-

6.3.3 Setting the Damping Time Constant of the Temperature Measurement

Set the damping time constant (63.2% response) for the temperature measurement of the built-in temperature gauge by the following parameters. Change the damping time constant, for example, to suppress output oscillation or to alter the response speed (default 4.0 seconds).

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Temperature setup ► Temperature damping
Display	-

6.3.4 Compensating Temperature Measurement

The measured temperature value of the built-in temperature gauge can be compensated. The calculation formula for temperature correction is as follows.

$T_r = T_n \times a + b$

T_r: Temperature after compensation based on measured temperature [unit selected at Temperature unit]

T_n: Measured temperature [unit selected at Temperature unit]

a: Compensation factor (gain)

B: Compensation value (offset)

Compensation factor (gain) and compensation value (offset) can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Additional Adjust ► Built-in Temperature Adjust ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Temperature gain	-	The compensation factor (gain) is set
Temperature offset	-	The compensation value (offset) is set

6.4 Pressure Measurement Function

The measured pressure value can be acquired from the pressure transmitter connected to the MAO function block. At Selection of compensation type (Compensation type) in Subsection 6.1.8, select pressure correction based on the pressure measured by external input.

6.4.1 Checking the Pressure Measurement Method

The pressure measurement method can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Temp./Press. Compensation Select ► Pressure select
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Fixed	-	The fixed pressure set at Fixed Pressure is used
Aux input	-	The measured value is acquired from the pressure transmitter connected to the MAO function block

6.5 Density Measurement Function

The measured density value can be acquired from the density transmitter using the MAO function block. At Selection of compensation type (Compensation type) in Subsection 6.1.8, select correction based on the density measured by external input.

NOTE

When acquiring the density by external input, set the density described in Subsection 6.1.8 correctly.

6.6 External Input Function

The process value of an external device can be loaded to this product as an external input.
The process value of an external device is loaded through the MAO function block.
External temperature, external pressure, external density, and external temperature difference can be used as external input to perform various correction calculations.
For details on correction calculation, see Subsection 6.1.8.

6.6.1 External Input Selection

The process value assigned to external input is displayed.
This setting can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Flow Setup Additionals ► Temp./Press. Compensation Select ► Aux input select
Display	-

Selection		Description
FOUNDATION Fieldbus	**Display**	
Off	-	External input is unused or cannot be used
Temperature	-	External input is currently used as the temperature
Pressure	-	External input is currently used as the pressure
Density	-	External input is currently used as the density
Delta temperature	-	External input is currently used as the temperature difference
Temperature & Pressure	-	External input is currently used as the temperature and pressure

NOTE

To assign a process value to external input, select external input as the target process value at Compensation Type. (See Subsection 6.1.8)

6.6.2 Displaying External Input

The value of the external input can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Process Variable ▶ STB ▶ Process Variables ▶ Dynamic Variables ▶ Device Variables ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
External Temperature ▶ External temperature. Status	-	The temperature status obtained from MAO IN_1 is displayed
External Temperature ▶ External temperature.Value	-	The temperature value obtained from MAO IN_1 is displayed
External Pressure ▶ External pressure.Status	-	The pressure status obtained from MAO IN_2 is displayed
External Pressure ▶ External pressure.Value	-	The pressure value obtained from MAO IN_2 is displayed
External Density ▶ External density.Status	-	The density status obtained from MAO IN_3 is displayed
External Density ▶ External density.Value	-	The density value obtained from MAO IN_3 is displayed

6.6.3 Temperature, Pressure, and Density Correction Using External Input

Temperature, pressure, and density correction can be performed through external input.
This function can be used by making the minimum settings, such as scheduling, and connecting the external input to IN_1 - IN_3 of the MAO function block.
External inputs and their connections are shown in the figure below.

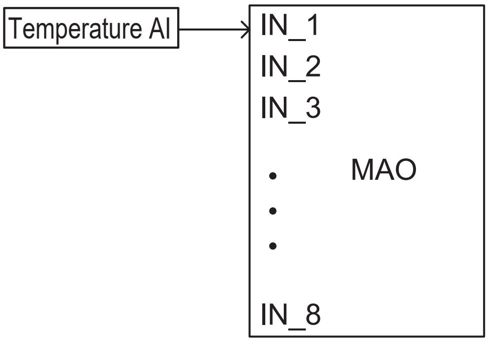
External input	Connected to
External temperature	IN_1
External pressure	IN_2
External density	IN_3

NOTE

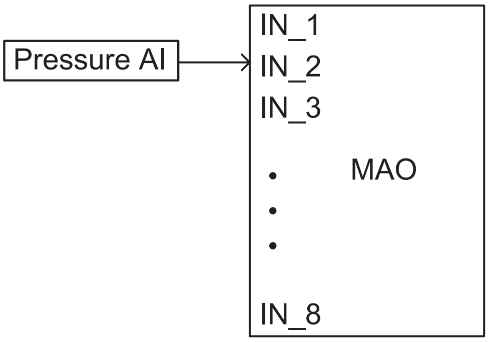
When the external input is connected to IN_4 - IN_8, it is not reflected.

Setting example:

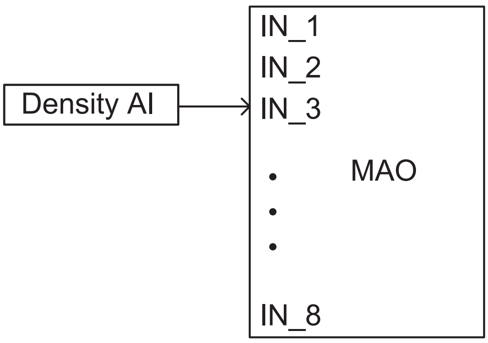
Saturated steam mass/heat flow rate (temperature compensation)
Fluid type: Steam
Flow select: Mass or Energy
Steam type: saturated steam
Compensation type: A-in temp



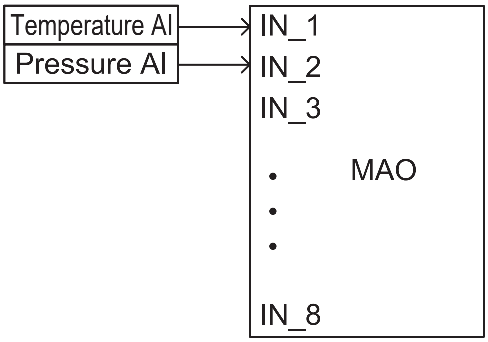
Saturated steam mass/Energy flow rate (pressure compensation)
Fluid type: Steam
Flow select: Mass or Energy
Steam type: saturated steam
Compensation type: A-in press



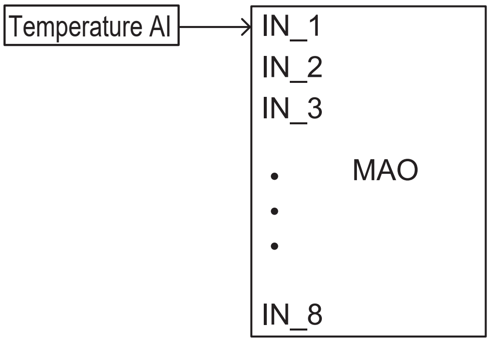
Saturated steam mass flow rate (density direct input)
Fluid type: Steam
Flow select: Mass
Steam type: saturated steam
Compensation type: A-in dens



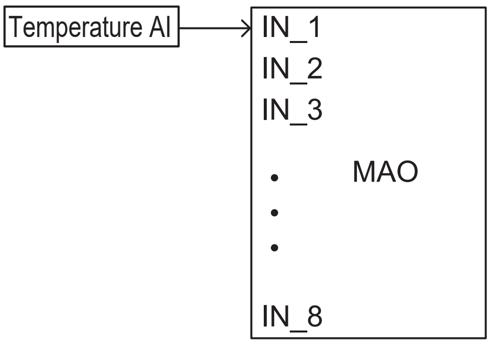
Gas mass/Standard/Normal flow rate (external temperature/pressure compensation)
Fluid type: gas
Flow select: Mass or Standard/Normal
Compensation type: A-in temp & A-in press



Liquid mass flow rate (external temperature compensation)
Fluid type: liquid
Flow select: Mass
Compensation type: A-in temp



Water mass/Energy (external temperature compensation)
Fluid type: Water
Flow select: Mass or Energy
Compensation type: A-in temp



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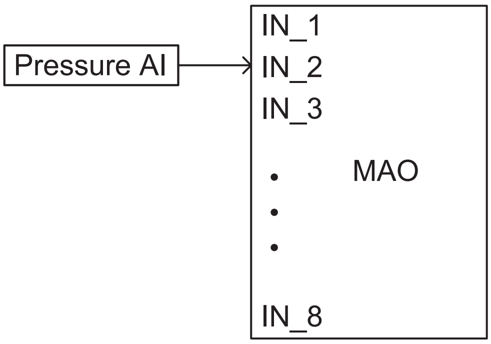
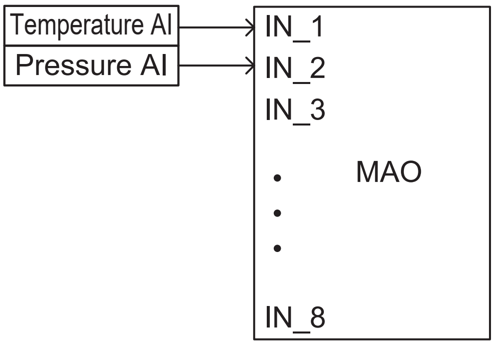
Superheated steam mass/heat flow rate (built-in temperature, external pressure compensation)

Fluid type: Steam
Flow select: Mass or Energy
Steam type: super heat steam
Compensation type: built-in temp & A-in press



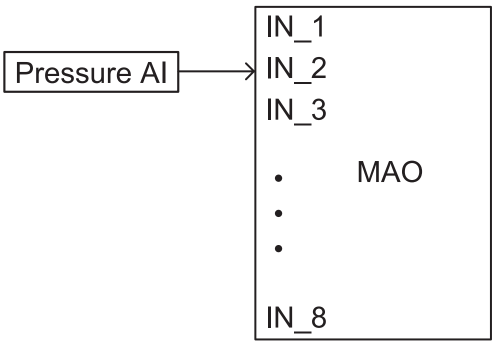
Superheated steam mass/heat flow rate (external temperature/pressure compensation)

Fluid type: Steam
Flow select: Mass or Energy
Steam type: super heat steam
Compensation type: A-in temp & A-in press



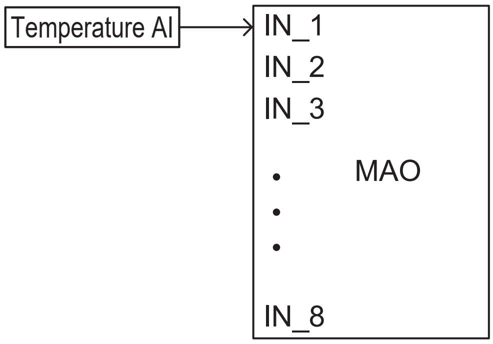
Gas mass/Standard/Normal flow rate (built-in temperature, external pressure compensation)

Fluid type: gas
Flow select: Mass or Standard/Normal
Compensation type: built-in temp & A-in press



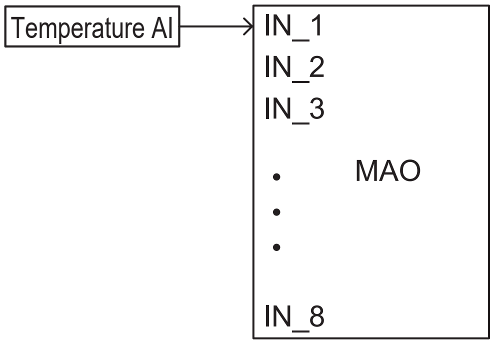
Steam/water heat difference flow rate (built-in temperature, external temperature compensation)

Fluid type: Steam or Water
Flow select: Energy(Heat difference)
Heat difference select:Built-In(H)/Aux input(L) or Aux input(H)/Built-In(L)



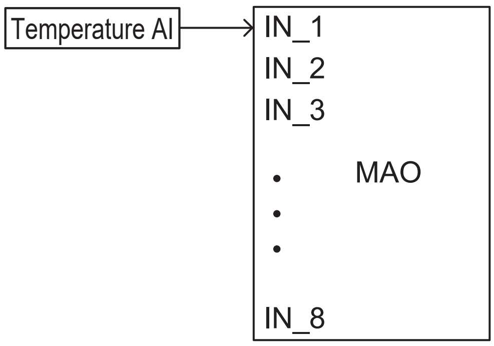
Liquid heat difference flow rate (built-in temperature, external temperature compensation)

Fluid type: Liquid
Flow select: Energy(Heat difference)
Heat difference select:Built-In(H)/Aux Input(L) or Aux Input(H)/Built-In(L)



Liquid heat difference flow rate (external temperature difference compensation)

Fluid type: Liquid
Flow select: Energy(Heat difference)
Heat difference select:Aux input(delta T)



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6.7 Limit Switch Function

6.7.1 Limit Switch Output

This function turns the limit switch on and off when a target selected from one of instantaneous flow rate, fluid temperature, fluid pressure, or totalization exceeds (High limit) or falls below (Low limit) a certain threshold value.
The process value to assign can be selected, and also selection of the H limit (upper limit value)/L limit (lower limit value), threshold value and hysteresis can be set.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Limit Switch Setup ► Limit Switch 1 Configuration ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Limit Switch 1 Target	-	The process value targeted in limit switch 1 is selected*1
Limit Switch 1 Direction	-	The H side/L side of limit switch 1 is selected*2
Limit Switch 1 Setpoint	-	The threshold value of limit switch 1 is set
Limit Switch 1 Hysteresis	-	The hysteresis width of the limit switch 1 switching is set*3
Limit Switch 1 Unit	-	The unit of the threshold value and hysteresis value of limit switch 1 is displayed

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Limit Switch Setup ► Limit Switch 2 Configuration ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Limit Switch 2 Target	-	The process value targeted in limit switch 2 is selected*1
Limit Switch 2 Direction	-	The H side/L side of limit switch 2 is selected*2
Limit Switch 2 Setpoint	-	The threshold value of limit switch 2 is set
Limit Switch 2 Hysteresis	-	The hysteresis width of the limit switch 2 switching is set*3
Limit Switch 2 Unit	-	The unit of the threshold value and hysteresis value of limit switch 2 is displayed

*1: Select the process value targeted in limit switch output from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Flow rate	-	The instantaneous flow rate is set to the limit switch target
Temperature	-	The fluid temperature is set to the limit switch target (When equipped with built-in temperature sensor)
Totalizer	-	The totalized flow rate value is set to the limit switch target

*2: Select the H limit (upper limit value)/L limit (lower limit value) of limit switch output from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Low limit	-	The L limit (lower limit value) is set. Limit switch becomes active when the target process value falls below the threshold value.
High limit	-	The H limit (upper limit value) is set. Limit switch becomes active when the target process value exceeds the threshold value.

*3: The value of limit switch switching is calculated as follows.

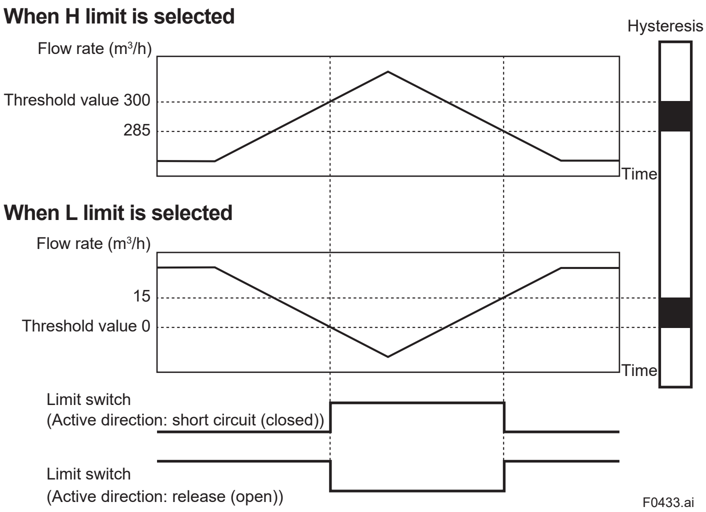
(1) Value at which the limit switch (when H limit is selected) switches from an active to a non-active state
= Set limit threshold value - Hysteresis value
(2) Value at which the limit switch (when L limit is selected) switches from an active to a non-active state
= Set limit threshold value + Hysteresis value

The following shows an example of operation.
Example of H limit:
Limit switch target = instantaneous flow rate
Measured flow rate selection = volumetric flow rate
Span of volumetric flow rate = 300 m^3/h,
H /L selection of limit switch is set = H limit
Limit threshold value = 300 m^3/h
When hysteresis width = 15 [m^3/h] is set

Value at which the limit switch switches from an active to a non-active state
= 285 [m^3/h]
= 300 [m^3/h] – 15 [m^3/h]

Example of L limit:
Limit switch target = instantaneous flow rate
Measured flow rate selection = volumetric flow rate
Span of volumetric flow rate = 300 m^3/h,
H /L selection of limit switch is set = L limit
Limit threshold value = 0 m^3/h
When hysteresis width = 15 [m^3/h] is set

Value at which the limit switch switches from an active to a non-active state
= 15 [m^3/h]
= 0 [m^3/h] + 15 [m^3/h]



NOTE

When the physical quantity to be output is changed, the alarm judgment value must be set again.

6.7.2 Displaying the Limit Switch

Display the state of limit switch.
This setting can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Limit Switch Setup ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Limit Switch 1 ► Limit Switch 1.Status	-	The status of the contact point output of limit switch 1 is displayed
Limit Switch 1 ► Limit Switch 1.Value	-	The contact point output of limit switch 1 is displayed
Limit Switch 2 ► Limit Switch 2.Status	-	The status of the contact point output of limit switch 2 is displayed
Limit Switch 2 ► Limit Switch 2.Value	-	The contact point output of limit switch 2 is displayed

6.7.3 Connection of Contact Point Output to DI Function

The contact point outputs at STB are output to specific channels, respectively. By selecting the channel to use in the DI function block, it is connected to the contact point.
The relation of the channel for each contact point output and the channel which can be selected from each DI function block is shown in the figure below.

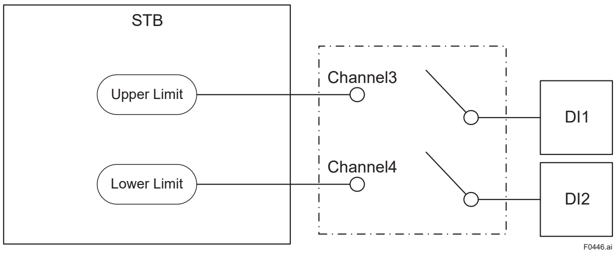


Figure 6.2 Relation of Process Value of STB and DI Function Block

The information of the figure above can be organized below.

Table 6.5 List of Relation of Contact Point Output and DI Function Block

CHANNEL number	Selection	Corresponding function block
3	Upper limit	DI1, DI2
4	Lower limit	DI1, DI2

A channel can be selected in each DI function block with the following parameter.

Menu path

FOUNDATION Fieldbus	Device Configuration ► DI1* ► Device Configuration ► Configuration ► Channel
Display	-

*Either DI1 or DI2.

6.8 Sensor Information

6.8.1 Setting Sensor Information

Sensor-related settings are set before shipment from the factory as specified at the time of ordering.
This setting can be set by the following parameters. Note, however, that normally there is no need to change this setting.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Configuration ► Sensor Basic Setup ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Nominal size	-	The nominal size is set*1
Body type	-	The body type is set*2
Sensor type	-	The sensor type is set*3
K factor unit	-	The K factor unit is set*4
K factor	-	The K factor 15 degC value is set

*1: Select the nominal size

Selection		Description
FOUNDATION Fieldbus	Display	
15 mm	-	The diameter is set to 15 mm
25 mm	-	The diameter is set to 25 mm
40 mm	-	The diameter is set to 40 mm
50 mm	-	The diameter is set to 50 mm
80 mm	-	The diameter is set to 80 mm
100 mm	-	The diameter is set to 100 mm
150 mm	-	The diameter is set to 150 mm
200 mm	-	The diameter is set to 200 mm
250 mm	-	The diameter is set to 250 mm
300 mm	-	The diameter is set to 300 mm
400 mm	-	The diameter is set to 400 mm

*2: Select the body type

Selection		Description
FOUNDATION Fieldbus	Display	
General	-	General type
One size down	-	Reduced bore type: 1 size reduction
Two size down	-	Reduced bore type: 2 size reduction
High pressure	-	High pressure reduced bore type: 1 size reduction
Dual sensor	-	Dual sensor type

*3: Select the sensor type

Selection		Description
FOUNDATION Fieldbus	Display	
Standard	-	General type
Standard w/ temp sensor	-	General type with temperature sensor
High temperature	-	High temperature type
High temperature w/ temp sensor	-	High temperature type with temperature sensor
Cryogenic	-	Cryogenic type
Long neck	-	Long neck type
Long neck w/ temp sensor	-	Long neck type with temperature sensor

*4: The K factor unit is selected

Selection		Description
FOUNDATION Fieldbus	Display	
p/l	-	p/l is set
p/USgal	-	p/USgal is set
p/UKgal	-	p/UKgal is set

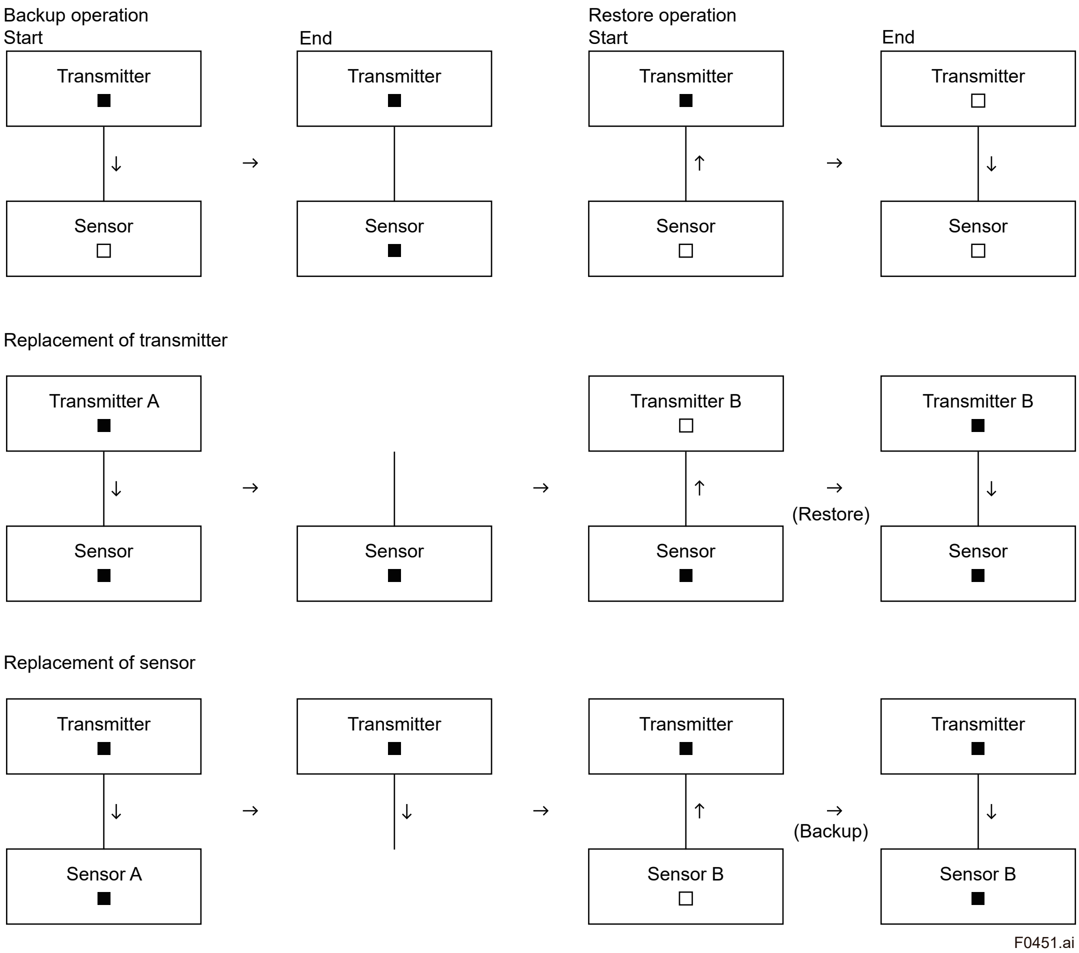
IMPORTANT

The K factor is a value unique to each individual device. Be sure to use the value set before shipment from the factory that is stamped on the nameplate, and do not rewrite this value. (Except when the sensor has been replaced on the remote type)

6.8.2 Backup/Restore of Sensor Information

These functions back up and restore sensor related setting information to facilitate changes to settings that occur due to replacement of the transmitter and sensor. This product has memory for both the transmitter and sensor.

- Backup: Data is copied from transmitter memory to sensor memory
- Restore: Data is copied from sensor memory to transmitter memory



Data to be backed up and restored are the sensor adjustment values, management information and inspection information.
The following table shows the actual data that is backed up and restored.

Fluctuating level	Prediction start date	Sensor MS code 2
Transient noise count	Prediction stop date	Sensor MS code 3
High vibration action	Flow lowcut	Sensor MS code 4
High vibration time	Nominal size	Sensor MS code 5
Critical vibration action	Body type	Sensor MS code 6
Critical vibration level	Sensor type	Sensor style code
Critical vibration time	Connection type	Sensor S/N
Clogging time	K factor unit	Signal level
Sensor circuit threshold	K factor	Trigger level mode
Sensor capacitance threshold	Process temperature	Trigger level(TLA)
Sensor resistance threshold	Max pressure	Noise balance mode
Prediction period	Sensor MS code 1	Noise ratio(manual)

Backup and restore can be executed and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Device Information ► Maintenance Information ► Sensor Backup/Restore ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Sensor Backup/Restore Exec. (method)	-	Backup/restore of sensor information is executed*1
Sensor backup/restore result	-	The backup/restore result of sensor information is displayed*2

*1: Select execution of backup/restore from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Not execute	-	Initial state after a power on
Backup parameter	-	Targeted parameters are copied from the transmitter to the sensor
Restore parameter	-	Targeted parameters are copied from the sensor to the transmitter
Restore parameter(factory)	-	Targeted parameters are copied from the sensor to the transmitter (parameter area for factory use)

*2: The result of backup/restore operation is shown as follows.

Selection		Description
FOUNDATION Fieldbus	Display	
Unknown	-	Initial state after a power on
Pass	-	Backup/restore was successful
Failure	-	Backup/restore failed
Running	-	Backup/restore execution in progress

NOTE

Only transmitter side memory is used for the flow calculation. Sensor side memory is only kept saving data as the backup function.

6.9 Auxiliary Calculation Function

6.9.1 Compensation (Gain)

A user-specified arbitrary compensation factor (gain) can be set. This compensation factor (gain) is applied by multiplication on the measured value.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Adjust ► Flow rate gain
Display	-

6.9.2 Reynolds Number Correction

On a vortex flowmeter, error increases at low Reynolds numbers. Output error at Reynolds numbers 20000 or less can be corrected by segment approximations.
The Reynolds number correction factor corresponding to the Reynolds number found based on the present flow velocity is calculated by linear approximation of five pairs of [Reynolds number - correction factor setting parameter]. This correction factor is applied by multiplication on the measured value.
The correction factor is calculated by the following formula.

Correction factor ε_r=
1 + ((Reynolds number – Adjust Reynolds number[x]) / (Adjust Reynolds number [x+1]– Adjust Reynolds number [x]) × (Reynolds adjust value [x+1]– Reynolds adjust value [x]) + Reynolds adjust value [x])) / 100

This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Adjust ▶ Reynolds Adjust ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Reynolds adjust	-	Execution of Reynolds number correction is selected*1
Viscosity unit	-	Unit of viscosity*2
Viscosity	-	Viscosity*3
Reynolds number	-	Reynolds number
Each Point Shifting ▶ Adjust reynolds number.1	-	Reynolds number of the No.1 break point of Reynolds number correction*4
Each Point Shifting ▶ Reynolds adjust value.1	-	Correction value of the No.1 break point of Reynolds number correction*4
Each Point Shifting ▶ Adjust reynolds number.2	-	Reynolds number of the No.2 break point of Reynolds number correction*4
Each Point Shifting ▶ Reynolds adjust value.2	-	Correction value of the No.2 break point of Reynolds number correction*4
Each Point Shifting ▶ Adjust reynolds number.3	-	Reynolds number of the No.3 break point of Reynolds number correction*4
Each Point Shifting ▶ Reynolds adjust value.3	-	Correction value of the No.3 break point of Reynolds number correction*4
Each Point Shifting ▶ Adjust reynolds number.4	-	Reynolds number of the No.4 break point of Reynolds number correction*4
Each Point Shifting ▶ Reynolds adjust value.4	-	Correction value of the No.4 break point of Reynolds number correction*4
Each Point Shifting ▶ Adjust reynolds number.5	-	Reynolds number of the No.5 break point of Reynolds number correction*4
Each Point Shifting ▶ Reynolds adjust value.5	-	Correction value of the No.5 break point of Reynolds number correction*4

*1: Execution of Reynolds number correction is selected

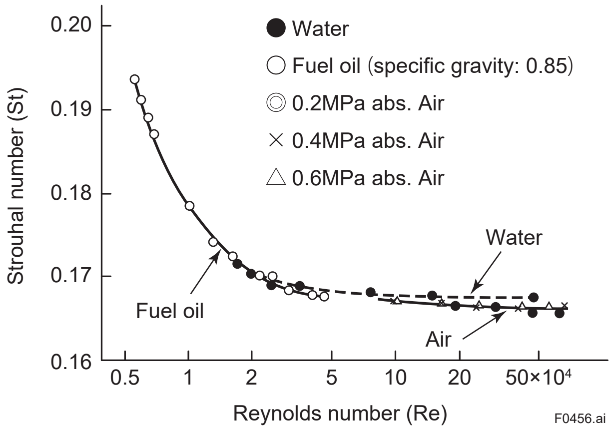
Selection		Description
FOUNDATION Fieldbus	Display	
Off	-	Correction calculation is not performed.
On	-	Correction calculation is performed.

*2: Select the viscosity unit

Selection	
FOUNDATION Fieldbus	Display
mPa·s	-
Pa·s	-
cP	-
P	-
m2/s	-
cSt	-
St	-

*3: Viscosity setting
The viscosity (mPa·s(cP)) is set to perform Reynolds number correction.
The Reynolds number (Re) is calculated by the following formula:
Reynolds number (Re) = (velocity x diameter x density * 10^3) / viscosity
velocity: Flow velocity (m/s)
diameter: Sensor inner diameter (m)
density: Fluid density (kg/m^3)
viscosity: Viscosity parameter setting value (mPa·s)

*4: Reynolds adjust
In a 3-dimensional flow inside a pipeline, as Reynolds number (≤20000) decreases, the Strouhal number (K factor) gradually increases. The curve of this K factor is corrected using a 5-point line segment approximation.



NOTE

When Reynolds number correction is used, be sure to set both Fixed density and Viscosity. Note, however, that when the Viscosity unit is a kinematic viscosity unit (m2/s, St), Fixed density is not affected.

6.9.3 Instrument Error Correction

The instrument error correction factor corresponding to the present vortex frequency is calculated by linear approximation of five pairs of [vortex frequency - correction factor setting parameter]. This correction factor is applied by multiplication on the measured value.
The correction factor is calculated by the following formula.

Correction factor ε_f=
1 + ((Vortex frequency– Adjust vortex frequency [x]) / (Adjust vortex frequency [x+1]– Adjust vortex frequency [x]) × (Adjust vortex value [x+1]– Adjust vortex value [x]) + Adjust vortex value [x])) / 100

This setting can be set by the following parameters.

Menu path

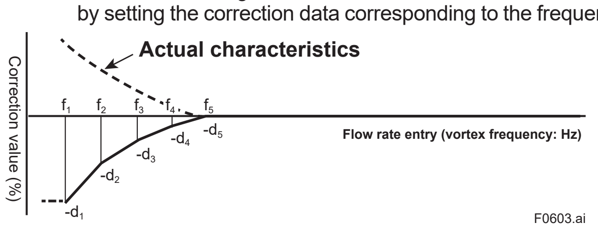
FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Adjust ▶ Instrumental Adjust ▶ (see table below)
Display	-

Parameter		**Description**
FOUNDATION Fieldbus	**Display**	
Instrument error adjust	-	Whether or not to use instrument error correction is selected*1
Each Point Shifting ▶ Adjust vortex frequency.1	-	Vortex frequency of No.1 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex value.1	-	Correction value of No.1 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex frequency.2	-	Vortex frequency of No.2 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex value.2	-	Correction value of No.2 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex frequency.3	-	Vortex frequency of No.3 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex value.3	-	Correction value of No.3 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex frequency.4	-	Vortex frequency of No.4 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex value.4	-	Correction value of No.4 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex frequency.5	-	Vortex frequency of No.5 break point of instrument error correction*2
Each Point Shifting ▶ Adjust vortex value.5	-	Correction value of No.5 break point of instrument error correction*2

*1: Whether or not to use instrument error correction is selected

Selection		**Description**
FOUNDATION Fieldbus	**Display**	
Off	-	Correction calculation is not performed.
On	-	Correction calculation is performed.

*2: As shown in the figure, flow rate error based on the reference flow rate value is corrected by segment approximations by setting the correction data corresponding to the frequency of any five points.



(1) Set the break point frequency as f1 ≤ f2 ≤ f3 ≤ f4 ≤ f5.
When there are 4 points, set f4 = f5.
When there are 3 points, set f3 = f4 = f5.
(2) When there is a flow rate input of f1 or less, instrument error correction is performed with the correction value taken to be d1.
(3) When there is a flow rate input of f5 or more, instrument error correction is performed with the correction value taken to be d5.
(4) Horizontal axis (f1 - f5): Set the break point frequency as the parameter.
(5) Vertical axis (d1 - d5): Set the correction value (%) of each break point as the parameter.

6.9.4 Expansion Correction

Error caused by pressure loss occurs in proportion to the increase in flow speed of a fluid.
Expansion correction is used to correct this error.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Additional Adjust ► Expansion factor adjust
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Off	-	Correction calculation is not performed.
On	-	Correction calculation is performed.

6.10 Maintenance/Adjustment Functions

6.10.1 Noise Balance

Normally, use noise balance in the Auto mode. Note, however, that when there is considerable vibration on the piping line and measurement is not succeeding in the Auto mode, adjust this by entering setting values in the Manual mode.
For details on adjustment method, see Subsections 6.10.3 Zero Tuning and 6.1.7 Setting the Lowcut Function of Instantaneous Flow Rate.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Signal Controls ► Signal Basic Items ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Signal band	-	The signal band is displayed.
Signal level	-	Adjustment scale factor of signal judgment level
Noise balance mode	-	Selection of noise balance mode
Noise ratio(auto)	-	Noise balance value when the noise balance mode is Auto
Noise ratio(manual)	-	Noise balance value when the noise balance mode is Manual

6.10.2 TLA

The trigger level (TLA) has already been set to the optimum value. Accordingly, there is no need to set this during regular measurement. However, the trigger level needs to be adjusted in the following cases:

- To perform measurement at a flow rate lower than the default flow rate
- When there is considerable vibration on the piping line, and the flow rate is zero even after manually adjusting noise balance, or when output indicates a value higher than the actual value during a low flow rate

Note, however, that the measurable lower limit flow velocity increases when the adjustment value has been set higher than the optimum value (default value).
For details on adjustment method, see Subsections 6.10.3 Zero Tuning and 6.1.7 Setting the Lowcut Function of Instantaneous Flow Rate.

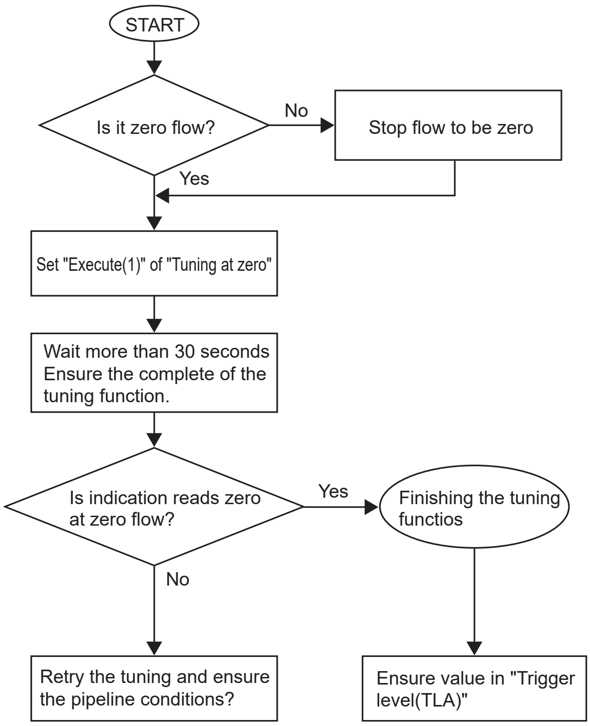
Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Signal Controls ► Signal Basic Items ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Trigger level mode	-	Selection of TLA mode
Trigger level(TLA)	-	User setting scale factor of trigger level judgment threshold value

6.10.3 Zero Tuning

Perform zero tuning manually when there is flow rate output despite the fact that fluid has been stopped even though the device has been automatically adjusted to cancel out external noise (e.g vibration on piping) at all times. Perform zero tuning by the procedure below.



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Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Adjust ► Zero Adjust ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Tuning at zero	-	Select whether to execute tuning of noise balance is executed
Tuning status	-	Noise balance tuning state

6.10.4 Other Maintenance Information

The following parameters can be checked.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Signal Controls ► Monitor/Calculated Values ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Velocity span	-	The flow velocity span value is displayed
Velocity lowcut	-	The lowcut flow velocity value is displayed
Vortex frequency span	-	The vortex frequency span is displayed
Vortex frequency lowcut	-	The lowcut vortex frequency is displayed

6.11 Alarms

6.11.1 Errors and Countermeasures

Explanation of NE107 status:

NE107 status		Status of the device
F	Failure	Parts failure, device failure, overall failure
C	Function Check	The output signal is temporarily abnormal as a local operation or value has been input manually.
S	Out of specification	The device is operating outside of the specification. The output signal is uncertain for the process or the environment.
M	Maintenance required	Maintenance is required in the near future.
N	No Effect	State other than mentioned above.

The table below shows error details and countermeasures.
The numbers listed in the “FD” column in the table below correspond to “n” in FD_EXTENDED_ACTIVE_n and DEVICE_CONDITION_ACTIVE_n in Section 7.1.
“Bit” shows the bit assignment for each parameter.

■ System alarm

The device has malfunctioned and normal measurement is not possible. The product might need to be replaced.

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
F	010:CPU failure	AL-010	A failure in the program memory of the transmitter CPU is detected	Contact your nearest Yokogawa service center.	2	31
F	011:CPU failure	AL-011	A failure in the I/O calculation memory of the transmitter CPU is detected	Contact your nearest Yokogawa service center.	2	30
F	012:Main storage failure	AL-012	Physical/logical failure of the transmitter EEPROM is detected	Contact your nearest Yokogawa service center.	2	29
F	013:Sub storage failure	AL-013	Physical/logical failure of the sensor EEPROM is detected	Contact your nearest Yokogawa service center.	2	28
F	014:Main ASIC failure	AL-014	Operation stop of the main control IC is detected	Contact your nearest Yokogawa service center.	2	27
F	015:Sub ASIC failure	AL-015	Operation stop of the sub control IC is detected	Contact your nearest Yokogawa service center.	2	26
F	016:ADC circuit failure	AL-016	Failure of the sensor ADC circuit is detected	Contact your nearest Yokogawa service center.	2	25
F	017:Signal circuit failure	AL-017	Failure of the sensor signal circuit is detected	Contact your nearest Yokogawa service center.	2	24
F	020:Flow sensor failure	AL-020	Failure of the flow sensors (A or B) is detected	Contact your nearest Yokogawa service center.	2	21
F	021:Temperature sensor failure	AL-021	Failure of the temperature sensor is detected	Contact your nearest Yokogawa service center.	2	20

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
F	Abnormal Boot Process	-	Failure occurred during the device startup process	Check the cable and power, and then check the MTB Soft DL Error(MTB.SOFTDL_ERROR) parameter.	1	26
C	SoftDL Failure	-	Software download failed	Check the download file and the MTB Soft DL Error(MTB.SOFTDL_ERROR) parameter.	1	25
C	SoftDL Incomplete	-	Software download incomplete	Check the cable and power, and then check the MTB Soft DL Error(MTB.SOFTDL_ERROR) parameter.	1	24
F	Amp EEPROM Failure	-	Physical/logical failure of the transmitter or sensor EEPROM is detected	Contact your nearest Yokogawa service center.	1	19
F	183:IT Total Backup Err	-	IT block totalized value saving error	Contact your nearest Yokogawa service center.	8	28

■ Process alarm

The device is normal but normal measurement is not possible due to process-related problems. Consider maintenance.

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
M	030:Fluctuation	AL-030	Fluctuation of the flow rate signal is detected	Check the process or installation status.	3	31
M	031:Transient noise	AL-031	Transient noise on the flow rate signal is detected	Check the process or installation status.	3	30
S	032:High vibration	AL-032	Abnormal vibration of the piping is detected	Check the process or installation status.	3	29
S	033:Critical vibration	AL-033	Abnormal resonance of the piping is detected	Check the process or installation status.	3	28
S	040:Temperature out of range	AL-040	The fluid temperature is out of the specification temperature range	Check the process.	3	21
C	045:T/P compensation out of range	AL-045	The fluid temperature and fluid pressure is out of the compensation range	Check the fluid temperature and fluid pressure values.	3	16

■ Setting alarm

The device is operating normally, however, a parameter setting error has occurred. Check the parameter settings.

NE107 status	Error message: FOUNDATION Fieldbus	Error message: Display	Details of error	Countermeasure	FD	bit
C	-	AL-050	The flow rate span setting is out of the specification range	Correct the values of XD_SCALE and OUT_SCALE for AI FBs that have flow rates assigned to channels. Or, check the flow rate calculation setting parameter.	-	-
C	-	AL-051	The temperature span setting is inconsistent or out of the specification range	Correct the temperature span value.	-	-
C	-	AL-053	Setting inconsistency in flow rate calculation(including calculation tool)	Check the flow rate setting, flow rate selection and flow rate calculation parameter.	-	-
C	060:Sensor backup error	AL-060	Transmitter/sensor backup setting inconsistency	Check the data to be backed up.	4	21
C	100:RB in O/S mode	-	Resource block is in O/S mode	Change the RS Block Mode.Target(RS.MODE_BLK.Target) parameter to the Auto mode.	1	22
C	Link Obj. 1/17/33 Not Open	-	Link objects 1, 17, and 33 are not in a normal open state	Check the link object.	1	15
C	Link Obj. 2/18/34 Not Open	-	Link objects 2, 18, and 34 are not in a normal open state	Check the link object.	1	14
C	Link Obj. 3/19/35 Not Open	-	Link objects 3, 19, and 35 are not in a normal open state	Check the link object.	1	13
C	Link Obj. 4/20/36 Not Open	-	Link objects 4, 20, and 36 are not in a normal open state	Check the link object.	1	12
C	Link Obj. 5/21/37 Not Open	-	Link objects 5, 21, and 37 are not in a normal open state	Check the link object.	1	11
C	Link Obj. 6/22/38 Not Open	-	Link objects 6, 22, and 38 are not in a normal open state	Check the link object.	1	10
C	Link Obj. 7/23/39 Not Open	-	Link objects 7, 23, and 39 are not in a normal open state	Check the link object.	1	9
C	Link Obj. 8/24/40 Not Open	-	Link objects 8, 24, and 40 are not in a normal open state	Check the link object.	1	8
C	Link Obj. 9/25/41 Not Open	-	Link objects 9, 25, and 41 are not in a normal open state	Check the link object.	1	7
C	Link Obj. 10/26/42 Not Open	-	Link objects 10, 26, and 42 are not in a normal open state	Check the link object.	1	6
C	Link Obj. 11/27/43 Not Open	-	Link objects 11, 27, and 43 are not in a normal open state	Check the link object.	1	5

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
C	Link Obj. 12/28/44 Not Open	-	Link objects 12, 28, and 44 are not in a normal open state	Check the link object.	1	4
C	Link Obj. 13/29/45 Not Open	-	Link objects 13, 29, and 45 are not in a normal open state	Check the link object.	1	3
C	Link Obj. 14/30 Not Open	-	Link objects 14 and 30 are not in a normal open state	Check the link object.	1	2
C	Link Obj. 15/31 Not Open	-	Link objects 15 and 31 are not in a normal open state	Check the link object.	1	1
C	Link Obj. 16/32 Not Open	-	Link objects 16 and 32 are not in a normal open state	Check the link object.	1	0
C	101:STB in O/S Mode	-	Sensor transducer block is in O/S mode	Change the STB Block Mode.Target(STB. MODE_BLK.Target) parameter to the Auto mode.	7	31
C	102:LTB in O/S Mode	-	LCD transducer block is in O/S mode	Change the LTB Block Mode.Target(LTB. MODE_BLK.Target) parameter to the Auto mode.	7	30
C	103:MTB in O/S Mode	-	Maintenance transducer block is in O/S mode	Change the MTB Block Mode.Target(MTB. MODE_BLK.Target) parameter to the Auto mode.	7	29
C	110:No FB Scheduled	-	Function Block is not scheduled	Schedule FB. Also, confirm communication with LAS.	7	24
C	120:AI1 in O/S Mode	-	AI1 block is in O/S mode	Change the AI1 Block Mode.Target(AI1. MODE_BLK.Target) parameter to the Auto mode.	7	23
C	121:AI1 in Man Mode	-	AI1 block is in Man mode	Change the AI1 Block Mode.Target(AI1. MODE_BLK.Target) parameter to the Auto mode or another mode.	7	22
C	122:AI1 Not Scheduled	-	AI1 block is not scheduled	Schedule the AI1 block.	7	21
C	123:AI1 Simulation Active	-	AI1 block simulation mode is enabled	Change the AI1 Simulation En/ Disable(AI1.SIMULATE. SIMULATE_ENABLE) parameter to Disable.	7	20
C	130:AI2 in O/S Mode	-	AI2 block is in O/S mode	Change the AI2 Block Mode.Target(AI2. MODE_BLK.Target) parameter to the Auto mode.	7	19
C	131:AI2 in Man Mode	-	AI2 block is in Man mode	Change the AI2 Block Mode.Target(AI2. MODE_BLK.Target) parameter to the Auto mode or another mode.	7	18
C	132:AI2 Not Scheduled	-	AI2 block is not scheduled	Schedule the AI2 block.	7	17

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
C	133:AI2 Simulation Active	-	AI2 block simulation mode is enabled	Change the AI2 Simulation En/ Disable(AI2.SIMULATE. SIMULATE_ENABLE) parameter to Disable.	7	16
C	140:AI3 in O/S Mode	-	AI3 block is in O/S mode	Change the AI3 Block Mode.Target(AI3. MODE_BLK.Target) parameter to the Auto mode.	7	15
C	141:AI3 in Man Mode	-	AI3 block is in Man mode	Change the AI3 Block Mode.Target(AI3. MODE_BLK.Target) parameter to the Auto mode or another mode.	7	14
C	142:AI3 Not Scheduled	-	AI3 block is not scheduled	Schedule the AI3 block.	7	13
C	143:AI3 Simulation Active	-	AI3 block simulation mode is enabled	Change the AI3 Simulation En/ Disable(AI3.SIMULATE. SIMULATE_ENABLE) parameter to Disable.	7	12
C	160:DI1 in O/S Mode	-	DI1 block is in O/S mode	Change the DI1 Block Mode.Target(DI1. MODE_BLK.Target) parameter to the Auto mode.	7	7
C	161:DI1 in Man Mode	-	DI1 block is in Man mode	Change the DI1 Block Mode.Target(DI1. MODE_BLK.Target) parameter to the Auto mode or another mode.	7	6
C	162:DI1 Not Scheduled	-	DI1 block is not scheduled	Schedule the DI1 block.	7	5
C	163:DI1 Simulation Active	-	DI1 block simulation mode is enabled	Change the DI1 Simulation En/ Disable(DI1.SIMULATE. SIMULATE_ENABLE) parameter to Disable.	7	4
C	170:DI2 in O/S Mode	-	DI2 block is in O/S mode	Change the DI2 Block Mode.Target(DI2. MODE_BLK.Target) parameter to the Auto mode.	7	3
C	171:DI2 in Man Mode	-	DI2 block is in Man mode	Change the DI2 Block Mode.Target(DI2. MODE_BLK.Target) parameter to the Auto mode or another mode.	7	2
C	172:DI2 Not Scheduled	-	DI2 block is not scheduled	Schedule the DI2 block.	7	1
C	173:DI2 Simulation Active	-	DI2 block simulation mode is enabled	Change the DI2 Simulation En/ Disable(DI2.SIMULATE. SIMULATE_ENABLE) parameter to Disable.	7	0
C	180:IT in O/S mode	-	IT block is in O/S mode	Change the IT Block Mode.Target(IT.MODE_ BLK.Target) parameter to the Auto mode.	8	31

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
C	181:IT in Man mode	-	IT block is in Man mode	Change the IT Block Mode.Target(IT.MODE_BLK.Target) parameter to the Auto mode or another mode.	8	30
C	182:IT Not Scheduled	-	IT block is not scheduled	Schedule the IT block.	8	29
C	190:PID in O/S mode	-	PID block is in O/S mode	Change the PID Block Mode.Target(PID.MODE_BLK.Target) parameter to the Auto mode.	8	27
C	191:PID in Man mode	-	PID block is in Man mode	Change the PID Block Mode.Target(PID.MODE_BLK.Target) parameter to the Auto mode or another mode.	8	26
C	192:PID Not Scheduled	-	PID block is not scheduled	Schedule the PID block.	8	25
C	193:PID in Bypass mode	-	PID block is in Bypass mode	Change the PID Bypass(PID.BYPASS) parameter to OFF.	8	24
C	200:AR in O/S mode	-	AR block is in O/S mode	Change the AR Block Mode.Target(AR.MODE_BLK.Target) parameter to the Auto mode.	8	23
C	201:AR in Man mode	-	AR block is in Man mode	Change the AR Block Mode.Target(AR.MODE_BLK.Target) parameter to the Auto mode or another mode.	8	22
C	202:AR Not Scheduled	-	AR block is not scheduled	Schedule the AR block.	8	21
C	210:MAO in O/S Mode	-	MAO block is in O/S mode	Change the MAO Block Mode.Target(MAO.MODE_BLK.Target) parameter to the Auto mode.	8	20
C	212:MAO Not Scheduled	-	MAO block is not scheduled	Schedule the MAO block.	8	18

■ Warning

The device and measurement are operating normally, however, a warning has occurred.

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
F	070:Sensor communication error	AL-070	Control IC communication error is detected	In the case of a remote type, check the remote cable. In the case of an integral flowmeter, contact a Yokogawa service center.	5	31
F	071:Flow sensor error	AL-071	Abnormal sensor sensitivity is detected	Check the state of the flow sensors by using Built-in Verification.	5	30

NE107 status	Error message		Details of error	Countermeasure	FD	bit
	FOUNDATION Fieldbus	Display				
M	072:Clogging	AL-072	Clogging of a flow sensor is detected	Remove foreign matter by following the instructions in the device manual.	5	29
M	073:Degradation	AL-073	Degradation of a flow sensor is detected	Consider the timing for removing foreign matter.	5	28
S	074:Board temperature out of range	AL-074	A device internal temperature out of the specification range is detected	Review the installation environment.	5	27
N	080:Simulation running	AL-080	Test/simulation is running	When restoring to normal operation, cancel simulation or the output test.	5	21
N	081:Verification running	AL-081	Verification is currently executing	Wait for diagnostic processing to complete.	5	20
N	Write Unlocked	-	Write lock function not operating (parameter writing possible)	Set Write Lock for the resource block to Locked, or turn the hardware write lock switch to ON.	1	30
N	Hard Write Lock SW OFF	-	Hardware write lock switch is OFF (writing possible)	Set the hardware write lock switch to ON.	1	29
N	Write Locked	-	Write lock function operating (parameter writing not possible)	Set Write Lock for the resource block to Unlocked.	1	28
N	Hard Write Lock SW ON	-	Hardware write lock switch is ON (writing not possible)	Set the hardware write lock switch to OFF.	1	27
N	Simulation Switch ON	-	Simulation switch is ON	Set the simulation switch to OFF.	1	23
N	Simulation Switch OFF	-	Simulation switch is OFF	Set the simulation switch to ON.	1	21

6.11.2 Operation When an Error Occurs

Description of Term

Term	Description
Operation	Operation state in which output is being correctly output
Interlocked to input	Operation state in which the same processing as when there is no alarm is performed

Example 1) The volumetric flow rate also is held if the vortex frequency to be input is held when the volumetric flow rate is in use.

Example 2) When a temperature sensor failure occurs
When the flow rate is used as the volumetric flow rate, the vortex frequency to be input becomes normal action and the volumetric flow rate also becomes normal action.
When the flow rate is used as the mass flow rate, temperature and pressure can be input in addition to the vortex frequency. Accordingly, the combination becomes vortex frequency (normal), temperature (error) and pressure (normal). Output becomes the mass flow rate calculated according to the temperature error as a result of specifying handling of the temperature error by setting in Temp sensor alarm action.

The following table summarizes output and display behavior when an error occurs.

■ System alarm

NE107 status	Error message	Vortex frequency	Built-in temperature	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
-	-	-		-	-	-
F	010:CPU failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	011:CPU failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	012:Main storage failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	013:Sub storage failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	014:Main ASIC failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	015:Sub ASIC failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	016:ADC circuit failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	017:Signal circuit failure	Fixed at 0%		Interlocked to input	Interlocked to input	Stop
F	020:Flow sensor failure	In accordance with setting*1	Operation	Interlocked to input	Interlocked to input	Stop
F	021:Temperature sensor failure	Operation	In accordance with setting*2	Interlocked to input	Interlocked to input	Stop

*1: Flow sensor alarm action parameter setting
*2: Temperature sensor alarm action parameter setting

■ Process alarm

NE107 status	Error message	Vortex frequency	Built-in temperature	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
M	030:Fluctuation	Operation		Interlocked to input	Interlocked to input	Operation
M	031:Transient noise	Operation		Interlocked to input	Interlocked to input	Operation
S	032:High vibration	In accordance with setting*1	Operation	Interlocked to input	Interlocked to input	Operation
S	033:Critical vibration	In accordance with setting*2	Operation	Interlocked to input	Interlocked to input	Operation
S	040:Temperature out of range	Operation		Interlocked to input	Interlocked to input	Operation
C	045:T/P compensation out of range	Operation		Interlocked to input	Interlocked to input	Operation

*1: High vibration action parameter setting
*2: Critical vibration action parameter setting

■ Setting alarm

NE107 status	Error message	Vortex frequency	Built-in temperature	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
C	050:Flow span set error	Operation			Interlocked to input	Operation
C	051:Temperature span set error	Operation			Interlocked to input	Operation
C	053:Flow calculation set error	Operation			Interlocked to input*1	Hold
C	060:Sensor backup error	Operation		Interlocked to input	Interlocked to input	Operation

*1: Fluid density, Fluid density ratio and Specific enthalpy are held.

■ Warning

NE107 status	Error message	Vortex frequency	Built-in temperature	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
F	070: Sensor Communication error	Operation		Interlocked to input	Interlocked to input	Operation
F	071: Flow sensor error	Operation		Interlocked to input	Interlocked to input	Operation
M	072: Clogging	Operation		Interlocked to input	Interlocked to input	Operation
M	073: Degradation	Operation		Interlocked to input	Interlocked to input	Operation
S	074: Board temperature out of range	Operation		Interlocked to input	Interlocked to input	Operation
N	080: Simulation running	Operation		Interlocked to input	Interlocked to input	Operation
N	081: Verification running	Hold		Interlocked to input	Interlocked to input	Operation

6.11.3 Alarm Display Setting

Alarms are displayed on the lower display when an error occurs on this product.
When two or more alarms occur on this product, alarms are displayed in sequence.
Also, the names of alarms are displayed prefixed in accordance with the NAMUR NE107 standard.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► LTB ► Device Configuration ► Configuration ► Display setup ► Display NE107
Display	D22

Parameter		Description
FOUNDATION Fieldbus	Display	
Off	0	The NAMUR NE107 category is not displayed.
On	1	The NAMUR NE107 category is displayed.

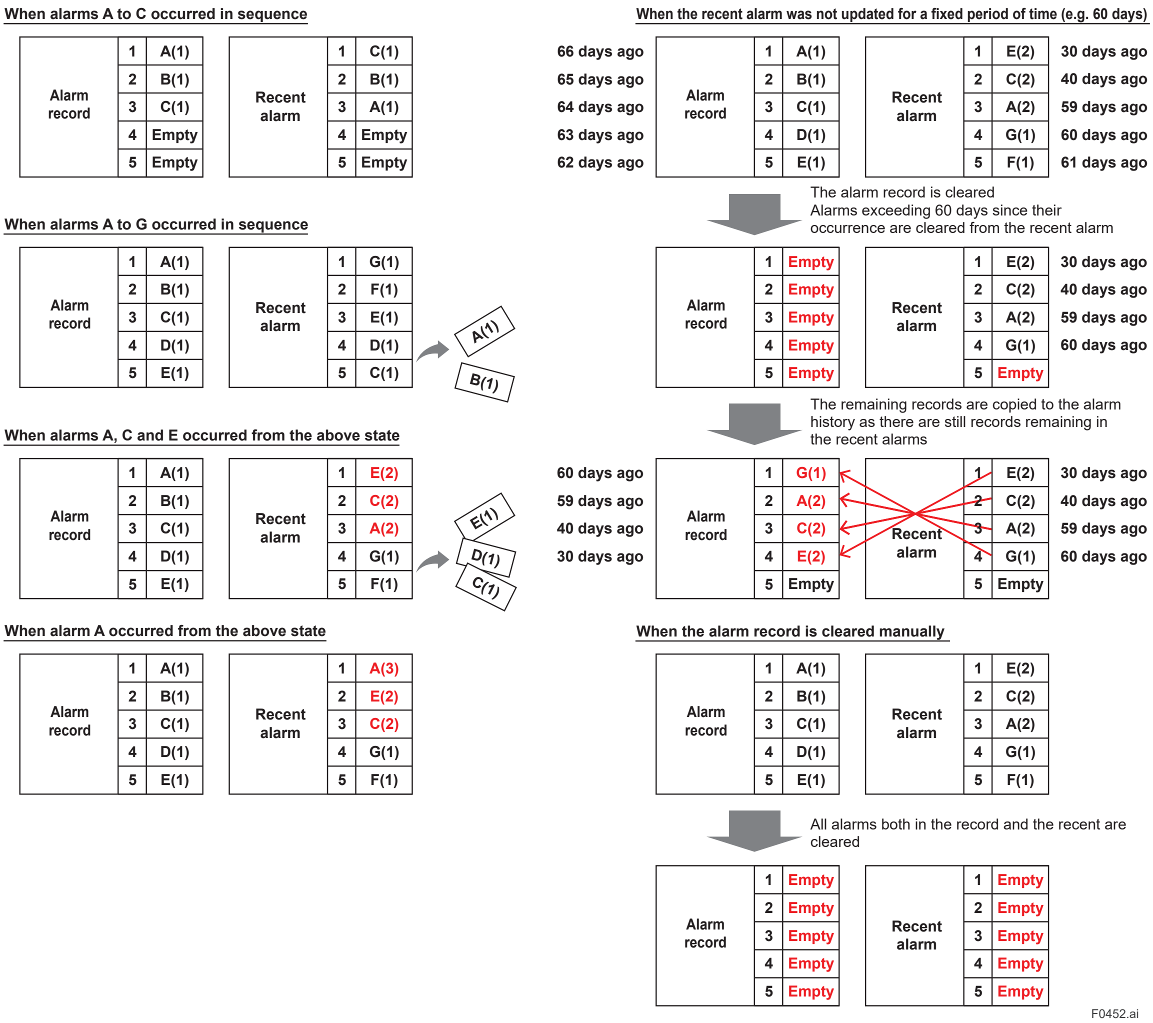
6.11.4 Alarm History Function

This function allows alarms that occurred in the past to be stored as an alarm history.
This function supports the following two types of functions:

- Alarm record: Five records are stored in sequence from the first alarm that occurs
- Recent alarm: The latest five alarms are stored

The features of these two functions are as follows.

Item	Alarm record	Recent alarm
Number of storage alarms	The first five alarms are stored in the order that they occurred	The latest five alarms that occurred are stored
6th alarm onwards	Not stored	Stored after the oldest alarm is cleared
Support for duplicate alarms	Not stored	Duplicate alarms are moved to the latest occurring alarm
Automatic deletion of alarms	After the specified number of days (default value: 60 days) has elapsed since the last alarm was stored, alarms [0] to [4] are cleared, and the alarm remaining in Recent alarm is stored (Even if the history is not filled with 5 alarms, alarms are cleared when the specified limit is reached)	Clearing is executed at the same timing as automatic deletion of Alarm record



A (x) to G (x): The number in parentheses indicates the number of occurrences of the alarm type.

These settings can be set and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Diagnostic ▶ MTB ▶ Device Diagnostics ▶ Diagnostics/Alerts ▶ Alarm Records ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Alarm record clear	-	Selection for forcibly clearing the alarm history and latest alarm
Auto delete time	-	Specified limit (number of days) for automatically clearing the alarm history and latest alarm
Alarm record 1-5 ▶ Alarm record 1-5	-	Alarms recorded in Alarm record are displayed 5: Latest ←→ 1: Oldest
Alarm record 1-5 ▶ Alarm record date 1-5	-	The date and time of alarms recorded in Alarm record are displayed (yyyy/mm/dd hh:mm:ss)
Alarm record 1-5 ▶ Alarm record operation time 1-5	-	The operation time when an alarm recorded in Alarm record is displayed in the format “ddddD hh:mm”*1
Recent alarm 1-5 ▶ Recent alarm 1-5	-	Alarms recorded in Recent alarm are displayed 1: Latest ←→ 5: Oldest
Recent alarm 1-5 ▶ Recent alarm date 1-5	-	The date and time of alarms recorded in Recent alarm are displayed (yyyy/mm/dd hh:mm:ss)
Recent alarm 1-5 ▶ Recent alarm operation time 1-5	-	The operation time when an alarm recorded in Recent alarm is displayed in the format “ddddD hh:mm”*1

*1: The operation time when an alarm occurred is displayed in the format “ddddD hh:mm”. “dddddD” indicates the day, “hh” indicates the hour, and “mm” indicates the minute.

Example:
“0031D 12:34” is displayed
This example shows that the alarm occurred when the product had been operated for 31 days, 12 hours, and 34 minutes.

6.11.5 Alarm Mask Function

This function masks a preset alarm group to hide alarm notification and prevents an alarm history from being left behind.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Diagnostic ▶ MTB ▶ Device Diagnostics ▶ Diagnostics/Alerts ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Alarm Select ▶ Alarm status select	-	Selection of alarm to be notified (FOUNDATION Fieldbus/ display)*1
Alarm Records ▶ Alarm record select	-	Selection of alarm to be stored in history*1

*1: Alarm status select / Alarm record select list

Selection		Description
FOUNDATION Fieldbus	Display	
All alarm/warning	-	All alarms and warnings are notified/stored in history
All alarm	-	Only alarms are displayed/stored in history (excluding warnings)
System/Process alarm	-	All System/Process alarms are notified and stored in history (excluding Setting Alarms, Warnings)

6.11.6 Output Operation When Alarm Occurs

Output operation when a specific alarm occurs can be set.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Signal Controls ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Alarm Actions ▶ Flow sensor alarm action	-	Output operation when AL-020:Flow sensor failure occurs is set*1
Alarm Actions ▶ Temp. sensor alarm action	-	Output operation when AL-021: Temperature sensor failure occurs is set*2
Additional Details ▶ High vibration action	-	Output operation when AL-032:High vibration occurs is set*3
Additional Details ▶ Critical vibration action	-	Output operation when AL-033:Critical vibration occurs is set*3

*1: Select output operation when AL-020 occurs

Selection		Description
FOUNDATION Fieldbus	Display	
Hold	-	Output is held at the value immediately before the alarm occurred
Zero	-	Flow rate zero
Measured value	-	Measurement is continued

*2: Select output operation when AL-021 occurs

Selection		Description
FOUNDATION Fieldbus	Display	
Hold	-	Output is held at the value immediately before the alarm occurred
Zero	-	Flow rate zero
Fixed value	-	The value is fixed and subsequently normal calculation is performed

*3: Select output operation when AL-032 and AL-033 occur

Selection		Description
FOUNDATION Fieldbus	Display	
Zero	-	Flow rate zero
Hold	-	Output is held at the value immediately before the alarm occurred
Measured value	-	Measurement is continued

6.12 Display

6.12.1 Setting Display Items

The content to display in the lower and upper displays can be set.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► LTB ► Device Configuration ► Configuration ► Display setup ► (see table below)
Display	(See table below)

Parameter		Description
FOUNDATION Fieldbus	Display	
Display line upper	B30	The content to display in the upper display is set*1
Display line lower	B31	The content to display in the lower display is set*2

*1: Select the content to display in the upper display from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Flow rate(%)	0	The instantaneous flow rate (%) is displayed
Flow rate	1	The instantaneous flow rate (engineering unit) is displayed
Temperature(%)	2	The fluid temperature (%) is displayed
AIFB1.OUT	4	OUT.Value in the AI function block 1 is displayed
AIFB1.OUT(%)	5	OUT.Value (%) in the AI function block 1 is displayed
AIFB2.OUT(%)	6	OUT.Value (%) in the AI function block 2 is displayed
AIFB3.OUT(%)	7	OUT.Value (%) in the AI function block 3 is displayed

*2: Select the content to display in the lower display from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Off	0	No display in lower display
Totalizer	1	The totalized flow rate value is displayed
Temperature	2	The fluid temperature (engineering unit) is displayed
Aux input	4	The process value assigned to external input (engineering unit) is displayed
AIFB2.OUT	5	OUT.Value (engineering unit) in the AI function block 1 is displayed
AIFB3.OUT	6	OUT.Value (engineering unit) in the AI function block 2 is displayed
ITFB.OUT	7	OUT.Value (engineering unit) in the IT function block is displayed

NOTE

The units of the external temperature, external pressure and external temperature difference can be displayed when external input is selected on the lower display. The unit is not displayed on the display when external density is selected for external input.

6.12.2 Setting the Decimal Point Position

The number of digits past the decimal point can be automatically adjusted or set to fixed when instantaneous flow rate (engineering unit), fluid temperature (engineering unit) or external input has been set to a display item in 6.12.1.

NOTE

There are some restrictions of this decimal point settings to give priority to show the value without over digit, cause of the 6 digit in lower line of this segment type LCD and it is restricted to 5 digit in case of numerical value with sign.
For example, the case of the value of -100 and decimal point setting is 4 digit, is NOT expressed like "-100.0000", so that, it is changed like "-100.00" with 2 digit of decimal point.

This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ LTB ▶ Device Configuration ▶ Configuration ▶ Display setup ▶ (see table below)
Display	(See table below)

Parameter		Description
FOUNDATION Fieldbus	Display	
Display format flow	D23	The decimal point position of the instantaneous flow rate value is set
Display format temperature	D24	The decimal point position of fluid temperature or external temperature from external input, included external temperature difference in case of heat difference application
Display format pressure	D25	The decimal point position of external pressure from external input

D23: Select the decimal point position of display format flow from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Auto	0	The number of digits past the decimal point is automatically adjusted*1
0 digit	1	The number of digits past the decimal point is fixed to 0
1 digit	2	The number of digits past the decimal point is fixed to 1
2 digit	3	The number of digits past the decimal point is fixed to 2
3 digit	4	The number of digits past the decimal point is fixed to 3
4 digit	5	The number of digits past the decimal point is fixed to 4

*1: When "Auto" is selected, the display format is automatically switched according to the span of the selected process value. The following table summarizes this in detail. This selection can be set only for Display format flow.

Judgment Range			Corresponding Display Format
700.0	< Flow span		0digit
70.0	< Flow span ≤	700.0	1digit
7.0	< Flow span ≤	70.0	2digit
0.7	< Flow span ≤	7.0	3digit
	Flow span ≤	0.7	4digit

D24: Select the decimal point position of Display format temperature and D25: Display format pressure from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
0 digit	0	The number of digits past the decimal point is fixed to 0
1 digit	1	The number of digits past the decimal point is fixed to 1
2 digit	2	The number of digits past the decimal point is fixed to 2
3 digit	3	The number of digits past the decimal point is fixed to 3
4 digit	4	The number of digits past the decimal point is fixed to 4

NOTE

When % display is selected, the number of digits past the decimal point is fixed to 1 and cannot be changed.

The decimal point position of totalized values is interlocked with the total rate setting. For details, see 6.2 Totalization Function.

6.12.3 Setting the Update Interval

The update interval of the process value for the display can be set.

NOTE

The display is the type of using liquid crystal, it has feature of slow response under lower temperature atmosphere. So, in this case, please set the longer update interval than usual to make sure to discern displaying contents.
Furthermore, pay attention about the following influences after setting the longer update interval. Turning period of exchanging alarm number and process value displaying.
Then, the time to move to the setting mode by pressing the [SET] switch, is needed a little longer cause of avoiding miss touch the switch. It depends on the setting of update interval and it is about 2 times of the interval. Pay attention in case of the long interval setting, especially.

This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► LTB ► Device Configuration ► Configuration ► Display setup ► Display period
Display	D20

Select the update internal from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
0.25s	0	The update interval is set to 0.25 seconds
0.5s	1	The update interval is set to 0.5 seconds
1s	2	The update interval is set to 1 second
2s	3	The update interval is set to 2 seconds
4s	4	The update interval is set to 4 seconds
8s	5	The update interval is set to 8 seconds

6.12.4 Other Settings

(1) Setting the startup screen

The screen display at startup can be selected.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► LTB ► Device Configuration ► Configuration ► Display setup ► Display startup
Display	D21

Select the screen display at startup from the table below

Selection		Description
FOUNDATION Fieldbus	**Display**	
Off	0	Nothing is displayed when the display is started up
On	1	The software version is displayed when the display is started up*1

*1: Example of software version display

F0453.ai

(2) Display test function

The test pattern is displayed by execution of the display test. Note that pressing any switch on the display during execution of this function will stop the function and return to the measurement screen.
This setting can be set by the following parameters.

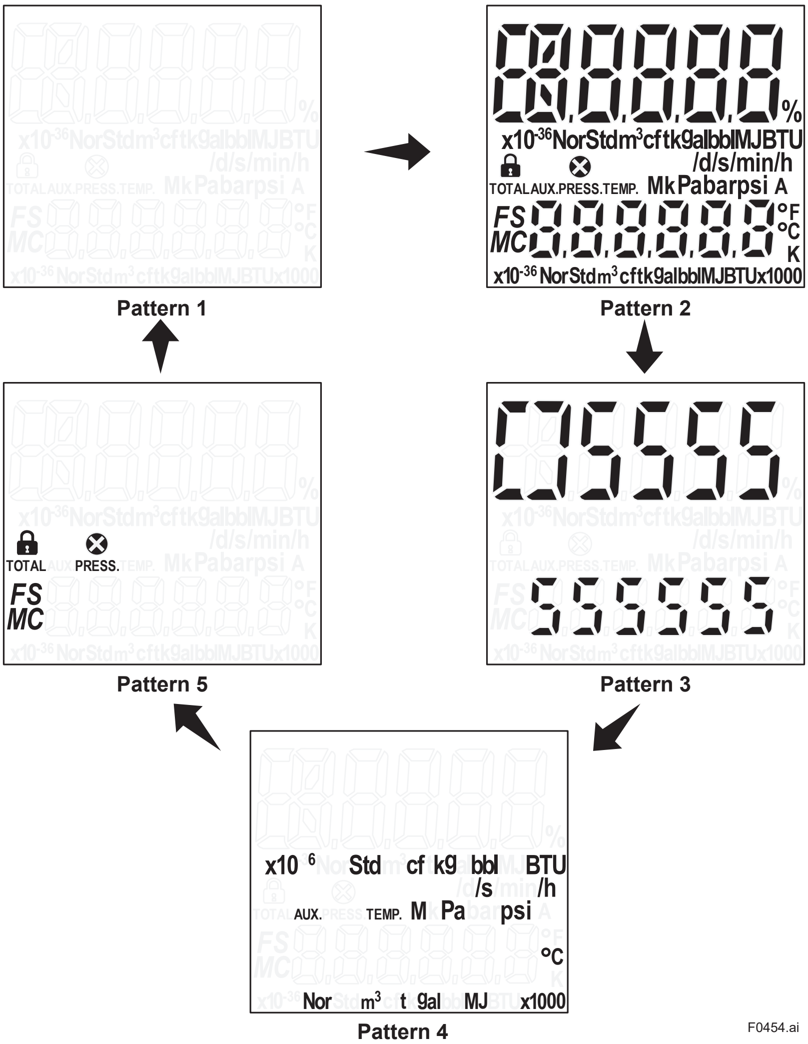
Menu path

FOUNDATION Fieldbus	Diagnostic ► LTB ► Device Diagnostics ► Service ► Test ► Display test
Display	J45

Select the screen display at startup from the table below

Selection		Description
FOUNDATION Fieldbus	**Display**	
Not execute	0	Not execute
Execute	1	Full segment pattern and the other pattern are displayed in order from pattern 2, 3, 4, 5, 1 to 2, repeated cyclically The display cycle depends on the display period setting. When it is set to less than 4 s, Full segment pattern is displayed 10 seconds, and the other patterns are displayed 4 seconds When it is set to greater than equal 4 s, Full segment pattern is displayed 16 seconds, and the other patterns are displayed 8 seconds
All on	2	All displayed (pattern 2)
All off	3	All hidden (pattern 1)
Only numeric	4	Only the number area is displayed (pattern 3)
Only unit	5	Only the unit area is displayed (pattern 4)
Only icon	6	Only the icon area is displayed (pattern 5)

● Example of display during execution of the display test



(3) Squawk function

A display pattern is displayed on the display to identify products that are being communicated with when two or more of the same model of product are installed. The display pattern is switched in sequence every 8 times of the update interval. Note that pressing any switch on the display during execution of this function will stop the function and return to the measurement screen. This setting can be set by the following parameters.

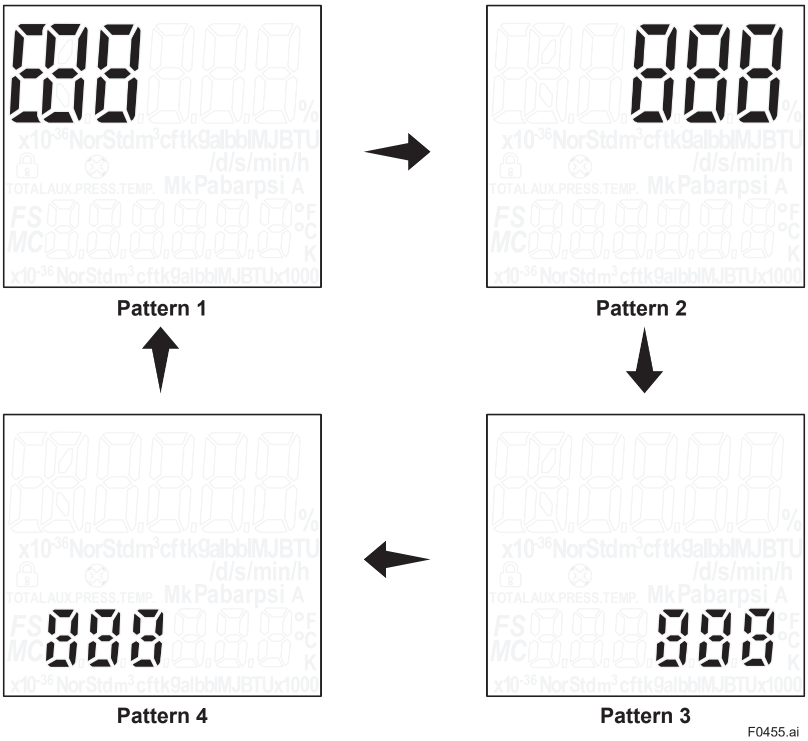
Menu path

FOUNDATION Fieldbus	Diagnostic ► LTB ► Device Diagnostics ► Service ► Test ► Squawk
Display	-

Select the squawk function from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Off	-	The squawk pattern is not displayed
On	-	The squawk display pattern is displayed (displayed continuously until squawk is turned off)
Once	-	The squawk display pattern is displayed (the measurement screen is returned to after the pattern is displayed for only 1 display cycle)

● Example of display during execution of the squawk function



6.13 Device Information

6.13.1 Order Information

The order information of the product can be set and displayed. If a particular parameter is specified at the time of order, this product is shipped with the parameter specified.
For details about the configuration of the model name and specification code, refer to General Specifications GS 01F07A00-01EN.

These settings can be set and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ MTB ▶ Device Configuration ▶ Device Information ▶ Order Information ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Major Model Codes ▶ Model	-	The model name is displayed
Major Model Codes ▶ Distributor name	-	The distributor name is displayed
Major Model Codes ▶ Device ID	-	The device ID is displayed
Major Model Codes ▶ Sensor MS code 1 - 6	-	The sensor MS code is displayed
Major Model Codes ▶ Sensor style code	-	The sensor style code is displayed
Major Model Codes ▶ Transmitter MS code 1 - 6	-	The transmitter MS code is displayed
Major Model Codes ▶ Transmitter style code	-	The transmitter style code is displayed
Additional Information ▶ Special order number 1-2	-	The special order No. is displayed
Additional Information ▶ Sizing number	-	The sizing No. is displayed
Additional Information ▶ Name plate tag number	-	The name plate tag No. is displayed
Additional Information ▶ Instruction manual number	-	The instruction manual No. is displayed
Additional Information ▶ Manufact. Date	-	The date of manufacture is displayed
Additional Information ▶ Connection type	-	Integral/remote sensor is selected *1
Additional Information ▶ Process temperature	-	The allowable temperature is displayed
Additional Information ▶ Max pressure	-	The maximum allowable pressure is displayed
Additional Information ▶ Communication select	-	The communication option is displayed
Additional Information ▶ Option dual bolt calibration	-	The optional dual sesnor is displayed
Additional Information ▶ Option cryogenic	-	The optional cryogenic is displayed
Additional Information ▶ Prediction function	-	The predictive diagnosis mode is displayed
Additional Information ▶ Option built-in verification	-	The verification option is displayed
Additional Information ▶ SI Control Codes	-	The optional SI unit is displayed
Additional Information ▶ Option bwc	-	The custom option is displayed

*1: Select the transmitter connection method

Selection		Description
FOUNDATION Fieldbus	Display	
Integral	-	The integral sensor is set
Remote	-	The remote sensor is set

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Configuration ▶ Flow Setup Additionals ▶ Temp./Press. Compensation Select ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Option built-in temperature	-	The optional built-in temperature gauge is displayed

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ LTB ▶ Device Configuration ▶ Configuration ▶ Display setup ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Option display installation	-	The optional display is displayed

6.13.2 Device Revision

The revision of the software, etc. currently used on this product can be checked.
This information can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ MTB ▶ Device Configuration ▶ Device Information ▶ Version/Number information ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Sensor S/N	-	The sensor serial No. is displayed
Transmitter S/N	-	The transmitter serial No. is displayed
Software Description	-	The revision No. of the software is displayed
Hardware revision	-	The revision No. of the hardware is displayed

6.13.3 Memo Function

Three parameters can be used for the memo function. Memos up to 16 characters long can be set.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ MTB ▶ Device Configuration ▶ Device Information ▶ Memos ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Memo 1	-	Memo 1 is set
Memo 2	-	Memo 2 is set
Memo 3	-	Memo 3 is set

6.13.4 Date and Time Information

Display the present date and time.
This setting can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Device Information ► Maintenance Information ► Current date/time ► (see table below)
Display	-

6.13.5 Displaying the Operation Time

Display the operation time. Operation time refers to the operation time up to the present from the time when the power was turned on for the first time. However, time is not counted when power is not turned on.
This information can be checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Device Information ► Maintenance Information ► Operation time
Display	-

The operation time is displayed in the format of “dddddD hh:mm”. “dddddD” indicates the day, “hh” indicates the hour, and “mm” indicates the minute.
Example:
“0031D 12:34”
This example shows that the product has been operated for 31 days, 12 hours, and 34 minutes.

NOTE

When the product has been operated for 10,000 days, the display stops at “9999D 23:59”.

6.14 Self-diagnostics

6.14.1 Types of Diagnostic Function

The self-diagnostics function of this product can be used to diagnose product failures or process status.
The diagnostic functions of this product are as follows.

Diagnostic Function	Description
Noise diagnosis	The presence of transient noise on the flow rate signal is diagnosed, and an alarm is notified when a failure is detected.
Vibration diagnosis	Vibration on the piping is diagnosed, and an alarm is notified when a failure is detected.
Resonant diagnosis	Resonance on the piping is diagnosed, and an alarm is notified when a failure is detected.
Clogging diagnosis	Clogging of the flow rate sensor is diagnosed, and a warning is notified when a failure is detected.
Predictive diagnosis	The time until failure of the piezo electric device is predicted, and a warning is notified before the failure occurs.
Verification	The health of the device is diagnosed, and the diagnosis result is displayed.
Signal latch	The state of the vortex signal at an arbitrary timing or when a specific alarm occurs is latched and the result is displayed.

6.14.2 Noise Diagnosis

Noise diagnosis diagnoses the presence of transient noise on the flow rate signal, and notifies the alarms Fluctuation (AL30) and Transient noise (AL31) when a failure is detected.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► STB ► Device Configuration ► Calibration ► Signal Controls ► Additional Details ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Transient noise count	-	This is the judgment count of Transient noise diagnosis. When this is set to “0”, Transient noise diagnosis is disabled.
Fluctuating level	-	This is the judgment value for the Fluctuation alarm. When this is set to “0.0%”, Fluctuation diagnosis is disabled.
Sensor circuit threshold(*)	-	The judgment value for the input circuit alarm (AL17) is set. When this is set to “0”, diagnosis is disabled.
Sensor capacitance threshold(*)	-	Failure value for the Sensor Failure alarm (AL20) is set. When this is set to “0”, diagnosis is disabled.
Sensor resistance threshold(*)	-	

NOTE

(*) If these parameters are set to other than 0, the output will be held once every 60 seconds for sensor diagnosis when the flow rate is zero or the sensor fails.

6.14.3 Vibration Diagnosis

With vibration diagnosis, the presence of abnormal vibration on the piping is diagnosed, and a High vibration alarm is notified when a failure is detected.
This judgment time for vibration diagnosis can be set by the following parameters.
When this is set to “0”, vibration diagnosis is disabled.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Signal Controls ▶ Additional Details ▶ High vibration time
Display	-

Output operation when the High vibration alarm occurs can be set. For details, see 6.11.6.

6.14.4 Resonant Diagnosis

With resonant diagnosis, flow rate signal data is used to diagnose the presence of resonance, and a Critical vibration alarm is notified when resonance is detected.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Signal Controls ▶ Additional Details ▶ (see table below)
Display	-

Parameter		**Description**
FOUNDATION Fieldbus	**Display**	
Critical vibration level	-	The judgment level for the Critical vibration alarm is set. When this is set to “0.0%”, resonant diagnosis is disabled.
Critical vibration time	-	The judgment time for the Critical vibration alarm is set.

Output operation when the Critical vibration alarm occurs can be set. For details, see 6.11.6.

6.14.5 Clogging Diagnosis

With clogging diagnosis, flow rate signal data is used to diagnose the presence of clogging on the piping, and a Clogging warning is notified when clogging is detected.
This judgment the judgment time for clogging diagnosis can be set by the following parameters.
When this is set to “0”, clogging diagnosis is disabled.

Menu path

FOUNDATION Fieldbus	Device Configuration ▶ STB ▶ Device Configuration ▶ Calibration ▶ Signal Controls ▶ Additional Details ▶ Clogging time
Display	-

6.14.6 Predictive Diagnosis

With predictive diagnosis, the time until an abnormal level is reached is predicted based on the trend of the detection signal from the piezo electric device, and a Degradation warning is notified before the failure is predicted to occur.
These settings can be set and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Configuration ► Prediction Setup ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Prediction execution	-	The predictive diagnosis mode is set
Prediction select	-	The data targeted in predictive diagnosis is set
Prediction period	-	The storage interval of predictive diagnosis is set
Prediction start date	-	The start date of predictive diagnosis is displayed
Prediction stop date	-	The stop date of predictive diagnosis is displayed
Prediction level	-	The judgment value of the prediction time is set
Prediction alarm time	-	The specified time of predictive diagnosis is set
Prediction estimate time	-	The prediction time of predictive diagnosis is displayed
Prediction result	-	The result of predictive diagnosis is displayed
Prediction type	-	The type of predictive diagnosis is set

NOTE

- Refer to Technical Information Vortex Flowmeter VY Series TI01F07A00-01EN for detailed setting method of predictive diagnosis.
- For Prediction execution, use Execute(1) only when fluid is flowing. If fluid is not flowing, the piezo electric device will not detect the signal, which can cause a malfunction.

6.14.7 Verification (Device Health Diagnosis) Function

The verification function diagnoses the health of the product and displays the diagnosis result. Each of the states of the detection circuit, signal circuit and calculation circuit are inspected, and device health diagnosis is performed based on the diagnosis results of internal alarm states and alarm history.
It takes approximately four minutes for the verification function to complete. The results of verification can be checked in parameters. “Pass” is displayed if no problem is found or “Failure” is displayed if a problem is found.
These settings can be set and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Diagnostic ▶ MTB ▶ Device Diagnostics ▶ Service ▶ Verification Execution ▶ (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Verification Exe	-	Execution/cancellation of verification*1
Verification target	-	The verification target is selected*2
Verification status	-	The progress of verification is displayed*3
Verification select switch	-	The verification result to be displayed is selected*4
Verification date/time	-	The date and time of verification execution selected at Verification select switch are displayed
Verification operation time	-	The operation time of verification execution selected at Verification select switch is displayed
Verification result	-	The overall result of verification at verification execution selected at Verification select switch is displayed*5
Sensor circuit result	-	The detection circuit diagnosis result of verification at verification execution selected at Verification select switch is displayed*5
Signal circuit result	-	The signal circuit diagnosis result of verification at verification execution selected at Verification select switch is displayed*5
Calculation circuit result	-	The calculation circuit diagnosis result of verification at verification execution selected at Verification select switch is displayed*5
Alarm status result	-	The alarm state result of verification at verification execution selected at Verification select switch is displayed*5
Alarm record result	-	The alarm history result of verification at verification execution selected at Verification select switch is displayed*5

*1: Select execution/cancellation of the verification function from the table below

Parameter		Description
FOUNDATION Fieldbus	Display	
Not execute	-	Initial state after a power on. Processing is canceled if this is set during execution.
Execute	-	Verification is executed. The state returns to Not execute if processing is completed or is forcibly ended after verification is executed. During execution, the state is Busy.

*2: Select the verification target from the table below

Parameter		Description
FOUNDATION Fieldbus	Display	
Sensor circuit	-	The detection circuit is set as the verification target.
Signal processing circuit	-	The signal circuit is set as the verification target.
Calculation circuit	-	The calculation circuit is set as the verification target.

Parameter		Description
FOUNDATION Fieldbus	Display	
Alarm status	-	The alarm status is set as the verification target.
Alarm record	-	The alarm history is set as the verification target.

*3: The progress of verification is displayed

Parameter		Description
FOUNDATION Fieldbus	Display	
Not execute	-	Verification is not yet executed. Initial state after a power on.
Execute (1 to 10/10)	-	Verification is currently executing. Progress is displayed in ten steps.
Finish	-	Verification is completed. The result is updated.
Cancel	-	Verification is canceled and forcibly ended. The result is not updated.

*4: Select the verification result to be displayed from the table below

Parameter		Description
FOUNDATION Fieldbus	Display	
Latest	-	Displays the result at this time.
Previous	-	Displays the previous result.
Factory	-	Displays the result obtained upon shipment from the manufacturing factory.

*5: From the table below, select the result of the verification function.

Parameter		Description
FOUNDATION Fieldbus	Display	
Unkown	-	Initial state after a power on
Pass	-	There are no problems concerning the diagnosis result.
Failure	-	There is a problem concerning the diagnosis result.
Cancel	-	Diagnosis is canceled/forcibly ended
Skip	-	Out of verification target

IMPORTANT

- Before using the verification function, be sure to disconnect this product from the control loop.
- Note that parameters cannot be changed while the verification function is executed.

NOTE

- When using the verification function, correctly set the fluid status with the parameter.
- If there is a problem with the verification result, refer to the Maintenance Manual.

6.14.8 Signal Latch

The signal latch function enables the vortex signal to be latched at arbitrary timing and the result displayed in accordance with parameters. Also, the status of the vortex signal when a specific alarm occurs is latched and the result is displayed in accordance with parameters.
These settings can be set and checked by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Query Device ► Page 10 ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Signal latch execution	-	Signal latch is executed*1
Signal latch target	-	The signal latch to display is set*2
Signal latch alarm	-	The alarm at a signal latch is displayed*3
Signal latch date	-	The date and time at a signal latch are displayed
Signal latch operation time	-	The operation time at a signal latch is displayed
Signal latch vortex frequency	-	The vortex frequency at a signal latch is displayed
Signal latch velocity	-	The flow velocity at a signal latch is displayed
Signal latch max band	-	The maximum band at a signal latch is displayed
Signal latch noise ratio	-	The noise ratio at a signal latch is displayed
Signal latch noise band 1-2	-	Noise band 1-2 at a signal latch is displayed
Signal latch TLA	-	The trigger level at a signal latch is displayed
Signal latch basic band	-	The basic band at a signal latch is displayed
Basic+0-8 band Basic+0-8 band.1	-	The A signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band Basic+0-8 band.2	-	The B signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band Basic+0-8 band.3	-	The C signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band Basic+0-8 band.4	-	The noise judgment level at the basic band + (0 to 8) at a signal latch is displayed

*1: Select execution of signal latch from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Not execute	-	Initial state after a power on
Execute	-	Signal latch is executed

*2: Select the signal latch to display from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Latest	-	The information that was latched at arbitrary timing is displayed
Sensor alarm record 1	-	The information that was latched when an alarm occurs is displayed 1 (Latest) ←→ 5 (Oldest)
Sensor alarm record 2	-	
Sensor alarm record 3	-	
Sensor alarm record 4	-	
Sensor alarm record 5	-	

*3: The alarm at a signal latch is displayed

Selection		Description
FOUNDATION Fieldbus	Display	
None	-	There is no information when an alarm occurs
Fluctuating	-	The information when a Fluctuating alarm occurs is displayed
Transient noise	-	The information when a Transient noise alarm occurs is displayed
High vibration	-	The information when a High vibration alarm occurs is displayed
Flow sensor error	-	The information when a Flow sensor error alarm occurs is displayed
Clogging	-	The information when a Clogging alarm occurs is displayed
Degradation	-	The information when a Degradation alarm occurs is displayed

6.15 Test/Simulation Function

IMPORTANT

Before using the test/simulation function, be sure to disconnect this product from the control loop.

6.15.1 Setting the Simulation Mode (TB)

In the simulation mode of the transducer block, values relating to vortex flowmeter inputs can be simulated.
That is, vortex frequency (Software/Hardware) and built-in temperature can be simulated.
With vortex frequency (Software) simulation, given simulation values are used in place of values resulting from the calculation of the vortex frequency.
With vortex frequency (Hardware) simulation, the health of the vortex signal input circuit can be checked by assigning pseudo vortex signals generated by internal circuits to the vortex signal input circuit in place of vortex signals from the vortex sensor.
Subsequent flow rate calculation and output is affected by setting simulation values.
A warning is displayed to indicate that the simulation mode is in use while this simulation mode is used.
The unit used when simulating built-in temperature is the temperature unit set in section 6.1.8. When the unit has been changed, the built-in temperature also is interlocked with the newly set unit and also changes.
This setting can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Diagnostic ► STB ► Device Diagnostics ► Service ► Simulation ► TB Simulation ► (see table below)
Display	-

Parameter		Description
FOUNDATION Fieldbus	Display	
Simulation mode	-	Setting of simulation target*1
Simulation vortex frequency	-	The simulation value (Hz) of the vortex frequency (software) is set
Simulation vortex frequency(HW)	-	The simulation value (Hz) of the vortex frequency (hardware) is set
Simulation built-in temperature	-	The simulation value of the built-in temperature is set

*1: Select the simulation target from the table below

Selection		Description
FOUNDATION Fieldbus	Display	
Vortex frequency	-	Simulation of vortex frequency input (Software) is started
Vortex frequency(HW)	-	Simulation of vortex frequency input (hardware) is started
Built-in temperature	-	Simulation of built-in temperature is started

6.15.2 Automatic Cancellation of the Simulation Mode (TB)

The simulation mode is automatically canceled when a fixed period of time has elapsed without changing parameters relating to the simulation mode after the transducer block simulation mode has been enabled. When parameters relating to the simulation mode are changed, the cancellation time is extended.
The time that the simulation mode is automatically canceled can be set by the following parameters.

Menu path

FOUNDATION Fieldbus	Diagnostic ▶ STB ▶ Device Diagnostics ▶ Service ▶ Simulation ▶ TB Simulation ▶ Auto release time
Display	-

Select the automatic cancellation time from the table below

Selection		**Description**
FOUNDATION Fieldbus	**Display**	
10min	-	The cancellation time is set to ten minutes
30min	-	The cancellation time is set to 30 minutes
60min	-	The cancellation time is set to one hour
3h	-	The cancellation time is set to three hours
6h	-	The cancellation time is set to six hours
12h	-	The cancellation time is set to 12 hours

6.15.3 Simulation (FB) Function

The product has a function to simulate the input of the function block as if the data is received from the transducer block. This function makes it possible to test the function block and alarm-processing system on the downstream side.
To prevent this function from being mistakenly activated while running, a simulation switch is implemented as a “key” on the amplifier. If this switch (SW1-1) is moved to the ON side, the simulation is enabled. If SIM_ENABLE_MSG of the sensor transducer block (index 2167) and REMOTE LOOP TEST SWITCH are written in order to do the same thing from remote, it activates the same operation as when the above switch is turned ON. However, the value of this parameter is lost when the power is turned off. An alarm occurs from the resource block in a state where a simulation is possible. After use, swiftly prohibit simulation.
This function can be configured with the following parameters.

■ AIFB

Menu path

FOUNDATION Fieldbus	Diagnostic ▶ AI1* ▶ Device Diagnostics ▶ Service ▶ (see table below)
Display	-

*One from AI1 to AI3.

Parameter		**Description**
FOUNDATION Fieldbus	**Display**	
Simulation Enable	-	In the communication access of FOUNDATION Fieldbus, the communication access is set with the procedures of the interactive operation guide called DD Method.
Simulation Disable	-	

■ DIFB

Menu path

FOUNDATION Fieldbus	Diagnostic ► DI1* ► Device Diagnostics ► Service ► (see table below)
Display	-

*Either DI1 or DI2.

Parameter		Description
FOUNDATION Fieldbus	**Display**	
Simulate Status	-	Specifies the data status to simulate.
Simulate Value	-	Specifies the data value to simulate.
Transducer Status	-	Displays the data status from the transducer block. Unable to change.
Transducer Value	-	Displays the data value from the transducer block. Unable to change.
Simulate En/Disable	-	Controls the simulation function of this block. 1: Simulation prohibited (standard state) 2: Simulation starts

If “2” is set to Simulate En/Disable, the relevant function block starts using the simulation value which is set to this parameter instead of the data from the transducer block. It can be used for propagation of the status to the subsequent block, occurrence of the process alarm, and operation test of the subsequent block.

IMPORTANT

- To set the simulation switch, it needs to remove and install the cover on the display side. For details about simulation switch, refer to the Installation Manual.
- To secure your safety, do not touch an electric circuit and cable other than the simulation switch.

6.15.4 Other Test Functions

Restarting the sensor circuit

Restart the device.
A restart can be executed by the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► MTB ► Device Configuration ► Query Device ► Page 18 ► Sensor reset
Display	-

Select execution of a restart from the table below

Selection		Description
FOUNDATION Fieldbus	**Display**	
Not execute	-	The sensor circuit restart is not executed
Execute	-	The sensor circuit restart is executed

6.16 Write Lock Function

A write lock can be changed with two methods; the hardware write lock switch and parameter settings for software write lock. When the write lock is enabled with either method, data cannot be written. For details about the write lock switch, see the Installation Manual. This function can be configured with the following parameters.

Menu path

FOUNDATION Fieldbus	Device Configuration ► RS ► Device Configuration ► Configuration ► (see table below)
Display	-

Selection		Description
FOUNDATION Fieldbus	Display	
Feature Info ► Feature Selection	-	Sets the operation of the write lock switch (see below).
Write Lock Info ► Write Lock	-	Specifies the use of the software write locking.
Write Lock Info ► Write Lock Level	-	Sets the operation of the target range for the write locking (see below).

Write Lock Level

If the write lock function is enabled, the parameter of the block for Write Lock Level cannot be changed. Table 6.6 shows correspondence between write lock level and target blocks for write lock. Furthermore, WRITE_LOCK_LEVEL is set to “A(ALL FBAP)” (resource block, all parameters of transducer block, and all parameters of the function block are write-protected) at shipping from factory.

Table 6.6 Correspondence between Write Lock Level and Target Blocks for Write Lock.

Selection	Target block for write lock function
FOUNDATION Fieldbus	
Level:C (TB)	All parameters of transducer block, FEATURE_SEL and WRITE_LOCK_LEVEL of resource block
Level:B (TB+RB)	Transducer block, all parameters of resource block
Level:A (All FBAP)	In addition to WRITE_CLCK_LEVEL"B(TB+RB)”, all parameters of function block
Level:AA (MIB+All FBAP)	In addition to WRITE_LOCK_LEVEL"AA(MIB+ALL FBAP)”, MIB

Feature Selection

The user can choose to enable either the write lock function with the switch, or the software write lock function. (See the table below.)

Table 6.7 Relationship among Feature Selection, Write Lock Switch and WRITE_ LOCK Parameter

Feature Selection		Write lock switch	Write Lock
Hard W Lock (bit4)	**Soft W Lock (bit3)**		
0 (OFF)	0 (OFF)	OFF (Write lock disabled)	Setting unable (“1” (write lock disabled))
	1 (ON)		1 (Write lock disabled)
			2 (Write lock enabled)
1 (ON)	0 (OFF)	ON (Write lock enabled)	Setting disabled (at factory shipping)

* When both of “Hard W Lock” and “Soft W Lock” are set to 1(ON), the settings for “Hard W Lock” takes precedence, and “Soft W Lock” is automatically set to 0(OFF).

When the write lock function (hardware write lock) is enabled with the switch, it is necessary to set Feature Selection for the resource block to settings for factory shipping in advance. (“Hard W Lock” (bit4) is set to “1” (ON), and “Soft W Lock” (bit3) to “0” (OFF) at factory shipping.)

Parameter: To enable the software write lock which is set with Write Lock, be sure to set “Soft W Lock” (bit3) of Feature Selection to “1” (ON), and “Hard W Lock” (bit4) to “0” (Off).

NOTE

The use status of the write lock function can be checked using the parameters or the icons shown on the display.
The following icons are displayed.

Icon	Description
(Off)	Write lock is not in use. (Parameters can be changed)
(On)	Write lock is in use. (Parameter cannot be changed)

7. Parameter Lists

This chapter shows parameter lists used for FOUNDATION Fieldbus communication.

Each parameter is set as specified at the time of ordering. Since other parameters are set with default values, be sure to refer to this chapter when changing them.

IMPORTANT

If this product is turned off before 30 seconds after setting the parameters, the settings will not be stored correctly. Keep the product turned on for over 30 seconds after setting the parameters.

NOTE

To obtain correct flow signals, it is necessary to set the nominal size, flow rate span and meter factor of the flow sensor. The nominal size and meter factor of the flow sensor are set on this product when shipped from the manufacturing factory. So, the customer is not required to set them.
If particular parameters are specified at the time of order, this product is shipped with the parameter set as specified. If a parameter is not specified at the time of order, that parameter needs to be set by the customer.

Note 1: The Write Mode column contains the modes in which each parameter is write enabled.

O/S : Write enabled in the O/S mode.

MAN : Write enabled in the Man and O/S modes.

AUTO : Write enabled in the Auto, Man, and O/S modes.

- : Unable to write

Note 2: Parameter Lists*1: Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
Parameter Lists*2: For option code/LAT, the measured lower limit temperature will be -50 degC instead of -40 degC.

7.1 Resource Block

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
0	1000	Block Header	“RS ”	O/S	Information on this block, such as Block Tag, DD Revision, Execution, etc.
1	1001	ST_REV	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.
2	1002	TAG_DESC	Space (32 characters)	AUTO	Universal parameter to store a comment explaining tag contents.
3	1003	STRATEGY	0	AUTO	Universal parameter intended to be used for the high-level system to separate function blocks.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
4	1004	ALERT_KEY	0	AUTO	Key information to identify where an alert takes place. Generally, this parameter is used by the high-level system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.
5	1005	MODE_BLK	0x08(Auto) 0x08(Auto) 0x88(Auto, O/S) 0x08(Auto)	AUTO - AUTO AUTO	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.
6	1006	BLOCK_ERR	0x0000	-	Indicates the error statuses related to the own block.
7	1007	RS_STATE	1	-	Indicates the state of the resource block in the device.
8	1008	TEST_RW	0 0 0 0 0 0 0 0.0 All spaces All 0 0,0,0,0,0,0 0,0 0,0 0 0,0	AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO AUTO	Parameter used to perform a read/write test to the device.
9	1009	DD_RESOURCE	Space (32 characters)	-	Name of the Device Description, including information on this resource block.
10	1010	MANUFAC_ID	0x594543	-	Manufacturer identification number (ID No.) used by an interface device to locate the DD for the resource. The manufacturer identification number of Yokogawa is 5850435 (0x594543).
11	1011	DEV_TYPE	0x0015	-	ID number assigned to the device.
12	1012	DEV_REV	1	-	Device revision number.
13	1013	DD_REV	1	-	Revision number in the device description of the device.
14	1014	GRANT_DENY	0x00 0x00	AUTO AUTO	The parameter for checking if various operations have been executed. Set a bit corresponding to the GRANT parameter before various operations are executed. Check the DENY parameter after the operation. If the bit for the operation is not set, it indicates that the operation was executed. Bit assignment complies with the Communication standard specifications.
15	1015	HARD_TYPES	0x0007	-	Bit string indicating the types of hardware (device). bit0: Scalar input analog input bit1: Scalar output analog output bit2: Discrete input digital input bit3: Discrete output digital output
16	1016	RESTART	1	AUTO	Indicates how the device re-starts up. 1: Run: Running 2: Resource: Re-start 3: Defaults: Re-start with default value 4: Processor: Re-start of CPU

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
17	1017	FEATURES	0x041E	-	Determines option operations of the resource block. Bit assignment complies with the Communication standard specifications.
18	1018	FEATURE_SEL	0x0015	AUTO	Parameter to used to select resource block options. Options defined in FEATURES can be selected. Bit assignment complies with the Communication standard specifications.
19	1019	CYCLE_TYPE	0x0001	-	Bit string indicating the type of cycle which the resource can execute. bit0: Scheduled: Used by scheduling bit1: Event driven: Used by event-driven type bit2: Manufacturer specified: Can be used with unique function
20	1020	CYCLE_SEL	0x0000	AUTO	Bit string to select the type of cycle.
21	1021	MIN_CYCLE_T	5760	-	Minimum value of period of execution.
22	1022	MEMORY_SIZE	0	-	Memory size available to configure the function block mounted in this device. To be checked before attempting a download.
23	1023	NV_CYCLE_T	0	-	Sets the interval between writing copies of nonvolatile parameters to EEPROM.
24	1024	FREE_SPACE	0.0	-	Percent of remaining memory available for further configuration. For this product, 0 is shown, which means a preconfigured resource.
25	1025	FREE_TIME	0.0	-	Percent of the block processing time that is free to process additional blocks. Not used for this product.
26	1026	SHED_RCAS	640000	AUTO	Sets time for device's communication timeout set for Remote cascade. Used only with PID function.
27	1027	SHED_ROUT	640000	AUTO	Sets time for device's communication timeout set for remote out. Used only with PID function.
28	1028	FAULT_STATE	1	-	Indicates failsafe state. Not used for this product.
29	1029	SET_FSTATE	1	AUTO	Starts failsafe state. Not used for this product.
30	1030	CLR_FSTATE	1	AUTO	Resets failsafe state. Not used for this product.
31	1031	MAX_NOTIFY	128	-	Maximum number of alert information which can be held in the device.
32	1032	LIM_NOTIFY	128	AUTO	Maximum number of alert information which the device notifies at a time. By specifying this, the number of alert to notify the host is limited, and it can prevent the host from overflowing.
33	1033	CONFIRM_TIME	640000	AUTO	
34	1034	WRITE_LOCK	1	AUTO	Prohibits setpoints from being written from the outside. 1: Not Locked 2: Locked
35	1035	UPDATE_EVT	0(Uninitialized) 0(Uninitialized) 0,0 0 0	AUTO - - - -	Indicates contents of the event when an update event (a change to the setpoint) occurs.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
36	1036	BLOCK_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when a block alarm occurs.
37	1037	ALARM_SUM	0x0000 0x0000 0x0000 0x0000	- - - AUTO	Parameter to show the alarm status of the entire block. Bit assignment complies with the Communication standard specifications.
38	1038	ACK_OPTION	0xFFFF	AUTO	Sets operation to acknowledge (acknowledgment for the alarm) of various alarms. By setting a bit to the alarm, the device operates for the alarm as if it is acknowledged without the acknowledgment. Bit assignment complies with the Communication standard specifications.
39	1039	WRITE_PRI	0	AUTO	Sets the WRITE_ALM priority. It can be used not just to set the priority, but to disable alarm notification with settings. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
40	1040	WRITE_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0(State 0)	AUTO - - - -	The alarm is activated if the write lock condition is changed in the sequence like, “Lock -> Reset” or “Reset -> Lock”.
41	1041	ITK_VER	6	-	Version number of the FF certification test (interoperability test) by Fieldbus Foundation applied to this product.
42	1042	COMPATIBILITY_REV	1	-	Indicates the lower revision compatible with the device DevRev.
43	1043	CAPABILITY_LEV	0	-	Indicates capability level inside the device.
44	1044	FD_VER	1	-	Indicates the major version value of diagnosis specification of the device.
45	1045	FD_FAIL_ACTIVE	0x00000000	-	Parameter assigned to “Failed” by the NAMUR NE-107 classification. For details about bit assignment, refer to ■ Field diagnostic.
46	1046	FD_OFFSPEC_ACTIVE	0x00000000	-	Parameter assigned to “Off Specification” by the NAMUR NE-107 classification. For details about bit assignment, refer to ■ Field diagnostic.
47	1047	FD_MAINT_ACTIVE	0x00000000	-	Parameter assigned to “Maintenance” by the NAMUR NE-107 classification. For details about bit assignment, refer to ■ Field diagnostic.
48	1048	FD_CHECK_ACTIVE	0x00000000	-	Parameter assigned to “Check Function” by the NAMUR NE-107 classification. For details about bit assignment, refer to ■ Field diagnostic.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
49	1049	FD_FAIL_MAP	0xFC000000	AUTO	Specifies a bit to assign to FD_FAIL_ACTIVE, parameter indicating “Failed”, among 32-bit alarms appearing on FD_SIMULATE.DiagnosticValue. For details about bit assignment, refer to ■ Field diagnostic.
50	1050	FD_OFFSPEC_MAP	0x00003800	AUTO	Specifies a bit to assign to FD_OFFSPEC_ACTIVE, parameter indicating “Off Specification” among 32-bit alarms appearing on FD_SIMULATE.DiagnosticValue. For details about bit assignment, refer to ■ Field diagnostic.
51	1051	FD_MAINT_MAP	0x000003E0	AUTO	Specifies a bit to assign to FD_MAINT_ACTIVE, parameter indicating “Maintenance”, among 32-bit alarms appearing on FD_SIMULATE.DiagnosticValue. For details about bit assignment, refer to ■ Field diagnostic.
52	1052	FD_CHECK_MAP	0x01FF8008	AUTO	Specifies a bit to assign to FD_CHECK_ACTIVE, parameter indicating “Check Function”, among 32-bit alarms appearing on FD_SIMULATE.DiagnosticValue. For details about bit assignment, refer to ■ Field diagnostic.
53	1053	FD_FAIL_MASK	0x00000000	AUTO	Specifies a bit not to notify to the host among 32-bit “Failed” alarms appearing on FD_FAIL_ACTIVE. For details about bit assignment, refer to ■ Field diagnostic.
54	1054	FD_OFFSPEC_MASK	0x00000000	AUTO	Specifies a bit not to notify to the host among 32-bit “Off Specification” alarms appearing on FD_OFFSPEC_ACTIVE. For details about bit assignment, refer to ■ Field diagnostic.
55	1055	FD_MAINT_MASK	0x00000000	AUTO	Specifies a bit not to notify to the host among 32-bit “Maintenance” alarms appearing on FD_MAINT_ACTIVE. For details about bit assignment, refer to ■ Field diagnostic.
56	1056	FD_CHECK_MASK	0x00000000	AUTO	Specifies a bit not to notify to the host among 32-bit “CheckFunction” alarms appearing on FD_CHECK_ACTIVE. For details about bit assignment, refer to ■ Field diagnostic.
57	1057	FD_FAIL_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when the alarm classified into “Failed” occurs.
58	1058	FD_OFFSPEC_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when the alarm classified into “Off Specification” occurs. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
59	1059	FD_MAINT_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when the alarm classified into “Maintenance” occurs.
60	1060	FD_CHECK_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when the alarm classified into “Check Function” occurs.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
61	1061	FD_FAIL_PRI	0	AUTO	Indicates the FD_FAIL_ALM priority of the alarm. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
62	1062	FD_OFFSPEC_ PRI	0	AUTO	Indicates the FD_OFFSPEC_ALM priority of the alarm. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
63	1063	FD_MAINT_PRI	0	AUTO	Indicates the FD_MAINT_ALM priority of the alarm. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
64	1064	FD_CHECK_PRI	0	AUTO	Shows the FD_CHECK_ALM priority of the alarm. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
65	1065	FD_SIMULATE	0x00000000 0x00000000 1	AUTO - AUTO	Parameter to simulate an alarm.
66	1066	FD_ RECOMMEN_ ACT	0	-	Indicates countermeasure for the most important alarm.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
67	1067	FD_EXTENDED_ACTIVE_1	0x00000000	-	Parameter to initiate an alarm. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
68	1068	FD_EXTENDED_ACTIVE_2	0x00000000	-	
69	1069	FD_EXTENDED_ACTIVE_3	0x00000000	-	
70	1070	FD_EXTENDED_ACTIVE_4	0x00000000	-	
71	1071	FD_EXTENDED_ACTIVE_5	0x00000000	-	
72	1072	FD_EXTENDED_ACTIVE_6	0x00000000	-	
73	1073	FD_EXTENDED_ACTIVE_7	0x00000000	-	
74	1074	FD_EXTENDED_ACTIVE_8	0x00000000	-	
75	1075	FD_EXTENDED_MAP_1	0x0708FFFF	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_1 to DEVICE CONDITION_ACTIVE_1.
76	1076	FD_EXTENDED_MAP_2	0xFFB80000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_2 to DEVICE CONDITION_ACTIVE_2. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
77	1077	FD_EXTENDED_MAP_3	0xF0210000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_3 to DEVICE CONDITION_ACTIVE_3. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
78	1078	FD_EXTENDED_MAP_4	0x00200000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_4 to DEVICE CONDITION_ACTIVE_4. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
79	1079	FD_EXTENDED_MAP_5	0xF8300000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_5 to DEVICE CONDITION_ACTIVE_5. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
80	1080	FD_EXTENDED_MAP_6	0x00000000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_6 to DEVICE CONDITION_ACTIVE_6. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
81	1081	FD_EXTENDED_MAP_7	0x01111011	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_7 to DEVICE CONDITION_ACTIVE_7. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
82	1082	FD_EXTENDED_MAP_8	0x10000000	AUTO	Parameter set by the user as the mask from FD_EXTENDED_ACTIVE_8 to DEVICE CONDITION_ACTIVE_8. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
83	1083	DEVICE_ CONDITION_ ACTIVE_1	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_1 for FD_ EXTENDED_ACTIVE_1. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
84	1084	DEVICE_ CONDITION_ ACTIVE_2	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_2 for FD_ EXTENDED_ACTIVE_2. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
85	1085	DEVICE_ CONDITION_ ACTIVE_3	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_3 for FD_ EXTENDED_ACTIVE_3. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
86	1086	DEVICE_ CONDITION_ ACTIVE_4	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_4 for FD_ EXTENDED_ACTIVE_4. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
87	1087	DEVICE_ CONDITION_ ACTIVE_5	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_5 for FD_ EXTENDED_ACTIVE_5. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
88	1088	DEVICE_ CONDITION_ ACTIVE_6	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_6 for FD_ EXTENDED_ACTIVE_6. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
89	1089	DEVICE_ CONDITION_ ACTIVE_7	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_7 for FD_ EXTENDED_ACTIVE_7. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
90	1090	DEVICE_ CONDITION_ ACTIVE_8	0x00000000	-	Shows results reflecting the mask by FD_EXTENDED_MAP_8 for FD_ EXTENDED_ACTIVE_8. For details about bit assignment, refer to FD and bit items in the table in Subsection 6.11.1.
91	1091	SOFTWARE_REV	-	-	Software revision
92	1092	WRITE_LOCK_ LEVEL	2	AUTO	See 6.16.

■ Field diagnostic

Bit	Selection
	FOUNDATION Fieldbus
31	Electronics failure
30	Sensor/Actuator failure
29	Potential failure
26	Operated at the backup side
24	Firmware update error
23	Communication configuration error
22	Non operating state
21	Calibration warning
20	Instrument configuration error
19	Function restricted
18	Simulation mode
17	Manual mode
16	Function Block notification
15	Device specific function check
13	Sensor-Actuator value out of specification
12	Environment out of specification
9	Temporal decrease of value quality
8	Deterioration estimated by Time Based Maintenance
7	Deterioration estimated by Condition Based Maintenance
5	Adjustment failure by process environment
3	Optional function configuration error
2	Alarm related information
1	Process alarm
0	CHECK

7.2 Sensor Transducer Block

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
0	2000	Block Header	-	-	O/S	STB	-	Information on this block, such as Block Tag, DD Revision, Execution, etc.	-
1	2001	ST_REV	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.	-
2	2002	TAG_DESC	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	Space (32 characters)	-	Universal parameter to store a comment explaining tag contents.	-
3	2003	STRATEGY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Universal parameter intended to be used for the high-level system to separate function blocks.	-
4	2004	ALERT_KEY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Key information to identify where an alert takes place. Generally, this parameter is used by the highlevel system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.	-
5	2005	MODE_BLK	Complies with Communication standard specifications	0x88(Auto, O/S) - 0x88(Auto, O/S) 0x88(Auto, O/S)	AUTO - AUTO AUTO	0x80(O/S) 0x80(O/S) 0x88(Auto, O/S) 0x08(Auto)	-	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.	-
6	2006	BLOCK_ERR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0x0000	-	Indicates the error statuses related to the own block.	-
7	2007	UPDATE_EVT	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0 0	-	Indicates contents of the event when an update event (a change to the setpoint) occurs.	-
8	2008	BLOCK_ALM	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	-	Indicates contents of the alarm when a block alarm occurs.	-
9	2009	TRANSDUCER_ DIRECTORY	Complies with Communication standard specifications	-	-	1 2010	-	Parameter to store the index of the transducer included in the device.	-
10	2010	TRANSDUCER_ TYPE	Complies with Communication standard specifications	-	-	Sensor TB (32832)	-	Indicates the device type.	-
11	2011	TRANSDUCER_ TYPE_VER	Complies with Communication standard specifications	-	-	1	-	Indicates the version of the device.	-
12	2012	XD_ERROR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Stores XD_ERROR which is occurring in the sensor transducer block.	-
13	2013	COLLECTION_ DIRECTORY	Complies with Communication standard specifications	-	-	0	-	Stores indexes of important parameters in the transducer block and the item ID of the corresponding DD.	-
14	2014	PRIMARY_ VALUE_TYPE	Complies with Communication standard specifications	Complies with Communication standard specifications	-	volumetric flow (101)	-	Indicates a process type of Primary Value.	-

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
15	2015	PRIMARY_ VALUE	Primary Value. Status Primary Value. Value	Complies with Communication standard specifications	-	0 0	- Primary Value Range. Units index (2016)	Indicates the instantaneous flow rate.	P.58
16	2016	PRIMARY_ VALUE_ RANGE	Primary Value Range.EU at 100% Primary Value Range.EU at 0% Primary Value Range.Unis index Primary Value Range.Decimal	Complies with Communication standard specifications	-	10 0 m³/h(1349) 4	-	Indicates the range information and unit information forinstantaneous flow rate.	-
17	2017	SECONDARY_ VALUE_TYPE	Complies with Communication standard specifications	Complies with Communication standard specifications	-	process temperature (104)	-	Indicates a process type of Secondary Value.	-
18	2018	SECONDARY_ VALUE	Secondary Value.Status Secondary Value.Value	Complies with Communication standard specifications	-	0 0	- Temperature Unit (2019)	Indicates the measured temperature.	P.58
19	2019	SECONDARY_ VALUE_UNIT	Temperature Unit	degC (1001) K (1000)	O/S	degC (1001)	-	The temperature unit is set	-
20	2020	XD_OPTS	Complies with Communication standard specifications	Complies with Communication standard specifications	O/S	0x00000000	-	Bit assignment complies with the Communication standard specifications.	-
21	2021	SENSOR_ TYPE	Complies with Communication standard specifications	Vortex (112)	O/S	Vortex (112)	-	Indicates a sensor input type.	-
22	2022	SENSOR_ RANGE	Complies with Communication standard specifications	Complies with Communication standard specifications	-	28.0124 0.0 m³/h (1349) 4	-	Indicates a sensor input range information.	-
23	2023	SENSOR_ CAL_ METHOD	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	volmetric(100)	-	Specifies a calibration method for the sensor.	-
24	2024	SENSOR_ CAL_LOC	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	Yokogawa	-	Specifies a location to calibrate the sensor.	-
25	2025	SENSOR_ CAL_DATE	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	0,0,0,225,1,23	-	Specifies the calibration date of the sensor.	-
26	2026	SENSOR_ CAL_WHO	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	Yokogawa	-	Specifies the calibrator of the sensor.	-

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
27	2027	BLOCK_ERR_DESC_1	Block Err. Desc. 1	bit0: 010:CPU failure bit1: 011:CPU failure bit2: 012:Main storage failure bit3: 013:Sub storage failure bit4: 014:Main ASIC failure bit5: 015:Sub ASIC failure bit6: 016:ADC circuit failure bit7: 017:Signal circuit failure bit8: 020:Flow sensor failure bit9: 021:Temperature sensor failure bit11: Primary Variable is BAD bit12: Secondary Variable is BAD bit13: Tertiary value is BAD bit14: Total value is BAD bit15: 101:STB in O/S mode bit16: 030:Fluctuating bit17: 031:Transient noise bit18: 032:High vibration bit19: 033:Critical vibration bit20: Temperature/Pressure out of range bit21: 070:Sensor communication error bit22: 071:Flow sensor error bit23: 072:Clogging bit24: 073:Degradation bit25: 074:Board temperature out of range bit26: 060:Sensor backup error bit27: Flow span set error bit28: Temperature span set error bit29: Flow calculation set error	-	0x00000000	-	Indicates the detailed information of BLOCK_ERR.	-
28	2028	TERTIARY_VALUE_TYPE	Tertiary Value Type	gauge pressure (108) absolute pressure (109)	-	absolute pressure (109)	-	Indicates a process type of Tertiary Value.	-
30	2030	TERTIARY_VALUE_UNIT	Pressure unit	kPaa (1547) MPaa (1545) Bara (1597) psia (1142) kPag (1548) MPag (1546) Barg (1590) psig (1143)	O/S	Mpaa (1545)*1	-	The unit for Tertiary Value is set	-
31	2031	LIMSW_1_VALUE_D	Limit Switch 1.Status Limit Switch 1.Value	Complies with Communication standard specifications	-	0 0	-	Indicates the contact output for limit switch 1	P.88
32	2032	LIMSW_1_TARGET	Limit Switch 1 Target	Flow rate (0) Temperature (1) Totalizer (3)	O/S	0(Flow rate)	-	The process value for limit switch 1 is selected	P.86
33	2033	LIMSW_1_SETPOINT	Limit Switch 1 Setpoint	-99999.9 to 99999.9	O/S	0.0	Limit Switch 1 Unit (2036)	The H/L side for limit switch 1 is selected	P.86
34	2034	LIMSW_1_ACT_DIRECTION	Limit Switch 1 Direction	Low limit (0) High limit (1)	O/S	1(High limit)	-	The threshold for limit switch 1 is set	P.86
35	2035	LIMSW_1_HYSTERESIS	Limit Switch 1 Hysteresis	0.0 to 99999.9	O/S	0.0	Limit Switch 1 Unit (2036)	The hysteresis width for switching limit switch 1 is set	P.86

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
36	2036	LIMSW_1_ UNIT	Limit Switch 1 Unit	m³/s (1347) m³/min (1348) m³/h (1349) m³/d (1350) km³/s (1497) km³/min (1501) km³/h (1505) km³/d (1509) L/s (1351) L/min (1352) L/h (1353) L/d (1354) mCFS (1627) mCFM (1626) mCFH (1625) mft³/d (1624) CFS (1356) CFM (1357) CFH (1358) ft³/d (1359) kCFS (1623) kCFM (1622) kCFH (1621) kft³/d (1620) gal/s (1362) GPM (1363) gal/h (1364) gal/d (1365) kgal/s (1450) kgal/min (1454) kgal/h (1458) kgal/d (1462) ImpGal/s (1367) ImpGal/min (1368) ImpGal/h (1369) ImpGal/d (1370) kImpGal/s (1465) kImpGal/min (1469) kImpGal/h (1473) kImpGal/d (1477) mbbl/s (1480) mbbl/min (1484) mbbl/h (1488) mbbl/d (1492) bbl/s (1371) bbl/min (1372) bbl/h (1373) bbl/d (1374) kbbl/s (1481) kbbl/min (1485) kbbl/h (1489) kbbl/d (1493) kg/s (1322) kg/min (1323) kg/h (1324) kg/d (1325) t/s (1326) t/min (1327) t/h (1328) t/d (1329) lb/s (1330) lb/min (1331) lb/h (1332) lb/d (1333) klb/s (1644) klb/min (1643) klb/h (1642) klb/d (1641) Nm³/s (1522) Nm³/min (1523) Nm³/h (1524) Nm³/d (1525) k(N)m³/s (32780) k(N)m³/min (32781) k(N)m³/h (32782) k(N)m³/d (32783) M(N)m³/s (32784) M(N)m³/min (32785) M(N)m³/h (32786) M(N)m³/d (32787) NL/s (1532) NL/min (1533) NL/h (1534) NL/d (1535) Sm³/s (1527) Sm³/min (1528) Sm³/h (1529) Sm³/d (1530) k(S)m³/s (32788) k(S)m³/min (32789) k(S)m³/h (32790) k(S)m³/d (32791) M(S)m³/s (32792) M(S)m³/min (32793) M(S)m³/h (32794) M(S)m³/d (32795) SL/s (1537) SL/min (1538) SL/h (1539) SL/d (1540) SCFS (1723) SCFM (1360) SCFH (1361) SCFD (1722) MSCFS (1741) MSCFSM (1742) MSCFSH (1743) MSCFSD (1598) MMSCFS (1744) MMSCFSM (1745) MMSCFSH (1746) MMSCFSD (1599) kJ/s (1438) kJ/min (1439) kJ/h (1440) kJ/d (1441) MJ/s (1442) MJ/min (1443) MJ/h (1196) MJ/d (1444) GJ/s (32796) GJ/min (32797) GJ/h (32798) GJ/d (32799) TJ/s (32800) TJ/min (32801) TJ/h (32802) TJ/d (32803) Btu/s (1445) Btu/min (1446) Btu/h (1197) Btu/day (1447) kBtu/s (32804) kBtu/min (32805) kBtu/h (32806) kBtu/d (32807) MBtu/s (32808) MBtu/min (32809) MBtu/h (32810) MBtu/d (32811) °C (1001) °F (1002) K (1000) MPaa (1545) kPaa (1547) bara (1597) psia (1142) MPag (1546) kPag (1548) barg (1590) psig (1143) m³ (1034) km³ (32768) l (1038) mcf (32769) cf (1043) kcf (32770) USgal (1048) kUSgal (1648) Impgal (1049) kImpgal (1649) mbbl (32771) bbl (1051) kbbl (32772) kg (1088) t (1092) lb (1094) klb (1749) (N)m³ (1521) k(N)m³ (32773) M(N)m³ (32774) (N)L (1531) (S)m³ (1526) k(S)m³ (32775) M(S)m³ (32776) (S)L (1536) SCF (1053) MSCF (1747) MMSCF (1748) kJ (1173) MJ (1172) GJ (1171) TJ (1170) BTU (1183) kBTU (32777) MBTU (32778)	-	m³/h(1349)	-	The threshold and hysteresis value unit for limit switch 1 is displayed	P.86

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
37	2037	LIMSW_2_ VALUE_D	Limit Switch 2.Status Limit Switch 2.Value	Complies with Communication standard specifications	-	0 0	-	Indicates the contact output for limit switch 2	P.88
38	2038	LIMSW_2_ TARGET	Limit Switch 2 Target	Flow rate (0) Temperature (1) Totalizer (3)	O/S	Flow rate (0)	-	The process value for limit switch 2 is selected	P.86
39	2039	LIMSW_2_ SETPOINT	Limit Switch 2 Setpoint	-99999.9 to 99999.9	O/S	0.0	Limit Switch 2 Unit (2042)	The H/L side for limit switch 2 is selected	P.86
40	2040	LIMSW_2_ ACT_ DIRECTION	Limit Switch 2 Direction	Low limit (0) High limit (1)	O/S	High limit (1)	-	The threshold for limit switch 2 is set	P.86
41	2041	LIMSW_2_ HYSTERESIS	Limit Switch 2 Hysteresis	0.0 to 99999.9	O/S	0.0	Limit Switch 2 Unit (2042)	The hysteresis width for switching limit switch 2 is set	P.86

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
42	2042	LIMSW_2_ UNIT	Limit Switch 2 Unit	m^3/s (1347) m^3/min (1348) m^3/h (1349) m^3/d (1350) km^3/s (1497) km^3/min (1501) km^3/h (1505) km^3/d (1509) L/s (1351) L/min (1352) L/h (1353) L/d (1354) mCFS (1627) mCFM (1626) mCFH (1625) mft^3/d (1624) CFS (1356) CFM (1357) CFH (1358) ft^3/d (1359) kCFS (1623) kCFM (1622) kCFH (1621) kft^3/d (1620) gal/s (1362) GPM (1363) gal/h (1364) gal/d (1365) kgal/s (1450) kgal/min (1454) kgal/h (1458) kgal/d (1462) ImpGal/s (1367) ImpGal/min (1368) ImpGal/h (1369) ImpGal/d (1370) kImpGal/s (1465) kImpGal/min (1469) kImpGal/h (1473) kImpGal/d (1477) mbbl/s (1480) mbbl/min (1484) mbbl/h (1488) mbbl/d (1492) bbl/s (1371) bbl/min (1372) bbl/h (1373) bbl/d (1374) kbbl/s (1481) kbbl/min (1485) kbbl/h (1489) kbbl/d (1493) kg/s (1322) kg/min (1323) kg/h (1324) kg/d (1325) t/s (1326) t/min (1327) t/h (1328) t/d (1329) lb/s (1330) lb/min (1331) lb/h (1332) lb/d (1333) klb/s (1644) klb/min (1643) klb/h (1642) klb/d (1641) Nm^3/s (1522) Nm^3/min (1523) Nm^3/h (1524) Nm^3/d (1525) k(N)m^3/s (32780) k(N)m^3/min (32781) k(N)m^3/h (32782) k(N)m^3/d (32783) M(N)m^3/s (32784) M(N)m^3/min (32785) M(N)m^3/h (32786) M(N)m^3/d (32787) NL/s (1532) NL/min (1533) NL/h (1534) NL/d (1535) Sm^3/s (1527) Sm^3/min (1528) Sm^3/h (1529) Sm^3/d (1530) k(S)m^3/s (32788) k(S)m^3/min (32789) k(S)m^3/h (32790) k(S)m^3/d (32791) M(S)m^3/s (32792) M(S)m^3/min (32793) M(S)m^3/h (32794) M(S)m^3/d (32795) SL/s (1537) SL/min (1538) SL/h (1539) SL/d (1540) SCFS (1723) SCFM (1360) SCFH (1361) SCFD (1722) MSCFS (1741) MSCFSM (1742) MSCFSH (1743) MSCFSD (1598) MMSCFS (1744) MMSCFSM (1745) MMSCFSH (1746) MMSCFSD (1599) kJ/s (1438) kJ/min (1439) kJ/h (1440) kJ/d (1441) MJ/s (1442) MJ/min (1443) MJ/h (1196) MJ/d (1444) GJ/s (32796) GJ/min (32797) GJ/h (32798) GJ/d (32799) TJ/s (32800) TJ/min (32801) TJ/h (32802) TJ/d (32803) Btu/s (1445) Btu/min (1446) Btu/h (1197) Btu/day (1447) kBtu/s (32804) kBtu/min (32805) kBtu/h (32806) kBtu/d (32807) MBtu/s (32808) MBtu/min (32809) MBtu/h (32810) MBtu/d (32811) °C (1001) °F (1002) K (1000) MPaa (1545) kPaa (1547) bara (1597) psia (1142) MPag (1546) kPag (1548) barg (1590) psig (1143) m^3 (1034) km^3 (32768) l (1038) mcf (32769) cf (1043) kcf (32770) USgal (1048) kUSgal (1648) Impgal (1049) kImpgal (1649) mbbl (32771) bbl (1051) kbbl (32772) kg (1088) t (1092) lb (1094) klb (1749) (N)m^3 (1521) k(N)m^3 (32773) M(N)m^3 (32774) (N)L (1531) (S)m^3 (1526) k(S)m^3 (32775) M(S)m^3 (32776) (S)L (1536) SCF (1053) MSCF (1747) MMSCF (1748) kJ (1173) MJ (1172) GJ (1171) TJ (1170) BTU (1183) kBTU (32777) MBTU (32778)	-	m^3/h(1349)	-	The threshold and hysteresis value unit for limit switch 2 is displayed	P.86

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
43	2043	FLOW_RATE_VALUE	Flow rate(%).Status Flow rate(%).Value	Complies with Communication standard specifications	-	0 0.0	- %		P.74
44	2044	TEMP_RATE_VALUE	Temperature(%).Status Temperature(%).Value	Complies with Communication standard specifications	-	0 0.0	- %		P.74
46	2046	TOTAL_VALUE	Totalizer.Status Totalizer.Value	Complies with Communication standard specifications	-	0 0.0	- Totalizer unit (2099)		P.58
47	2047	DENSITY	Density	-99999.9 to 99999.9	-	0.0	Density unit (2121)	The density is displayed	P.74
48	2048	DENSITY_RATIO	Density ratio	-99999.9 to 99999.9	-	0.0	-	The density ratio used for Standard/Normal flow rate measurement is displayed	P.74
49	2049	ENTHALPY	Enthalpy	-99999.9 to 99999.9	-	0.0	Enthalpy unit (2128)	The specific enthalpy used for heat measurement is displayed at the set unit	P.74
50	2050	DELTA_TEMP	Delta temperature	-99999.9 to 99999.9	-	0.0	Temperature Unit (2019)	The temperature difference used for heat difference measurement is displayed	P.74
51	2051	DELTA_ENTHALPY	Delta enthalpy	-99999.9 to 99999.9	-	0.0	Enthalpy unit (2128)	The specific enthalpy used for heat measurement is displayed	P.74
52	2052	VORTEX_FREQUENCY	Vortex frequency	-99999.9 to 99999.9	-	0.0	Hz	The vortex frequency is displayed	-
53	2053	FLOW_VELOCITY	Velocity	-99999.9 to 99999.9	-	0.0	m/s	The flow velocity is displayed	-
54	2054	CALC_TEMPERATURE	Calc. Temperature	-99999.9 to 99999.9	-	0.0	Temperature Unit (2019)	The temperature used for fluid density and specific enthalpy compensation is displayed	-
55	2055	CALC_PRESSURE	Calc. Pressure	-99999.9 to 99999.9	-	0.0	Pressure unit (2030)	The pressure used for fluid density and specific enthalpy compensation is displayed	-
56	2056	BUILT_IN_TEMP	Built-in temperature	-99999.9 to 99999.9	-	0.0	Temperature Unit (2019)	The measured value of the internal temperature gauge is displayed	-
58	2058	SENSOR_BOARD_TEMP	Sensor Board temperature	-99999.9 to 99999.9	-	0.0	Temperature Unit (2019)	The device internal temperature is displayed	-
59	2059	EXTERNAL_TEMP_VALUE	External temperature.Status External temperature.Value	-99999.9 to 99999.9	-	0 0.0	- Temperature Unit (2019)	The temperature of the external input is displayed	P.83
60	2060	EXTERNAL_PRESS_VALUE	External pressure.Status External pressure.Value	-99999.9 to 99999.9	-	0 0.0	- Pressure unit (2030)	The pressure of the external input is displayed	P.83
61	2061	EXTERNAL_DENSITY_VALUE	External density.Status External density.Value	-99999.9 to 99999.9	-	0 0.0	- Density unit (2121)	The density of the external input is displayed	P.83
62	2062	FLUID	Fluid type	Liquid (0) Gas (1) Water (2) Steam (3)	O/S	Liquid(0)*1	-	The measured fluid is set	P.60
63	2063	FLOW_SELECT	Flow select	Volume (0) Mass (1) Standard/Normal (2) Energy (3) Energy(Heat difference) (4)	O/S	Volume(0)*1	-	The measured flow rate is set	P.61
64	2064	STEAM_TYPE	Steam type	Saturated steam (0) Superheated steam (1)	O/S	Saturated steam(0)*1	-	The steam type is selected	P.67
65	2065	COMPENSATION_TYPE	Compensation type	Not used (0) Built-in temp. (1) Built-in temp. & A-in press. (2) A-in temp. (4) A-in press. (5) A-in density (6) A-in temp. & A-in press. (9)	O/S	Not used (0)*1	-	The compensation type is selected	P.67

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
66	2066	TEMP_ SELECT	Temperature select	Fixed (0) Built-in (1) Aux input (2)	-	Fixed (0)	-	The temperature measurement method is checked	P.79
67	2067	PRESS_ SELECT	Pressure select	Fixed (0) Aux input (2)	-	Fixed (0)	-	The pressure measurement method is checked	P.80
68	2068	AUX_INPUT_ SELECT	Aux input select	Off (0) Temperature (1) Presseure (2) Density (3) Delta temperature (4)	-	Off (0)	-	The process value assigned to the external input is displayed	P.82
70	2070	FLOW_SPAN	Flow span	0.0< to 99999.9	-	10.0	Primary Value Range. Units index (2016)	The span of the instantaneous flow rate is displayed	-
72	2072	FLOW_ DAMPING	Flow damping	0.0 to 200.0	O/S	4.0[*1]	s	The damping time constant of the instantaneous flow rate is set	P.65
73	2073	FLOW_RATE_ LOWCUT	Flow lowcut	1/2 or equivalent of minimum flow velocity to 99999.9	O/S	0.47[*1]	Primary Value Range. Units index (2016)	The lowcut value of the instantaneous flow rate is set	P.65
78	2078	TEMP_URV	Temperature URV	-999.9 to 999.9	O/S	250.0	Temperature Unit (2019)	The scaling upper limit value (100%) of temperature measurement is set	P.78
79	2079	TEMP_LRV	Temperature LRV	-999.9 to 999.9	O/S	-40.0	Temperature Unit (2019)	The scaling lower limit value (0%) of temperature measurement is set	P.78
80	2080	TEMP_ DAMPING	Temperature damping	0.0 to 200.0	O/S	4.0	s	The damping time constant of the temperature measurement is set	P.79
81	2081	FIXED_TEMP	Fixed temperature	-999.9 to 999.9	O/S	15.0[*1]	Temperature Unit (2019)	The fixed temperature is set	P.67
82	2082	BASE_TEMP	Base temperature	-999.9 to 999.9	O/S	15.0[*1]	Temperature Unit (2019)	The temperature of the normal/standard condition is set	P.67
83	2083	TEMP_GAIN	Temperature gain	0.0< to 99999.9	O/S	1.0	-	The compensation factor (gain) of temperature measurement is set	P.79
84	2084	TEMP_ OFFSET	Temperature offset	-999.9 to 999.9	O/S	0.0	Temperature Unit (2019)	The compensation value (offset) of temperature measurement is set	P.79
85	2085	BUILT_IN_ TEMP_ OPTION	Option built-in temperature	Off (0) On (1)	-	Off (0)	-	The optional built-in temperature gauge is displayed	P.122
89	2089	FIXED_PRESS	Fixed pressure	0.0< to 99999.9	O/S	0.10133[*1]	Pressure unit (2030)	The fixed pressure is set	P.67
90	2090	BASE_PRESS	Base pressure	0.0< to 99999.9	O/S	0.10133[*1]	Pressure unit (2030)	The pressure of the normal/standard condition is set	P.67
91	2091	ATM_PRESS	Air pressure	0.0< to 99999.9	O/S	0.10133	Air pressure unit (2092)	Pressure is added to the gauge pressure and air pressure is set at calculation of absolute pressure	-
92	2092	AIR_ PRESSURE_ UNIT	Air pressure unit	kPaa (0) MPaa (1) Bara (2) psia (3)	-	MPaa(1)	-	The air pressure unit is displayed	-
96	2096	TOTAL_ START_STOP	Totalizer start/ stop	Stop (0) Start (1)	O/S	Stop (0)[*1]	-	Start/stop of the totalization function is set	P.75
97	2097	TOTAL_RESET	Totalizer reset/ preset	Not execute (0) Reset (1) Preset (2)	O/S	Not execute (0)	-	Reset/preset of the totalization function is set	P.76
98	2098	TOTAL_ PRESET_ VALUE	Totalizer preset value	0.0 to 99999.9	O/S	0.0	Totalizer unit (2099)	The preset value of the totalization function is set	P.76

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
99	2099	TOTAL_UNIT	Totalizer unit	m^3 (1034) km^3 (32768) l (1038) mcf (32769) cf (1043) kcf (32770) USgal (1048) kUSgal (1648) Impgal (1049) kImpgal (1649) mbbl (32771) bbl (1051) kbbl (32772) kg (1088) t (1092) lb (1094) klb (1749) (N)m^3 (1521) k(N)m^3 (32773) M(N)m^3 (32774) (N)L (1531) (S)m^3 (1526) k(S)m^3 (32775) M(S)m^3 (32776) (S)L (1536) SCF (1053) MSCF (1747) MMSCF (1748) kJ (1173) MJ (1172) GJ (1171) TJ (1170) BTU (1183) kBTU (32777) MBTU (32778)	-	m^3 (1034)	-	The totalized value unit is checked	P.75
100	2100	TOTAL_RATE	Totalizer rate	0.00001 to 99999.9	O/S	1.0[*1]	Totalizer rate unit (2101)	The total rate is set	P.77
101	2101	TOTAL_ RATE_UNIT	Totalizer rate unit	m^3/p (0) km^3/p (1) l/p (2) mcf/p (3) cf/p (4) kcf/p (5) USgal/p (6) kUSgal/p (7) Ukgal/p (8) kUKgal/p (9) mbbl/p (10) bbl/p (11) kbbl/p (12) kg/p (13) t/p (14) lb/p (15) klb/p (16) (N)m^3/p (17) k(N)m^3/p (18) M(N)m^3/p (19) (N)L/p (20) (S)m^3/p (21) k(S)m^3/p (22) M(S)m^3/p (23) (S)L/p (24) (S)cf/p (25) k(S)cf/p (26) M(S)cf/p (27) kJ/p (28) MJ/p (29) GJ/p (30) TJ/p (31) BTU/p (32) kBTU/p (33) MBTU/p (34)	-	m^3/p (0)	-	The total rate unit is checked	-
102	2102	TOTALIZER_ RESET_ MODE	Totalizer reset mode	Reset (0) Hold only display (1) Hold (2)	O/S	Reset (0)	-	The totalization operation of the totalization function is set	P.77
103	2103	K_FACTOR_ UNIT	K factor unit	p/l (0) p/USgal (1) p/UKgal (2)	O/S	p/l (0)[*1]	-	The K factor unit is selected	P.89
104	2104	K_FACTOR	K factor	0.0< to 99999.9	-	68.6[*1]	K factor unit (2103)	The K factor is set	P.89

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
105	2105	EXEC_TUNING_AT_ZERO	Tuning at zero	Not execute (0) Execute (1)	O/S	Not execute (0)	-	Whether or not to execute tuning of noise balance is selected	P.99
106	2106	TUNING_STATUS	Tuning status	Unknown (0) Pass (1) Failure (2) Running (3)	-	Unknown (0)	-	The tuning state of noise balance is displayed	P.99
107	2107	FLOW_RATE_GAIN	Flow rate gain	0.0< to 99999.9	O/S	1.0	-	An arbitrary compensation factor (gain) is set	P.93
108	2108	INSTRUMENT_ERR_ADJ	Instrument error adjust	Off (0) On (1)	O/S	Off (0)	-	Whether or not to use instrument error correction is selected	P.96
109	2109	ADJ_VORTEX_FREQ	Adjust vortex frequency.1 Adjust vortex frequency.2 Adjust vortex frequency.3 Adjust vortex frequency.4 Adjust vortex frequency.5	0.0 to 10000.0	O/S	0.0	Hz	Vortex frequency (f1) of No.1 break point Vortex frequency (f2) of No.2 break point Vortex frequency (f3) of No.3 break point Vortex frequency (f4) of No.4 break point Vortex frequency (f5) of No.5 break point	P.96
110	2110	ADJ_VORTEX_VALUE	Adjust vortex value.1 Adjust vortex value.2 Adjust vortex value.3 Adjust vortex value.4 Adjust vortex value.5	-50.0 to 50.0	O/S	0.0	%	Compensation value (d1) of No.1 break point Compensation value (d2) of No.2 break point Compensation value (d3) of No.3 break point Compensation value (d4) of No.4 break point Compensation value (d5) of No.5 break point	P.96
111	2111	REYNOLDS_ADJ	Reynolds adjust	Off (0) On (1)	O/S	Off (0)	-	Execution of Reynolds number correction is selected	P.93
112	2112	VISCOSITY	Viscosity	0.0< to 99999.9	O/S	1.0*1	Viscosity unit (2113)	The viscosity factor is set	P.93
113	2113	VISCOSITY_UNIT	Viscosity unit	mPa·s (0) Pa·s (1) P (3) m^2/s (4) cSt (5) St (6)	O/S	mPa·s (0)*1	-	The viscosity factor unit is selected	P.93
114	2114	REYNOLDS_NUM	Reynolds number	-99999.9 to 99999.9	-	0.0	-	The Reynolds number is displayed	P.93
115	2115	ADJ_REYNOLDS_NUM	Adjust reynolds number.1 Adjust reynolds number.2 Adjust reynolds number.3 Adjust reynolds number.4 Adjust reynolds number.5	0.0 to 99999.9	O/S	5500.0 8000.0 12000.0 20000.0 40000.0	-	Reynolds number of No.1 break point Reynolds number of No.2 break point Reynolds number of No.3 break point Reynolds number of No.4 break point Reynolds number of No.5 break point	P.93
116	2116	ADJ_REYNOLDS_VALUE	Reynolds adjust value.1 Reynolds adjust value.2 Reynolds adjust value.3 Reynolds adjust value.4 Reynolds adjust value.5	-50.0 to 50.0	O/S	-11.4 -6.5 -3.6 -1.0 0.0	%	Compensation value of No.1 break point Compensation value of No.2 break point Compensation value of No.3 break point Compensation value of No.4 break point Compensation value of No.5 break point	P.93
117	2117	EXP_FACTOR_ADJ	Expansion factor adjust	Off (0) On (1)	O/S	Off (0)	-	Whether or not to use expansion factor is selected	P.97
120	2120	DENSITY_ENTHALPY_SEL	Calculation type	Fixed (0) Aux input (1) Compensation T (2) Compensation T/P (3) Saturated steam T (6) Saturated steam P (7) Superheated steam T/P (8)	-	Fixed (0)	-	The compensation method of density and specific enthalpy is confirmed	P.67
121	2121	DENSITY_UNIT	Density unit	kg/m^3 (0) lb/cf (1) lb/USgal (2) lb/UKgal (3)	O/S	kg/m^3 (0)*1	-	The density unit is set	P.67

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
122	2122	FIXED_DENSITY	Fixed density	0.0< to 99999.9	O/S	1000.0*1	Density unit (2121)	The fixed density is set	P.67
123	2123	BASE_DENSITY	Base density	0.0< to 99999.9	O/S	1000.0*1	Density unit (2121)	The density of the normal condition is set	P.67
124	2124	DRYNESS	Dryness	90.0 to 100.0	O/S	100.0*1	%	The dryness level is set	-
125	2125	DEVIATION	Deviation	0.0< to 99999.9	O/S	1.0*1	-	The deviation factor (ratio) for the density of the normal/standard condition is set	P.67
126	2126	FIRST_TEMP_COEF	Temperature coefficient 1	-99999.9 to 99999.9	O/S	0.0	First temp. coef. unit (2179)	The primary temperature factor of density calculation is set	-
127	2127	SECOND_TEMP_COEF	Temperature coefficient 2	-99999.9 to 99999.9	O/S	0.0	Second temp. coef. unit (2180)	The secondary temperature factor of density calculation is set	-
128	2128	ENTHALPY_UNIT	Enthalpy unit	kJ/kg (0) MJ/kg (1) GJ/kg (2) TJ/kg (3) BTU/lb (4)	O/S	kJ/kg (0)*1	-	The specific enthalpy unit is set	P.67
129	2129	FIXED_ENTHALPY	Fixed enthalpy	0.0< to 99999.9	O/S	1000.0*1	Enthalpy unit (2128)	The fixed specific enthalpy is set	P.67
130	2130	HEAT_DIFF_TEMP_SEL	Heat difference temp. select	Built-in(H)/Aux input(L) (0) Aux input(H)/Built-in(L) (1) Aux input(delta T) (2)	O/S	Built-in(H)/Aux input(L) (0)	-	The method of use of the fluid temperature is selected	P.67
131	2131	HEAT_DIFF_CNV_UNIT	Heat diff. conv. factor unit	(kJ/kg)/K (0) (MJ/m³)/K (1) (BTU/cf)/degF (2) (BTU/USgal)/degF (3) (BTU/UKgal)/degF (4) (BTU/lb)/degF (5)	O/S	(kJ/kg)/K (0)	-	The unit of heat conversion factor is selected	P.67
132	2132	HEAT_DIFF_CNV_FACTOR	Heat difference conv. factor	0.0< to 99999.9	O/S	1.0	Heat diff. conv. factor unit (2131)	The heat conversion factor is set	P.67
139	2139	NOMINAL_SIZE	Nominal size	15 mm (1) 25 mm (2) 40 mm (3) 50 mm (4) 80 mm (5) 100 mm (6) 150 mm (7) 200 mm (8) 250 mm (9) 300 mm (10) 400 mm (11)	O/S	25 mm (2)*1	-	The diameter is selected	P.89
140	2140	BODY_TYPE	Body type	General (0) One size down (1) Two size down (2) High pressure (4) Dual sensor (6)	O/S	General (0)*1	-	The body type is selected	P.89
141	2141	VORTEX_SENSOR_TYPE	Sensor type	Standard (0) Standard w/ temp sensor (1) High temperature (2) High temperature w/ temp sensor (3) Cryogenic (4) Long neck (6) Long neck w/ temp sensor (7)	O/S	Standard (0)*1	-	The sensor type is selected	P.89
143	2143	SIGNAL_BAND	Signal band	Up to 19200 Hz (0) Up to 9600 Hz (1) Up to 4800 Hz (2) Up to 2400 Hz (3) Up to 1200 Hz (4) Up to 600 Hz (5) Up to 300 Hz (6) Up to 150 Hz (7) Up to 75.0 Hz (8) Up to 37.5 Hz (9) Up to 18.8 Hz (10) Up to 9.38 Hz (11) Up to 4.69 Hz (12) Up to 2.34 Hz (13) Up to 1.17 Hz (14) Up to 0.59 Hz (15) Up to 0.29 Hz (16) Up to 0.15 Hz (17) Up to 0.07 Hz (18)	-	Up to 19200 Hz (0)	-	The signal band is displayed	P.98

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
144	2144	SIGNAL_ LEVEL	Signal level	0.1 to 20.0	O/S	1.0	-	The signal level is set	P.98
145	2145	TLA_MODE	Trigger level mode	Fix (0) Tracking (1)	O/S	Tracking (1)	-	The trigger level mode is selected	P.98
146	2146	TLA_ THRESHOLD_ VAL	Trigger level(TLA)	0.1 to 20.0	O/S	1.0	-	The trigger level is set	P.98
147	2147	NOISE_ BALANCE_ MODE	Noise balance mode	Auto (0) Manual (1)	O/S	Auto (0)	-	The noise balance mode is selected	P.98
148	2148	NOISE_ RATIO_AUTO	Noise ratio(auto)	0.0 to 2.0	-	0.0	-	The noise balance value when the noise balance mode is Auto is displayed	P.98
149	2149	NOISE_ RATIO_ MANUAL	Noise ratio(manual)	-2.0 to 2.0	O/S	0.0	-	The noise balance value when the noise balance mode is Manual is set	P.98
150	2150	SPAN_ VELOCITY	Velocity span	-99999.9 to 99999.9	-	0.0	m/s	The flow velocity span is displayed	P.100
151	2151	LOWCUT_ VELOCITY	Velocity lowcut	-99999.9 to 99999.9	-	0.0	m/s	The lowcut flow velocity value is displayed	P.100
152	2152	VORTEX_ FREQ	Vortex frequency	-99999.9 to 99999.9	-	0.0	Hz	The vortex frequency is displayed	-
153	2153	SPAN_FREQ	Vortex frequency span	-99999.9 to 99999.9	-	0.0	Hz	The vortex frequency span is displayed	P.100
154	2154	LOWCUT_ FREQ	Vortex frequency lowcut	-99999.9 to 99999.9	-	0.0	Hz	The lowcut vortex frequency is displayed	P.100
155	2155	LOWCUT_ LIMIT	Lowcut limit	0 to 99999.9	-	0.0	Primary Value Range. Units index(2016)	The input lower limit value of lowcut is displayed	P.65
156	2156	FLUCTUATING	Fluctuating level	0.0 to 100.0	O/S	10.0	%	The judgment value for the fluctuation alarm is set	P.125
157	2157	TRANSIENT	Transient noise count	0 to 99	O/S	12	-	The judgment count for noise diagnosis is set	P.125
158	2158	HIGH_ VIBRATION_ SELECT	High vibration action	Zero (0) Hold (1) Measured value (2)	O/S	Measured value (2)	-	Output operation when alarm 032: High vibration occurs is set	P.114
159	2159	HIGH_ VIBRATION_ TIME	High vibration time	0 to 99	O/S	10	s	The judgment time for vibration diagnosis is set	P.126
160	2160	CRITICAL_ VIBRATION_ ACTION	Critical vibration action	Zero (0) Hold (1) Measured value (2)	O/S	Hold (1)	-	Output operation when alarm 033: Critical vibration occurs is set	P.114
161	2161	CRITICAL_ VIBRATION_ LEVEL	Critical vibration level	0.0 to 100.0	O/S	5.0	%	The judgment value for the resonant diagnosis alarm is set	P.126
162	2162	CRITICAL_ VIBRATION_ TIME	Critical vibration time	0 to 99	O/S	5	s	The judgment time for resonant diagnosis is set	P.126
163	2163	CLOGGING_ TIME	Clogging time	0 to 99	O/S	30	s	The judgment time for clogging diagnosis is set	P.126
164	2164	SENSOR_ CIRCUIT_ THRESHOLD	Sensor circuit threshold	0 to 65535	O/S	150*1	-	The judgment value for the input circuit alarm is set	P.125
165	2165	SNSR_CAP_ THRESHOLD	Sensor capacitance threshold	0.0 to 99999.9	O/S	33*1	pF	The abnormality judgment value of the static capacitance for the piezoelectric element sensor is set	P.125
166	2166	SNSR_RES_ THRESHOLD	Sensor resistance threshold	0.0 to 99999.9	O/S	50*1	kohm	The abnormality judgment value of the insulation resistance for the piezoelectric element sensor is set	P.125
167	2167	SIM_ ENABLE_MSG	SIM Enable Message	-	AUTO	Space (32 characters)	-	Software switch for simulation function	P.133
168	2168	SIM_MODE	Simulation mode	Vortex frequency (bit:0) Vortex frequency(HW) (bit:1) Built-in temperature (bit:2)	AUTO	All Off (0x00)	-	Simulation mode and target are selected	P.132
169	2169	SIM_ VORTEX_ FREQ_VALUE	Simulation vortex frequency	0.0 to 10000.0	AUTO	0.0	Hz	The simulation value (Hz) of the vortex frequency is set	P.132
170	2170	SIM_VORTEX_ FREQ_HW_ VALUE	Simulation vortex frequency(HW)	0.0 to 10000.0	AUTO	0.0	Hz	The simulation value (Hz) of the vortex frequency (hardware) is set,	P.132

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
171	2171	SIM_BUILTIN_TEMP_VALUE	Simulation built-in temperature	-999.9 to 999.9	AUTO	0.0	Temperature Unit (2019)	The simulation value of the built-in temperature is set	P.132
173	2173	SIM_AUTO_RELEASE_TIME	Auto release time	10min (0) 30min (1) 60min (2) 3h (3) 6h (4) 12h (5)	AUTO	30min (1)	-	The time until automatic cancellation of the simulation mode is set	P.133
174	2174	FLOW_SENSOR_ALARM_ACTION	Flow sensor alarm action	Hold (1) Zero (2) Measured value (3)	O/S	Zero (2)	-	Output operation when alarm 020:Flow sensor failure occurs is set	P.114
175	2175	TEMPERATURE_SENSOR_ALARM_ACTION	Temp. sensor alarm action	Hold (1) Zero (2) Fixed value (3)	O/S	Zero (2)	-	Output operation when alarm 021: Temperature sensor failure occurs is set	P.114
178	2178	AUX_INPUT_OPTION	Aux input option	Off (0) On (1)	-	On (1)	-	The external input option is displayed	P.122
179	2179	FIRST_TEMP_COEF_UNIT	First temp. coef. unit	1/degC (0) 1/degF (1) 1/K (2)	-	1/degC (0)	-	The unit for the primary temperature factor of density calculation is displayed	-
180	2180	SECOND_TEMP_COEF_UNIT	Second temp. coef. unit	1/SqdegC (0) 1/SqdegF (1) 1/SqK (2)	-	1/SqdegC (0)	-	The unit for the secondary temperature factor of density calculation is displayed	-

7.3 Display Transducer Block

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
0	2500	Block Header	-	-	O/S	LTB	-	Information on this block, such as Block Tag, DD Revision, Execution, etc.	-
1	2501	ST_REV	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.	-
2	2502	TAG_DESC	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	Space (32 characters)	-	Universal parameter to store a comment explaining tag contents.	-
3	2503	STRATEGY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Universal parameter intended to be used for the high-level system to separate function blocks.	-
4	2504	ALERT_KEY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Key information to identify where an alert takes place. Generally, this parameter is used by the highlevel system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.	-
5	2505	MODE_BLK	Complies with Communication standard specifications	0x88(Auto, O/S) - 0x88(Auto, O/S) 0x88(Auto, O/S)	AUTO - AUTO AUTO	0x80(O/S) 0x80(O/S) 0x88(Auto, O/S) 0x08(Auto)	-	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.	-
6	2506	BLOCK_ERR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0x0000	-	Indicates the error statuses related to the own block.	-
7	2507	UPDATE_EVT	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0 0	-	Indicates contents of the event when an update event (a change to the setpoint) occurs.	-
8	2508	BLOCK_ALM	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	-	Indicates contents of the alarm when a block alarm occurs.	-
9	2509	TRANSDUCER_ DIRECTORY	Complies with Communication standard specifications	-	-	1 2510	-	Parameter to store the index of the transducer included in the device.	-
10	2510	TRANSDUCER_ TYPE	Complies with Communication standard specifications	-	-	LCD TB (32848)	-	Indicates the device type.	-
11	2511	TRANSDUCER_ TYPE_VER	Complies with Communication standard specifications	-	-	1	-	Indicates the version of the device.	-
12	2512	XD_ERROR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Stores XD_ERROR which is occurring in the sensor transducer block.	-
13	2513	COLLECTION_ DIRECTORY	Complies with Communication standard specifications	-	-	0	-	Stores indexes of important parameters in the transducer block and the item ID of the corresponding DD.	-
14	2514	UPPER_ DISPLAY_ MODE	Display line upper	Flow rate(%) (0) Flow rate (1) Temperature(%) (2) AIFB1.OUT (4) AIFB1.OUT(%) (5) AIFB2.OUT(%) (6) AIFB3.OUT(%) (7)	AUTO	AIFB1.OUT(%)[*1]	-	The content to display in the upper display is set	P.115
15	2515	LOWER_ DISPLAY_ MODE	Display line lower	0:Off (0) 1:Totalizer (1) 2:Temperature (2) 4:Aux input (4) 5:AIFB2.OUT (5) 6:AIFB3.OUT (6) 7:ITFB.OUT (7)	AUTO	Off (0)[*1]	-	The content to display in the lower display is set	P.115

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
16	2516	DISPLAY_ PERIOD	Display period	0.25s (0) 0.5s (1) 1s (2) 2s (3) 4s (4) 8s (5)	AUTO	0.25s (0)	-	The update interval of the process value for the display is set	P.117
17	2517	DISPLAY_ STARTUP	Display startup	Off (0) On (1)	AUTO	Off (0)	-	The screen display at startup is selected	P.118
18	2518	DISPLAY_ NE107	Display NE107	Off (0) On (1)	AUTO	Off (0)	-	Display/hide of the NAMUR NE107 category is selected	P.110
19	2519	DISPLAY_ FLOW_RATE_ DIGIT	Display format flow	Auto (0) 0digit (1) 1digit (2) 2digit (3) 3digit (4) 4digit (5)	AUTO	Auto (0)	-	The decimal point position of the instantaneous flow rate value is set	P.116
20	2520	DISPLAY_ TEMP_DIGIT	Display format temperature	0digit (0) 1digit (1) 2digit (2) 3digit (3) 4digit (4)	AUTO	0digit (0)	-	The decimal point position of the temperature value is set	P.116
21	2521	DISPLAY_ PRESS_DIGIT	Display format pressure	0digit (0) 1digit (1) 2digit (2) 3digit (3) 4digit (4)	AUTO	0digit (0)	-	The decimal point position of the pressure value is set	P.116
22	2522	LCD_TEST	Display test	Not execute (0) Execute (1) All on (2) All off (3) Only numeric (4) Only unit (5) Only icon (6)	AUTO	Not execute (0)	-	The test pattern and whether or not to execute the display test are selected	P.118
23	2523	SQUAWK	LCD squawk	Off (0) On (1) Once (2)	AUTO	Off (0)	-	Whether or not to execute the display's squawk function is selected	P.118
24	2524	DISPLAY_ INST_OPTION	Option display installation	Off (0) On (1)	-	Off (0)	-	The optional display is displayed	P.122

7.4 Maintenance Transducer Block

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
0	3000	Block Header	-	-	O/S	MTB	-	Information on this block, such as Block Tag, DD Revision, Execution, etc.	-
1	3001	ST_REV	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.	-
2	3002	TAG_DESC	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	Space (32 characters)	-	Universal parameter to store a comment explaining tag contents.	-
3	3003	STRATEGY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Universal parameter intended to be used for the high-level system to separate function blocks.	-
4	3004	ALERT_KEY	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO	1	-	Key information to identify where an alert takes place. Generally, this parameter is used by the highlevel system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.	-
5	3005	MODE_BLK	Complies with Communication standard specifications	0x88(Auto, O/S) - 0x88(Auto, O/S) 0x88(Auto, O/S)	AUTO - AUTO AUTO	0x80(O/S) 0x80(O/S) 0x88(Auto, O/S) 0x08(Auto)	-	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.	-
6	3006	BLOCK_ERR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0x0000	-	Indicates the error statuses related to the own block.	-
7	3007	UPDATE_EVT	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0 0	-	Indicates contents of the event when an update event (a change to the setpoint) occurs.	-
8	3008	BLOCK_ALM	Complies with Communication standard specifications	Complies with Communication standard specifications	AUTO - - - -	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	-	Indicates contents of the alarm when a block alarm occurs.	-
9	3009	TRANSDUCER_ DIRECTORY	Complies with Communication standard specifications	-	-	1 3010	-	Parameter to store the index of the transducer included in the device.	-
10	3010	TRANSDUCER_ TYPE	Complies with Communication standard specifications	-	-	Maintenance TB (32864)	-	Indicates the device type.	-
11	3011	TRANSDUCER_ TYPE_VER	Complies with Communication standard specifications	-	-	1	-	Indicates the version of the device.	-
12	3012	XD_ERROR	Complies with Communication standard specifications	Complies with Communication standard specifications	-	0	-	Stores XD_ERROR which is occurring in the sensor transducer block.	-
13	3013	COLLECTION_ DIRECTORY	Complies with Communication standard specifications	-	-	0	-	Stores indexes of important parameters in the transducer block and the item ID of the corresponding DD.	-
14	3014	OPERATION_ TIME	Operation time	0000D 00:00 to 9999D 23:59	-	0000D 00:00	-	The operation time of the device is displayed	P.124
15	3015	CURRENT_ DATE	Current date/ time	-	-	-	-	The current date and time are displayed	P.124
16	3016	SYSTEM_ ALARM_1	System alarm 1	010:CPU failure (bit:0) 011:CPU failure (bit:1) 012:Main storage failure (bit:2) 013:Sub storage failure (bit:3) 014:Main ASIC failure (bit:4) 015:Sub ASIC failure (bit:5)	-	0x00	-	System alarm 1 is displayed	P.101

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
17	3017	SYSTEM_ ALARM_2	System alarm 2	016:ADC circuit failure (bit:0) 017:Signal circuit failure (bit:1) 020:Flow sensor failure (bit:3) 021:Temperature sensor failure (bit:4)	-	0x00	-	System alarm 2 is displayed	P.101
18	3018	PROCESS_ ALARM_1	Process alarm 1	030:Fluctuation (bit:0) 031:Transient noise (bit:1) 032:High vibration (bit:2) 033:Critical vibration (bit:3)	-	0x00	-	Process alarm 1 is displayed	P.101
19	3019	PROCESS_ ALARM_2	Process alarm 2	040:Temperature out of range (bit:0) 045:T/P compensation out of range (bit:5)	-	0x00	-	Process alarm 2 is displayed	P.101
20	3020	SETTING_ ALARM_1	Setting alarm 1	-	-	0x00	-	Setting alarm 1 is displayed	P.101
21	3021	SETTING_ ALARM_2	Setting alarm 2	060:Sensor backup error (bit:0)	-	0x00	-	Setting alarm 2 is displayed	P.101
22	3022	WARNING_1	Warning 1	070:Sensor communication error (bit:0) 071:Flow sensor error (bit:1) 072:Clogging (bit:2) 073:Degradation (bit:3) 074:Board temperature out of range (bit:4)	-	0x00	-	Warning 1 is displayed	P.101
23	3023	WARNING_2	Warning 2	080:Simulation running (bit:0) 081:Verification running (bit:1)	-	0x00	-	Warning 2 is displayed	P.101
24	3024	ALARM_ STATUS_ SELECT	Alarm status select	All alarm/warning (0) All alarm (1) System/Process alarm (2)	AUTO	All alarm/warning (0)	-	The alarm to be notified is selected	P.113
25	3025	ALARM_ RECORD_ SELECT	Alarm record select	All alarm/warning (0) All alarm (1) System/Process alarm (2)	AUTO	All alarm/warning (0)	-	The alarm to be stored in history is selected	P.113
26	3026	CLEAR_ ALARM_ RECORD	Alarm record clear	Not execute (0) Execute (1)	AUTO	Not execute (0)	-	Clearing of the alarm history is executed	P.111
27	3027	ALARM_ AUTO_ DELETE_TIME	Auto delete time	0 to 9999	AUTO	60	day	The auto-clear time of the alarm history is set	P.111
28	3028	SENSOR_ BACKUP_ RESTORE	Sensor backup/ restore	Not execute (0) Backup parameter (1) Restore parameter (3) Restore parameter(factory) (4)	O/S	Not execute (0)	-	Backup/restore of sensor information	P.91
29	3029	SENSOR_ BACKUP_ RESTORE_ RESULT	Sensor backup/ restore result	Unknown (0) Pass (1) Failure (2) Running (3)	-	Unknown (0)	-	The backup/restore result of sensor information is displayed	P.91
30	3030	SOFTWARE_ DESC	Software Description	-	-	4.2.2 - 21 - 1.01.01	-	Software description	-
31	3031	SOFTDL_ PROTECT	Soft DL Protect	Unprotected (1) Protected (2)	AUTO	Unprotected (0)	-	Mask for software download function	P.333
32	3032	SOFTDL_ ERROR	Soft DL Error	-	-	0	-	Error at software download	P.333
33	3033	SOFTDL_ COUNT	Soft DL Count	-	-	0	-	Number of times the software is downloaded	P.333
34	3034	SOFTDL_ACT_ AREA	Soft DL Act Area	Flash ROM #0 (0x00) Flash ROM #1 (0x01) Unused (0xFF)	-	0x00	-	Startup of flash ROM	P.333
35	3035	MODEL	Model	-	-	VY Series	-	The device model name is displayed	P.122
36	3036	MEMO_1	Memo 1	16 characters	AUTO	All Space	-	Memo 1 is set	P.123
37	3037	MEMO_2	Memo 2	16 characters	AUTO	All Space	-	Memo 2 is set	P.123
38	3038	MEMO_3	Memo 3	16 characters	AUTO	All Space	-	Memo 3 is set	P.123
39	3039	DISTRIBUTOR	Distributor name	-	-	YOKOGAWA	-	The distributor name is displayed	P.122
40	3040	DEVICE_ID	Device ID	-	-	5945430015J0000000	-	The device ID is displayed	P.122
41	3041	SENSOR_MS_ CODE_1	Sensor MS code 1	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
42	3042	SENSOR_MS_ CODE_2	Sensor MS code 2	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
43	3043	SENSOR_MS_ CODE_3	Sensor MS code 3	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
44	3044	SENSOR_MS_ CODE_4	Sensor MS code 4	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
45	3045	SENSOR_MS_ CODE_5	Sensor MS code 5	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
46	3046	SENSOR_MS_ CODE_6	Sensor MS code 6	16 characters	-	All Space	-	The sensor model and code are displayed	P.122
47	3047	SENSOR_ STYLE_CODE	Sensor style code	16 characters	-	All Space	-	The sensor style code is displayed	P.122

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
48	3048	TRANSMITTER_MS_CODE_1	Transmitter MS code 1	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
49	3049	TRANSMITTER_MS_CODE_2	Transmitter MS code 2	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
50	3050	TRANSMITTER_MS_CODE_3	Transmitter MS code 3	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
51	3051	TRANSMITTER_MS_CODE_4	Transmitter MS code 4	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
52	3052	TRANSMITTER_MS_CODE_5	Transmitter MS code 5	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
53	3053	TRANSMITTER_MS_CODE_6	Transmitter MS code 6	16 characters	-	All Space	-	The transmitter model and code are displayed	P.122
54	3054	TRANSMITTER_STYLE_CODE	Transmitter style code	16 characters	-	All Space	-	The transmitter style code is displayed	P.122
55	3055	SPECIAL_ORDER_NUM_1	Special order number 1	16 characters	-	All Space	-	The special order No. is displayed	P.122
56	3056	SPECIAL_ORDER_NUM_2	Special order number 2	16 characters	-	All Space	-	The special order No. is displayed	P.122
57	3057	SIZING_NUMBER	Sizing number	16 characters	-	All Space	-	The sizing No. is displayed	P.122
58	3058	NAME_PLATE_TAG_NUMBER	Name plate tag number	16 characters	-	All Space	-	The name plate tag No. is displayed	P.122
59	3059	IM_NUMBER	Instruction manual number	16 characters	-	All Space	-	The instruction manual No. is displayed	P.122
60	3060	MANUFAC_DATE	Manufact. date	2000/01/01 to 2155/12/31	-	2021/01/01	-	The release date is displayed	P.122
61	3061	SENSOR_SERIAL_NUM	Sensor S/N	16 characters	-	All Space[*1]	-	The sensor serial number is displayed	P.123
62	3062	TRANSMITTER_SN	Transmitter S/N	16 characters	-	All Space	-	The transmitter serial number is displayed	P.123
63	3063	HARD_REV	Hardware revision	-	-	S1.01	-	The hardware revision is displayed	P.123
72	3072	INTEGRAL_OR_REMOTE	Connection type	Integral (0) Remote (1)	O/S	Integral (0)[*1]	-	Integral/remote sensor is selected	P.122
73	3073	MAX_TEMP	Process temperature	-29 to +250 degC (0) -40 to +250 degC (1)[*2] -40 to +450 degC (2)[*2] -40 to +400 degC (3)[*2] -196 to +250 degC (4)	-	-29 to +250 degC (0)[*1]	-	The allowable temperature is displayed	P.122
74	3074	MAX_PRESS	Max pressure	0.0 to 99999.9	-	0.0[*1]	MPa at 38 degC	The maximum allowable pressure is displayed	P.122
75	3075	COMM_TYPE	Communication select	FF (2)	-	FF (2)	-	The communication type is displayed	P.122
76	3076	SI_CONTROL_CODES	SI Control Codes	All (0) JP only (1)	-	All (0)	-	The optional SI unit is displayed	P.122
80	3080	VERIFICATION_OPTION	Option built-in verification	Off (0) On (1)	-	On (1)	-	The verification option (/VF) is displayed	P.122
81	3081	PREDICTION_FUNCTION	Prediction function	Off (0) On (1)	-	On (1)	-	The predictive diagnosis mode is displayed	P.122
83	3083	ALARM_RECORD_1	Alarm record 1	None (0) 010:CPU failure (1) 011:CPU failure (2) 012:Main storage failure (3) 013:Sub storage failure (4) 014:Main ASIC failure (5) 015:Sub ASIC failure (6) 016:ADC circuit failure (9) 017:Signal circuit failure (10) 020:Flow sensor failure (12) 021:Temperature sensor failure (13) 030:Fluctuation (17) 031:Transient noise (18) 032:High vibration (19) 033:Critical vibration (20) 040:Temperature out of range (25) 045:T/P compensation out of range (30) 060:Sensor backup error (41) 070:Sensor communication error (49) 071:Flow sensor error (50) 072:Clogging (51) 073:Degradation (52) 074:Board temperature out of range (53) 080:Simulation running (57) 081:Verification running (58)	-	None (0)	-	The alarm recorded in alarm history 1 (Alarm record 1) is displayed	P.111

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
84	3084	ALARM_ RECORD_1_ DATE	Alarm record date 1	1900/01/01 00:00:00 to 2155/12/31 23:59:59	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 1 (Alarm record 1) are displayed	P.111
85	3085	ALARM_ RECORD_1_ OP_TIME	Alarm record operation time 1	0000D 00:00 to 9999D 23:59	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 1 (Alarm record 1) is displayed	P.111
86	3086	ALARM_ RECORD_2	Alarm record 2	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 2 (Alarm record 2) is displayed	P.111
87	3087	ALARM_ RECORD_2_ DATE	Alarm record date 2	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 2 (Alarm record 2) are displayed	P.111
88	3088	ALARM_ RECORD_2_ OP_TIME	Alarm record operation time 2	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 2 (Alarm record 2) is displayed	P.111
89	3089	ALARM_ RECORD_3	Alarm record 3	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 3 (Alarm record 3) is displayed	P.111
90	3090	ALARM_ RECORD_3_ DATE	Alarm record date 3	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 3 (Alarm record 3) are displayed	P.111
91	3091	ALARM_ RECORD_3_ OP_TIME	Alarm record operation time 3	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 3 (Alarm record 3) is displayed	P.111
92	3092	ALARM_ RECORD_4	Alarm record 4	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 4 (Alarm record 4) is displayed	P.111
93	3093	ALARM_ RECORD_4_ DATE	Alarm record date 4	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 4 (Alarm record 4) are displayed	P.111
94	3094	ALARM_ RECORD_4_ OP_TIME	Alarm record operation time 4	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 4 (Alarm record 4) is displayed	P.111
95	3095	ALARM_ RECORD_5	Alarm record 5	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 5 (Alarm record 5) is displayed	P.111
96	3096	ALARM_ RECORD_5_ DATE	Alarm record date 5	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 5 (Alarm record 5) are displayed	P.111
97	3097	ALARM_ RECORD_5_ OP_TIME	Alarm record operation time 5	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 5 (Alarm record 5) is displayed	P.111
98	3098	RECENT_ ALARM_1	Recent alarm 1	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 1 (Recent alarm 1) is displayed	P.111
99	3099	RECENT_ ALARM_1_ DATE	Recent alarm date 1	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 1 (Recent alarm 1) are displayed	P.111
100	3100	RECENT_ ALARM_1_OP_ TIME	Recent alarm operation time 1	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 1 (Recent alarm 1) is displayed	P.111
101	3101	RECENT_ ALARM_2	Recent alarm 2	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 2 (Recent alarm 2) is displayed	P.111
102	3102	RECENT_ ALARM_2_ DATE	Recent alarm date 2	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 2 (Recent alarm 2) are displayed	P.111

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
103	3103	RECENT_ALARM_2_OP_TIME	Recent alarm operation time 2	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 2 (Recent alarm 2) is displayed	P.111
104	3104	RECENT_ALARM_3	Recent alarm 3	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 3 (Recent alarm 3) is displayed	P.111
105	3105	RECENT_ALARM_3_DATE	Recent alarm date 3	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 3 (Recent alarm 3) are displayed	P.111
106	3106	RECENT_ALARM_3_OP_TIME	Recent alarm operation time 3	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 3 (Recent alarm 3) is displayed	P.111
107	3107	RECENT_ALARM_4	Recent alarm 4	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 4 (Recent alarm 4) is displayed	P.111
108	3108	RECENT_ALARM_4_DATE	Recent alarm date 4	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 4 (Recent alarm 4) are displayed	P.111
109	3109	RECENT_ALARM_4_OP_TIME	Recent alarm operation time 4	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 4 (Recent alarm 4) is displayed	P.111
110	3110	RECENT_ALARM_5	Recent alarm 5	Same as Alarm record 1	-	None (0)	-	The alarm recorded in alarm history 5 (Recent alarm 5) is displayed	P.111
111	3111	RECENT_ALARM_5_DATE	Recent alarm date 5	Same as Alarm record date 1	-	2023/01/01 00:00:00	-	The date and time of the alarm recorded in alarm history 5 (Recent alarm 5) are displayed	P.111
112	3112	RECENT_ALARM_5_OP_TIME	Recent alarm operation time 5	Same as Alarm record operation time 1	-	0000D 00:00	-	The operation time of the device up to when the alarm was recorded in alarm history 5 (Recent alarm 5) is displayed	P.111
113	3113	EXEC_BUILTIN_VF	Verification Exe	Not execute (0) Execute (1)	O/S	Not execute (0)	-	Execution/cancellation of verification is selected	P.128
114	3114	BUILTIN_VF_TARGET	Verification target	Sensor circuit (bit:0) Signal processing circuit (bit:1) Calculation circuit (bit:2) Alarm status (bit:3) Alarm record (bit:4)	O/S	All on	-	The verification target is selected	P.128
115	3115	BUILTIN_VF_PROGRESS	Verification status	Not execute (0) Execute(1/10) (1) Execute(2/10) (2) Execute(3/10) (3) Execute(4/10) (4) Execute(5/10) (5) Execute(6/10) (6) Execute(7/10) (7) Execute(8/10) (8) Execute(9/10) (9) Execute(10/10) (10) Finish (11) Cancel (12)	-	Not execute (0)	-	The progress of verification is displayed	P.128
116	3116	BUILTIN_VF_SWITCH	Verification select switch	Latest (0) Previous (1) Factory (2)	O/S	Latest (0)	-	The verification result to be displayed is selected	P.128
117	3117	BUILTIN_VF_DATE	Verification date/time	1900/01/01 00:00:00 to 2155/12/31 23:59:59	-	2023/01/01 00:00:00	-	The date and time when verification is executed are displayed	P.128
118	3118	BUILTIN_VF_OPERATION_TIME	Verification operation time	0000D 00:00 to 9999D 23:59	-	0000D 00:00	-	The operation time of the device up to verification execution is displayed	P.128
119	3119	BUILTIN_VF_RESULT	Verification result	Unknown (0) Pass (1) Failure (2) Cancel (3)	-	Unknown (0)	-	The overall result of verification is displayed	P.128
120	3120	SENSOR_CIRCUIT_RESULT	Sensor circuit result	Unknown (0) Pass (1) Failure (2) Cancel (3) Skip (4)	-	Unknown (0)	-	The diagnosis result of the sensor circuit is displayed	P.128

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
121	3121	SIGNAL_PROC_CIRCUIT_RESULT	Signal circuit result	Unknown (0) Pass (1) Failure (2) Cancel (3) Skip (4)	-	Unknown (0)	-	The diagnosis result of the signal circuit is displayed	P.128
122	3122	CALC_CIRCUIT_RESULT	Calculation circuit result	Unknown (0) Pass (1) Failure (2) Cancel (3) Skip (4)	-	Unknown (0)	-	The diagnosis result of the calculation circuit is displayed	P.128
123	3123	ALARM_STATUS_RESULT	Alarm status result	Unknown (0) Pass (1) Failure (2) Cancel (3) Skip (4)	-	Unknown (0)	-	The diagnosis result of the alarm is displayed	P.128
124	3124	ALARM_RECORD_RESULT	Alarm record result	Unknown (0) Pass (1) Failure (2) Cancel (3) Skip (4)	-	Unknown (0)	-	The diagnosis result of the alarm history is displayed	P.128
125	3125	LATCH_EXE	Signal latch execution	Not execute (0) Execute (1)	O/S	Not execute (0)	-	Signal latch is executed	P.130
126	3126	LATCH_SWITCH	Signal latch target	Latest (0) Sensor alarm record 1 (1) Sensor alarm record 2 (2) Sensor alarm record 3 (3) Sensor alarm record 4 (4) Sensor alarm record 5 (5)	AUTO	Latest (0)	-	The signal latch to display is selected	P.130
127	3127	LATCHED_STATUS	Signal latch alarm	None (0) Fluctuating (1) Transient noise (2) High vibration (3) Critical vibration (4) Flow sensor error (5) Clogging (6) Degradation (7)	-	None (0)	-	The alarm when a signal latch is executed is displayed	P.130
128	3128	LATCHED_DATE	Signal latch date	1900/01/01 00:00:00 to 2155/12/31 23:59:59	-	2023/01/01 00:00:00	-	The date and time when a signal latch is executed are displayed	P.130
129	3129	LATCHED_OPERATION_TIME	Signal latch operation time	0000D 00:00 to 9999D 23:59	-	0000D 00:00	-	The operation time of the device up to signal latch execution is displayed	P.130
130	3130	LATCHED_VORTEX_FREQ	Signal latch vortex frequency	-99999.9 to 99999.9	-	0.0	Hz	The vortex frequency when a signal latch is executed is displayed	P.130
131	3131	LATCHED_FLOW_VELOCITY	Signal latch velocity	-99999.9 to 99999.9	-	0.0	m/s	The flow velocity when a signal latch is executed is displayed	P.130
132	3132	LATCHED_MAX_BAND	Signal latch max band	0 to 99	-	0	-	The maximum band when a signal latch is executed is displayed	P.130
133	3133	LATCHED_NOISE_RATIO	Signal latch noise ratio	-99999.9 to 99999.9	-	0.0	-	The noise ratio when a signal latch is executed is displayed	P.130
134	3134	LATCHED_NR_CAL_BAND_1	Signal latch noise band 1	0 to 99	-	0	-	Noise band 1 when a signal latch is executed is displayed	P.130
135	3135	LATCHED_NR_CAL_BAND_2	Signal latch noise band 2	0 to 99	-	0	-	Noise band 2 when a signal latch is executed is displayed	P.130
136	3136	LATCHED_TLA	Signal latch TLA	-99999.9 to 99999.9	-	0.0	-	The trigger level when a signal latch is executed is displayed	P.130
137	3137	LATCHED_BASIC_BAND	Signal latch basic band	0 to 99	-	0	-	The basic band when a signal latch is executed is displayed	P.130
138	3138	LATCHED_AMP_0	Basic+0 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 0 when a signal latch is executed is displayed	P.130
			Basic+0 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 0 when a signal latch is executed is displayed	
			Basic+0 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 0 when a signal latch is executed is displayed	
			Basic+0 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 0 when a signal latch is executed is displayed	

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
139	3139	LATCHED_AMP_1	Basic+1 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 1 when a signal latch is executed is displayed	P.130
			Basic+1 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 1 when a signal latch is executed is displayed	
			Basic+1 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 1 when a signal latch is executed is displayed	
			Basic+1 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 1 when a signal latch is executed is displayed	
140	3140	LATCHED_AMP_2	Basic+2 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 2 when a signal latch is executed is displayed	P.130
			Basic+2 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 2 when a signal latch is executed is displayed	
			Basic+2 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 2 when a signal latch is executed is displayed	
			Basic+2 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 2 when a signal latch is executed is displayed	
141	3141	LATCHED_AMP_3	Basic+3 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 3 when a signal latch is executed is displayed	P.130
			Basic+3 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 3 when a signal latch is executed is displayed	
			Basic+3 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 3 when a signal latch is executed is displayed	
			Basic+3 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 3 when a signal latch is executed is displayed	
142	3142	LATCHED_AMP_4	Basic+4 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 4 when a signal latch is executed is displayed	P.130
			Basic+4 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 4 when a signal latch is executed is displayed	
			Basic+4 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 4 when a signal latch is executed is displayed	
			Basic+4 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 4 when a signal latch is executed is displayed	
143	3143	LATCHED_AMP_5	Basic+5 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 5 when a signal latch is executed is displayed	P.130
			Basic+5 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 5 when a signal latch is executed is displayed	
			Basic+5 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 5 when a signal latch is executed is displayed	
			Basic+5 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 5 when a signal latch is executed is displayed	

Relative Index	Index	Label: Parameter Name	Label: FOUNDATION Fieldbus	Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
144	3144	LATCHED_ AMP_6	Basic+6 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 6 when a signal latch is executed is displayed	P.130
			Basic+6 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 6 when a signal latch is executed is displayed	
			Basic+6 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 6 when a signal latch is executed is displayed	
			Basic+6 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 6 when a signal latch is executed is displayed	
145	3145	LATCHED_ AMP_7	Basic+7 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 7 when a signal latch is executed is displayed	P.130
			Basic+7 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 7 when a signal latch is executed is displayed	
			Basic+7 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 7 when a signal latch is executed is displayed	
			Basic+7 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 7 when a signal latch is executed is displayed	
146	3146	LATCHED_ AMP_8	Basic+8 band.1	0 to 65535	-	0	-	The A signal amplitude at the basic band + 8 when a signal latch is executed is displayed	P.130
			Basic+8 band.2	0 to 65535	-	0	-	The B signal amplitude at the basic band + 8 when a signal latch is executed is displayed	
			Basic+8 band.3	0 to 65535	-	0	-	The C signal amplitude at the basic band + 8 when a signal latch is executed is displayed	
			Basic+8 band.4	0 to 65535	-	0	-	The noise judgment level at the basic band + 8 when a signal latch is executed is displayed	
158	3158	PREDICTION_ EXE	Prediction execution	Not execute (0) Execute (1)	O/S	Not execute (0)	-	Execution/cancellation of predictive diagnosis is selected	P.127
159	3159	PREDICTION_ SEL	Prediction select	A/B ratio (0) Sensor sensitivity (1) Signal A (2) Signal B (3) Signal C (4)	O/S	A/B ratio (0)	-	The target of predictive diagnosis is selected	P.127
160	3160	PREDICTION_ PERIOD	Prediction period	0 to 65535	O/S	60	min	The storage interval of predictive diagnosis is set	P.127
161	3161	PREDICTION_ START_DATE	Prediction start date	1900/01/01 00:00:00 to 2155/12/31 23:59:59	-	2023/01/01 00:00:00	-	The start date/time of predictive diagnosis is displayed	P.127
162	3162	PREDICTION_ STOP_DATE	Prediction stop date	1900/01/01 00:00:00 to 2155/12/31 23:59:59	-	2023/01/01 00:00:00	-	The stop date/time of predictive diagnosis is displayed	P.127
163	3163	PREDICTION_ LEVEL	Prediction level	0.0 to 99999.9	O/S	0.0	-	The judgment value of predictive diagnosis is displayed	P.127
164	3164	PREDICTION_ ALARM_TIME	Prediction alarm time	0 to 65535	O/S	0	h	The specified time of predictive diagnosis is set	P.127
165	3165	PREDICTION_ ESTIMATE_ TIME	Prediction estimate time	0 to 65535	-	0	h	The prediction time of predictive diagnosis is displayed	P.127
166	3166	PREDICTION_ RESULT	Prediction result	Unknown (0) Pass (1) Failure (2)	-	Unknown (0)	-	The result of predictive diagnosis is displayed	P.127
167	3167	PREDICTION_ TYPE	Prediction type	Type 1 (0) Type 2 (1) Type 3 (2)	O/S	Type 1 (0)	-	The type of predictive diagnosis is set	P.127
242	3242	TEMP_UNIT_ REF	Temp. Unit for ref.	degC (1001) degF (1002) K (1000)	-	degC (1001)	-	The unit for temperature is displayed	-

Relative Index	Index	Label		Data Range	Write Mode	Default Value	Unit (Index)	Description	Refer to
		Parameter Name	FOUNDATION Fieldbus						
243	3243	PRESS_UNIT_ REF	Press. Unit for ref.	kPaa (1547) MPaa (1545) Bara (1597) psia (1142) kPag (1548) MPag (1546) Barg (1590) psig (1143)	-	Mpaa (1545)	-	The unit for pressure is displayed	-
244	3244	SENSOR_ RESET	Sensor reset	Not execute (0) Execute (1)	O/S	Not execute (0)	-	Whether or not to execute a sensor circuit restart is selected	P.135

7.5 AI Function Block

Relative Index	Index			Parameter Name	Default Value	Write Mode	Description
	AI1	AI2	AI3				
0	4000	4100	4200	Block Header	AI1:“AI1 ” AI2:“AI2 ” AI3:“AI3 ”	O/S	Information on this block, such as Block Tag, DD Revision, Execution, etc.
1	4001	4101	4201	ST_REV	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.
2	4002	4102	4202	TAG_DESC	Space (32 characters)	AUTO	Universal parameter to store a comment explaining tag contents.
3	4003	4103	4203	STRATEGY	1	AUTO	Universal parameter intended to be used for the high-level system to separate function blocks.
4	4004	4104	4204	ALERT_KEY	1	AUTO	Key information to identify where an alert takes place. Generally, this parameter is used by the high-level system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.
5	4005	4105	4205	MODE_BLK	0x80(O/S) 0x80(O/S) 0x98(Auto, Man, O/S) 0x08(Auto)	AUTO - AUTO AUTO	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.
6	4006	4106	4206	BLOCK_ERR	0x0000	-	Indicates the error statuses related to the own block.
7	4007	4107	4207	PV	0x1C 0.0	- -	Indicates the PV value (or the process value corresponding to the value) and status to be used for functional execution.
8	4008	4108	4208	OUT	0x1C 0.0	- MAN	Indicates the value and status of analog output. Held when the block mode is MAN and O/S.
9	4009	4109	4209	SIMULATE	0 0.0 0 0.0 1	AUTO AUTO - - AUTO	Parameter to simulate the AI block. The user can arbitrarily specify an input value and status from CHANNEL.
10	4010	4110	4210	XD_SCALE	AI1:10.0[*1], AI2:100.0, AI3:1.0 0.0 AI1:1349(m^3/h)[*1], AI2:1001(degC)[*1], AI3:1034(m^3) AI1,AI3:4, AI2:1	O/S O/S O/S O/S	Sets an input value (measured range) from the Transducer Block which corresponds to 0% and 100% points in calculation in the AI function block.
11	4011	4111	4211	OUT_SCALE	100.0[*1] 0.0 1342(%)[*1] 1	O/S O/S O/S O/S	Parameter to scale output. Sets the output values for 0% and 100% points in calculation in the AI function block. Any unit stipulated in the FieldComm Group specifications can be defined.
12	4012	4112	4212	GRANT_DENY	0x00 0x00	AUTO AUTO	The parameter for checking if various operations have been executed. Set a bit corresponding to the GRANT parameter before various operations are executed. Check the DENY parameter after the operation. If the bit for the operation is not set, it indicates that the operation was executed. Bit assignment complies with the Communication standard specifications.

Relative Index	Index			Parameter Name	Default Value	Write Mode	Description
	AI1	AI2	AI3				
13	4013	4113	4213	IO_OPTS	0x0000	O/S	Specifies the option settings and input/output functions of the IO block. Bit assignment complies with the Communication standard specifications.
14	4014	4114	4214	STATUS_OPTS	0x0000	O/S	Option for the user to select in the status book processing. Bit assignment complies with the Communication standard specifications.
15	4015	4115	4215	CHANNEL	AI1:1(Flow Rate) AI2:2(Temperature) AI3:6(Total)	O/S	Parameter to select a channel for the transducer block to connect with.
16	4016	4116	4216	L_TYPE	1(Direct)	Man	Parameter to select a totalization method for OUT.
17	4017	4117	4217	LOW_CUT	0.0	AUTO	Specifies a low-cut point. When the square root output is selected, and this function is set to valid with IO_OPTS, the output becomes 0 if the output goes below the setpoint for this parameter.
18	4018	4118	4218	PV_FTIME	0.0	AUTO	Specifies the AI block filter (damping) in seconds.
19	4019	4119	4219	FIELD_VAL	0x00 0.0	- -	Value obtained by scaling the input value with XD_SCALE and expressed in %. Raw value that is not influenced by the calculation or filter specified by L_TYPE.
20	4020	4120	4220	UPDATE_EVT	0(Uninitialized) 0(Uninitialized) 0,0 0 0	AUTO - - - -	Indicates contents of the event when an update event (a change to the setpoint) occurs.
21	4021	4121	4221	BLOCK_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when a block alarm occurs.
22	4022	4122	4222	ALARM_SUM	0x0000 0x0000 0x0000 0x0000	- - - AUTO	Parameter to indicate the alarm status of the entire block.
23	4023	4123	4223	ACK_OPTION	0xFFFF	AUTO	Sets operation to acknowledge (acknowledgment for the alarm) of various alarms. By setting a bit to the alarm, the device operates for the alarm as if it is acknowledged without the acknowledgment. Bit assignment complies with the Communication standard specifications.
24	4024	4124	4224	ALARM_HYS	0.5	AUTO	Threshold (hysteresis) against clearing each alarm of HI_HI, HI, LO and LO_LO. An active alarm is cleared if the setpoint goes into the normal value side by the amount of hysteresis from the limit value.

Relative Index	Index			Parameter Name	Default Value	Write Mode	Description
	AI1	AI2	AI3				
25	4025	4125	4225	HI_HI_PRI	0	AUTO	Specifies the priority for the HI_HI alarm. It can be used not just to set the priority, but to disable alarm notification. Meanwhile, to activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
26	4026	4126	4226	HI_HI_LIM	FLT_MAX	AUTO	Specifies a limit value for the HI_HI alarm.
27	4027	4127	4227	HI_PRI	0	AUTO	Specifies the priority of the HI alarm. Meanwhile, to activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
28	4028	4128	4228	HI_LIM	FLT_MAX	AUTO	Specifies a limit value for the HI alarm.
29	4029	4129	4229	LO_PRI	0	AUTO	Specifies the priority for the LO alarm. Meanwhile, to activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
30	4030	4130	4230	LO_LIM	-FLT_MAX	AUTO	Specifies a limit value for the LO alarm.
31	4031	4131	4231	LO_LO_PRI	0	AUTO	Specifies the priority of the LO_LO alarm. Meanwhile, to activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
32	4032	4132	4232	LO_LO_LIM	-FLT_MAX	AUTO	Specifies a limit value for the LO_LO alarm.
33	4033	4133	4233	HI_HI_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0.0	AUTO - - - -	Indicates information about the HI_HI alarm that occurred.

Relative Index	Index			Parameter Name	Default Value	Write Mode	Description
	AI1	AI2	AI3				
34	4034	4134	4234	HI_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0.0	AUTO - - - -	Indicates information about the HI alarm that occurred.
35	4035	4135	4235	LO_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0.0	AUTO - - - -	Indicates information about the LO alarm that occurred.
36	4036	4136	4236	LO_LO_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0.0	AUTO - - - -	Indicates information about the LO_LO alarm that occurred.
37	4037	4137	4237	BLOCK_ERR_DESC_1	0x00000000	-	Indicates details for the error that occurred due to BLOCK_ERR. bit1:Channel-Not-Init bit2:Wrong-Channel bit3:Channel-Unit-Mismatch bit4:L_type-Not-Init bit5:Wrong-L_type bit6:XD_Scale-Inconsist bit7:OUT_Scale-Inconsist bit8:PV_Scale-Inconsist bit9:TRK_Scale-Inconsist bit10:FF_Scale-Inconsist bit11:Bypass-Not-Init bit12:Shed_Opt-Not-Init bit13:SP_Limits-Inconsist bit14:OUT_Limits-Inconsist bit15:Arith_Type-Not-Init bit16:Select_Type-Not-Init bit17:Integ_Type-Not-Init bit18:Range-Inconsist bit19:Compensation-Inconsist bit20:Curve_X-Inconsist bit21:Curve_X-Not-Monoton bit22:Curve_Y-Inconsist bit23:Swap_2-Not-Init bit24:Curve_Y-Not-Monoton bit26:Period_Of_Exec-is-Zero

7.6 DI Function Block

Relative Index	Index DI1	Index DI2	Parameter Name	Default Value	Write Mode	Description
0	6000	6100	Block Header	DI1:"DI1 " DI2:"DI2 "	O/S	Information on this block, such as Block Tag, DD Revision, Execution, etc.
1	6001	6101	ST_REV	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.
2	6002	6102	TAG_DESC	Space (32 characters)	AUTO	Universal parameter to store a comment explaining tag contents.
3	6003	6103	STRATEGY	1	AUTO	Universal parameter intended to be used for the high-level system to separate function blocks.
4	6004	6104	ALERT_KEY	1	AUTO	Key information to identify where an alert takes place. Generally, this parameter is used by the high-level system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.
5	6005	6105	MODE_BLK	0x80(O/S) 0x80(O/S) 0x98(Auto, Man, O/S) 0x08(Auto)	AUTO - AUTO AUTO	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.
6	6006	6106	BLOCK_ERR	0x0000	-	Indicates the error statuses related to the own block.
7	6007	6107	PV_D	0x1C 0	- -	The primary discrete value (or process value) for execution of the block's functions.
8	6008	6108	OUT_D	0x1C 0	- MAN	Indicates the value and status of output value.
9	6009	6109	SIMULATE_D	0(Bad:NonSpecific:NotLimited) 0(State 0) 0(Bad:NonSpecific:NotLimited) 0(State 0) 1(Disabled)	AUTO AUTO - - AUTO	Selects whether to use a limit switch input which is actually input from the transducer block, or to use a value specified by an operator. If the simulation is set to Disable, the actual value and status will be reflected.
10	6010	6110	XD_STATE	0	AUTO	Not used for this product.
11	6011	6111	OUT_STATE	0	AUTO	Not used for this product.
12	6012	6112	GRANT_DENY	0x00 0x00	AUTO AUTO	Parameter to check whether various operations are executed. Corresponds to the operation of the GRANT parameter before executing various operations. Set a bit and check the DENY parameter after the operation. If the bit corresponding to the operation is not set, it indicates that the operation was executed. Bit assignment complies with the Communication standard specifications.
13	6013	6113	IO_OPTS	0x0000	O/S	Sets function settings for the block input/output options. Bit assignment complies with the Communication standard specifications.

Relative Index	Index DI1	Index DI2	Parameter Name	Default Value	Write Mode	Description
14	6014	6114	STATUS_OPTS	0x0000	O/S	Parameter to select a block operation with status condition, etc. Bit assignment complies with the Communication standard specifications.
15	6015	6115	CHANNEL	DI1:3 (Limit Switch 1) DI2:4 (Limit Switch 2)	O/S	Specifies a channel number for hardware to be connected to the transducer block.
16	6016	6116	PV_FTIME	0.0	AUTO	Specifies filter damp for PV_D.
17	6017	6117	FIELD_VAL_D	0x00 0	- -	The status of the limit switch signal transferred from the transducer block.
18	6018	6118	UPDATE_EVT	0(Uninitialized) 0(Uninitialized) 0,0 0 0	AUTO - - - -	Shows the content of an update event (a change to the setpoint) upon occurrence.
19	6019	6119	BLOCK_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0	AUTO - - - -	Indicates contents when a block alarm occurs.
20	6020	6120	ALARM_SUM	0x0000 0x0000 0x0000 0x0000	- - - AUTO	Parameter to show alarm status in the block. Bit assignment complies with the Communication standard specifications.
21	6021	6121	ACK_OPTION	0xFFFF	AUTO	Sets operation to acknowledge (acknowledgment for the alarm) of various alarms. By setting a bit to the alarm, the device operates for the alarm as if it is acknowledged without the acknowledgment. Bit assignment complies with the Communication standard specifications.
22	6022	6122	DISC_PRI	0	AUTO	Specifies the alarm priority.
23	6023	6123	DISC_LIM	0	AUTO	Indicates the input status for discrete alarm. Meanwhile, to activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
24	6024	6124	DISC_ALM	0(Uninitialized) 0(Uninitialized) 0,0 0(Other) 0(State 0)	AUTO - - - -	Indicates the status related to discrete alarm.

7.7 MAO Function Block

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
0	10000	Block Header	“MAO”	O/S	Information on this block, such as Block Tag, DD Revision, Execution, etc.
1	10001	ST_REV	0	-	Represents the revision level of the setting parameter of the own block. This revision is updated if the setpoint is changed. Used to check for parameter change, etc.
2	10002	TAG_DESC	Space (32 characters)	AUTO	Universal parameter to store a comment explaining tag contents.
3	10003	STRATEGY	1	AUTO	Universal parameter intended to be used for the high-level system to separate function blocks.
4	10004	ALERT_KEY	1	AUTO	Key information to identify where an alert takes place. Generally, this parameter is used by the high-level system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.
5	10005	MODE_BLK	0x80(O/S) 0x80(O/S) 0x88(Auto, O/S) 0x08(Auto)	AUTO - AUTO AUTO	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.
6	10006	BLOCK_ERR	0x0000	-	Indicates the error statuses related to the own block.
7	10007	CHANNEL	12(Aux Input)	O/S	Parameter to select a channel for the transducer block to connect with. For this product, 20 fixed.
8	10008	IN_1	0x0B 0	AUTO AUTO	See 6.6.3.
9	10009	IN_2	0x0B 0	AUTO AUTO	See 6.6.3.
10	10010	IN_3	0x0B 0	AUTO AUTO	See 6.6.3.
11	10011	IN_4	0x0B 0	AUTO AUTO	Not used for this product.
12	10012	IN_5	0x0B 0	AUTO AUTO	
13	10013	IN_6	0x0B 0	AUTO AUTO	
14	10014	IN_7	0x0B 0	AUTO AUTO	
15	10015	IN_8	0x0B 0	AUTO AUTO	
16	10016	MO_OPTS	0x0000	AUTO	Operational parameter to specify the output operation of MAO Function Block. Specifies a value to be transmitted to the sensor transducer block mainly at the fault state. Bit assignment complies with the Communication standard specifications.
17	10017	FSTATE_TIME	0	AUTO	Transits to the fault state when an input continues to be Bad for more than time set by FSTATE_TIME.
18	10018	FSTATE_VAL1	0	AUTO	Value to be transmitted to the sensor transducer block as input 1 at the fault state. (Option)
19	10019	FSTATE_VAL2	0	AUTO	Value to be transmitted to the sensor transducer block as input 2 at the fault state. (Option)

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
20	10020	FSTATE_VAL3	0	AUTO	Value to be transmitted to the sensor transducer block as input 3 at the fault state. (Option)
21	10021	FSTATE_VAL4	0	AUTO	Value to be transmitted to the sensor transducer block as input 4 at the fault state. (Option)
22	10022	FSTATE_VAL5	0	AUTO	Value to be transmitted to the sensor transducer block as input 5 at the fault state. (Option)
23	10023	FSTATE_VAL6	0	AUTO	Value to be transmitted to the sensor transducer block as input 6 at the fault state. (Option)
24	10024	FSTATE_VAL7	0	AUTO	Value to be transmitted to the sensor transducer block as input 7 at the fault state. (Option)
25	10025	FSTATE_VAL8	0	AUTO	Value to be transmitted to the sensor transducer block as input 8 at the fault state. (Option)
26	10026	FSTATE_STATUS	0x0000	-	Indicates the list of input items transited to the fault state. Bit assignment complies with the Communication standard specifications.
27	10027	UPDATE_EVT	0(Uninitialized) 0(Uninitialized) 0 0 0	AUTO - - - -	Indicates contents of the event when an update event (a change to the setpoint) occurs.
28	10028	BLOCK_ALM	0(Uninitialized) 0(Uninitialized) 0 0(Other) 0	AUTO - - - -	Indicates contents of the alarm when a block alarm occurs.

7.8 Unit and Code

Code	Unit
1347	m^3/s
1348	m^3/min
1349	m^3/h
1350	m^3/d
1497	km^3/s
1501	km^3/min
1505	km^3/h
1509	km^3/d
1351	L/s
1352	L/min
1353	L/h
1354	L/d
1627	mCFS
1626	mCFM
1625	mCFH
1624	mft^3/d
1356	CFS
1357	CFM
1358	CFH
1359	ft^3/d
1623	kCFS
1622	kCFM
1621	kCFH
1620	kft^3/d
1362	gal/s
1363	GPM
1364	gal/h
1365	gal/d
1450	kgal/s
1454	kgal/min
1458	kgal/h
1462	kgal/d
1367	ImpGal/s
1368	ImpGal/min
1369	ImpGal/h
1370	ImpGal/d
1465	kImpGal/s
1469	kImpGal/min
1473	kImpGal/h
1477	kImpGal/d
1480	mbbl/s
1484	mbbl/min
1488	mbbl/h
1492	mbbl/d
1371	bbl/s
1372	bbl/min
1373	bbl/h

Code	Unit
1374	bbl/d
1481	kbbl/s
1485	kbbl/min
1489	kbbl/h
1493	kbbl/d
1322	kg/s
1323	kg/min
1324	kg/h
1325	kg/d
1326	t/s
1327	t/min
1328	t/h
1329	t/d
1330	lb/s
1331	lb/min
1332	lb/h
1333	lb/d
1644	klb/s
1643	klb/min
1642	klb/h
1641	klb/d
1522	Nm^3/s
1523	Nm^3/min
1524	Nm^3/h
1525	Nm^3/d
32780*	k(N)m^3/s
32781*	k(N)m^3/min
32782*	k(N)m^3/h
32783*	k(N)m^3/d
32784*	M(N)m^3/s
32785*	M(N)m^3/min
32786*	M(N)m^3/h
32787*	M(N)m^3/d
1532	NL/s
1533	NL/min
1534	NL/h
1535	NL/d
1527	Sm^3/s
1528	Sm^3/min
1529	Sm^3/h
1530	Sm^3/d
32788*	k(S)m^3/s
32789*	k(S)m^3/min
32790*	k(S)m^3/h
32791*	k(S)m^3/d
32792*	M(S)m^3/s
32793*	M(S)m^3/min

Code	Unit
32794*	M(S)m^3/h
32795*	M(S)m^3/d
1537	SL/s
1538	SL/min
1539	SL/h
1540	SL/d
1723	SCFS
1360	SCFM
1361	SCFH
1722	SCFD
1741	MSCFS
1742	MSCFSM
1743	MSCFSH
1598	MSCFSD
1744	MMSCFS
1745	MMSCFSM
1746	MMSCFSH
1599	MMSCFSD
1438	kJ/s
1439	kJ/min
1440	kJ/h
1441	kJ/d
1442	MJ/s
1443	MJ/min
1196	MJ/h
1444	MJ/d
32796*	GJ/s
32797*	GJ/min
32798*	GJ/h
32799*	GJ/d
32800*	TJ/s
32801*	TJ/min
32802*	TJ/h
32803*	TJ/d
1445	Btu/s
1446	Btu/min
1197	Btu/h
1447	Btu/day
32804*	kBtu/s
32805*	kBtu/min
32806*	kBtu/h
32807*	kBtu/d
32808*	MBtu/s
32809*	MBtu/min
32810*	MBtu/h
32811*	MBtu/d
1001	°C

Code	Unit
1002	°F
1000	K
1545	MPaa
1547	kPaa
1597	bara
1142	psia
1546	MPag
1548	kPag
1590	barg
1143	psig
1034	m^3
32768*	km^3
1038	l
32769*	mcf
1043	cf
32770*	kcf
1048	USgal
1648	kUSgal
1049	Impgal
1649	kImpgal
32771*	mbbl
1051	bbl
32772*	kbbl
1088	kg
1092	t
1094	lb
1749	klb
1521	(N)m^3
32773*	k(N)m^3
32774*	M(N)m^3
1531	(N)L
1526	(S)m^3
32775*	k(S)m^3
32776*	M(S)m^3
1536	(S)L
1053	SCF
1747	MSCF
1748	MMSCF
1173	kJ
1172	MJ
1171	GJ
1170	TJ
1183	BTU
32777*	kBTU
32778*	MBTU

*: These units are vendor specific unit. They may not be supported by some hosts.

8. Menu Tree

The following shows the hierarchy of the FOUNDATION Fieldbus communication menu.

NOTE

The available functions and parameters displayed vary depending on communication and I/O code, and option code specified at the time of ordering.

■ Device Configuration(FDI)

- **Device Settings**
  - Block Info
    - Block Tags →Page 181
    - Block Strategy →Page 182
    - Block Alert Key →Page 183
  - Basic Setup
    - Access Control & Block Mode Conf. →Page 184
    - AIFB-TB Connect w/ Units & Range →Page 186
    - Flow Rate Setup →Page 187
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    - Display Setup →Page 189
    - Temperature Setup →Page 189
    - Pressure Setup →Page 190
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  - Additional Setup
    - Display Setup Additionals →Page 193
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    - Aux Input Setup →Page 194
    - Limit Switch Setup →Page 194
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  - Additional Block Config.
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    - MAO FB Setup →Page 198
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  - Device Information
    - Order Information →Page 201
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Block Tags

- **Block Tags**
  - Resource Block
    - Characteristics.Block Tag
  - Sensor Transducer Block
    - Characteristics.Block Tag
  - LCD Indicator Transducer Block
    - Characteristics.Block Tag
  - Maintenance Transducer Block
    - Characteristics.Block Tag
  - Analog Input 1 Function Block
    - Characteristics.Block Tag
  - Analog Input 2 Function Block
    - Characteristics.Block Tag
  - Analog Input 3 Function Block
    - Characteristics.Block Tag
  - Integrator Function Block
    - Characteristics.Block Tag
  - Multiple Analog Output Function Block
    - Characteristics.Block Tag
  - Discrete Input 1 Function Block
    - Characteristics.Block Tag
  - Discrete Input 2 Function Block
    - Characteristics.Block Tag
  - PID Function Block
    - Characteristics.Block Tag
  - Arithmetic Function Block
    - Characteristics.Block Tag
  - RB Tag Desc.
    - Tag Description
  - STB Tag Desc.
    - Tag Description
  - LTB Tag Desc.
    - Tag Description
  - MTB Tag Desc.
    - Tag Description
  - AI1 Tag Desc.
    - Tag Description
  - AI2 Tag Desc.
    - Tag Description
  - AI3 Tag Desc.
    - Tag Description
  - IT Tag Desc.
    - Tag Description
  - MAO Tag Desc.
    - Tag Description
  - DI1 Tag Desc.
    - Tag Description
  - DI2 Tag Desc.
    - Tag Description
  - PID Tag Desc.
    - Tag Description
  - AR Tag Desc.
    - Tag Description

● Block Strategy

- **Block Strategy**
  - Resource Block
    - Strategy
  - Sensor Transducer Block
    - Strategy
  - LCD Indicator Transducer Block
    - Strategy
  - Maintenance Transducer Block
    - Strategy
  - Analog Input 1 Function Block
    - Strategy
  - Analog Input 2 Function Block
    - Strategy
  - Analog Input 3 Function Block
    - Strategy
  - Integrator Function Block
    - Strategy
  - Multiple Analog Output Function Block
    - Strategy
  - Discrete Input 1 Function Block
    - Strategy
  - Discrete Input 2 Function Block
    - Strategy
  - PID Function Block
    - Strategy
  - Arithmetic Function Block
    - Strategy

Block Alert Key

- **Block Alert Key**
  - Resource Block
    - Alert Key
  - Sensor Transducer Block
    - Alert Key
  - LCD Indicator Transducer Block
    - Alert Key
  - Maintenance Transducer Block
    - Alert Key
  - Analog Input 1 Function Block
    - Alert Key
  - Analog Input 2 Function Block
    - Alert Key
  - Analog Input 3 Function Block
    - Alert Key
  - Integrator Function Block
    - Alert Key
  - Multiple Analog Output Function Block
    - Alert Key
  - Discrete Input 1 Function Block
    - Alert Key
  - Discrete Input 2 Function Block
    - Alert Key
  - PID Function Block
    - Alert Key
  - Arithmetic Function Block
    - Alert Key

● Access Control & Block Mode Conf.

- **Access Control & Block Mode Conf.**
  - Actual Mode
    - RB Block Mode (Actual)
      - Block Mode.Actual
    - STB Block Mode (Actual)
      - Block Mode.Actual
    - LTB Block Mode (Actual)
      - Block Mode.Actual
    - MTB Block Mode (Actual)
      - Block Mode.Actual
    - AI1 Block Mode (Actual)
      - Block Mode.Actual
    - AI2 Block Mode (Actual)
      - Block Mode.Actual
    - AI3 Block Mode (Actual)
      - Block Mode.Actual
  - Target Mode
    - RB Target Mode
      - Block Mode.Target
    - STB Target Mode
      - Block Mode.Target
    - LTB Target Mode
      - Block Mode.Target
    - MTB Target Mode
      - Block Mode.Target
    - AI1 Target Mode
      - Block Mode.Target
    - AI2 Target Mode
      - Block Mode.Target
    - AI3 Target Mode
      - Block Mode.Target
  - Permitted Mode
    - RB Permitted Mode
      - Block Mode.Permitted
    - STB Permitted Mode
      - Block Mode.Permitted
    - LTB Permitted Mode
      - Block Mode.Permitted
    - MTB Permitted Mode
      - Block Mode.Permitted
    - AI1 Permitted Mode
      - Block Mode.Permitted
    - AI2 Permitted Mode
      - Block Mode.Permitted
    - AI3 Permitted Mode
      - Block Mode.Permitted

(Continued on next page)

- Normal Mode
  - RB Normal Mode
    - Block Mode.Normal
  - STB Normal Mode
    - Block Mode.Normal
  - LTB Normal Mode
    - Block Mode.Normal
  - MTB Normal Mode
    - Block Mode.Normal
  - AI1 Normal Mode
    - Block Mode.Normal
  - AI2 Normal Mode
    - Block Mode.Normal
  - AI3 Normal Mode
    - Block Mode.Normal
- Write Lock Control
  - Write Lock
  - Feature Selection
  - Write Lock Level

● AIFB-TB Connect w/ Units & Range

- **AIFB-TB Connect w/ Units & Range**
  - Channel Mapping
    - AI1 Channel
      - Channel
    - AI2 Channel
      - Channel
    - AI3 Channel
      - Channel
  - AI1 Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - AI2 Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - AI3 Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - Flow Unit & Range
    - Primary Value Range.Units Index
    - Primary Value Range.EU at 100%
    - Primary Value Range.EU at 0%
  - Temperature Unit & Range
    - Temperature Unit
    - Temperature URV
    - Temperature LRV
  - Pressure Unit & Range
    - Pressure unit
    - Pressure URV
    - Pressure LRV
  - Totalizer unit

● Flow Rate Setup

- **Flow Rate Setup**
  - STB Block Mode (Actual)
    - Block Mode.Actual
  - Flow
    - Primary Value.Status
    - Primary Value.Value
  - Application Setup
    - Fluid type
    - Flow select
    - Flow rate config (M)
  - STB Target Mode
    - Block Mode.Target
  - Additional Config.
    - Flow span
    - Flow zero
    - Flow damping
    - Flow lowcut
    - Lowcut limit
  - Sensor Range
    - Sensor Range.Units Index
    - Sensor Range.EU at 100%
    - Sensor Range.EU at 0%

AI1 FB Setup

- **AI1 FB Setup**
  - Block Mode (Actual)
    - Block Mode.Actual
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value
  - Target Mode
    - Block Mode.Target
  - Channel
  - Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - Output Scale
    - Output Scale.EU at 100%
    - Output Scale.EU at 0%
    - Output Scale.Units Index
  - Additional Config.
    - Linearization Type
    - Low Cutoff
    - Process Value Filter Time
  - Options
    - I/O Options
    - Status Options

Display Setup

- **Display Setup**
  - Display line upper
  - Display line lower

Temperature Setup

- **Temperature Setup**
  - STB Block Mode (Actual)
    - Block Mode.Actual
  - Temperature
    - Secondary Value.Status
    - Secondary Value.Value
  - Temperature Unit
  - STB Target Mode
    - Block Mode.Target
  - Additional Config.
    - Temperature damping

● Pressure Setup

- **Pressure Setup**
  - STB Block Mode (Actual)
    - Block Mode.Actual
  - Pressure unit
  - STB Target Mode
    - Block Mode.Target

● Total Value Setup

- **Total Value Setup**
  - STB Block Mode (Actual)
    - Block Mode.Actual
  - Totalizer
    - Totalizer.Status
    - Totalizer.Value
  - Totalizer unit
  - Totalizer start/stop
  - STB Target Mode
    - Block Mode.Target
  - Additional Config.
    - Totalizer reset/press (M)
    - Totalizer preset value
    - Totalizer rate
    - Totalizer rate unit
    - Totalizer reset mode

AI2 FB Setup

- **AI2 FB Setup**
  - Block Mode (Actual)
    - Block Mode.Actual
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value
  - Target Mode
    - Block Mode.Target
  - Channel
  - Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - Output Scale
    - Output Scale.EU at 100%
    - Output Scale.EU at 0%
    - Output Scale.Units Index
  - Additional Config.
    - Linearization Type
    - Low Cutoff
    - Process Value Filter Time
  - Options
    - I/O Options
    - Status Options

● AI3 FB Setup

- **AI3 FB Setup**
  - Block Mode (Actual)
    - Block Mode.Actual
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value
  - Target Mode
    - Block Mode.Target
  - Channel
  - Transducer Scale
    - Transducer Scale.Units Index
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
  - Output Scale
    - Output Scale.EU at 100%
    - Output Scale.EU at 0%
    - Output Scale.Units Index
  - Additional Config.
    - Linearization Type
    - Low Cutoff
    - Process Value Filter Time
  - Options
    - I/O Options
    - Status Options

● Display Setup Additionals

- **Display Setup Additionals**
  - Display period
  - Display startup
  - Display NE107
  - Display format flow
  - Display format temperature
  - Display format pressure
  - Option display installation

● Flow Setup Additionals

- **Flow Setup Additionals**
  - Temp./Press. Compensation Select
    - Option built-in temperature
    - Compensation type
    - Temperature select
    - Aux input select
  - Additional Selection
    - Steam type
    - Flow Navi. select
  - Density Calculation Items
    - Calculation type
    - Density unit
    - Fixed density
    - Base density
    - Fixed temperature
    - Base temperature
    - Fixed pressure
    - Base pressure
    - Dryness
    - Deviation
    - Temperature coefficient 1
    - Temperature coefficient 2
  - Energy Calculation Items
    - Enthalpy unit
    - Fixed enthalpy
    - Heat difference temp. select
    - Heat diff. conv. factor unit
    - Heat difference conv. factor
  - Monitor/Calculated Values
    - Built-in temperature
    - Calc. Temperature
    - Calc. Pressure
    - Density
    - Density ratio
    - Enthalpy
    - Delta temperature
    - Delta enthalpy

Aux Input Setup

- **Aux Input Setup**
  - Aux input select
  - Air pressure
  - Air pressure unit
  - External Temperature
    - External temperature.Status
    - External temperature.Value
  - External Pressure
    - External pressure.Status
    - External pressure.Value
  - External Density
    - External density.Status
    - External density.Value

Limit Switch Setup

- **Limit Switch Setup**
  - Limit Switch 1
    - Limit Switch 1.Status
    - Limit Switch 1.Value
  - Limit Switch 1 Configuration
    - Limit Switch 1 Target
    - Limit Switch 1 Setpoint
    - Limit Switch 1 Direction
    - Limit Switch 1 Hysteresis
    - Limit Switch 1 Unit
  - Limit Switch 2
    - Limit Switch 2.Status
    - Limit Switch 2.Value
  - Limit Switch 2 Configuration
    - Limit Switch 2 Target
    - Limit Switch 2 Setpoint
    - Limit Switch 2 Direction
    - Limit Switch 2 Hysteresis
    - Limit Switch 2 Unit

Sensor Basic Setup

- **Sensor Basic Setup**
  - Nominal size
  - Body type
  - Sensor type
  - K factor unit
  - K factor

● Adjust

- **Adjust**
  - Zero Adjust
    - Tuning at zero (M)
    - Tuning status
  - Flow rate gain
  - Instrumental Adjust
    - Instrument error adjust
    - Each Point Shifting
      - Adjust vortex frequency.1
      - Adjust vortex frequency.2
      - Adjust vortex frequency.3
      - Adjust vortex frequency.4
      - Adjust vortex frequency.5
      - Adjust vortex value.1
      - Adjust vortex value.2
      - Adjust vortex value.3
      - Adjust vortex value.4
      - Adjust vortex value.5
  - Reynolds Adjust
    - Reynolds adjust
    - Viscosity
    - Viscosity unit
    - Reynolds number
    - Density unit
    - Fixed density
    - Each Point Shifting
      - Adjust reynolds number.1
      - Adjust reynolds number.2
      - Adjust reynolds number.3
      - Adjust reynolds number.4
      - Adjust reynolds number.5
      - Reynolds adjust value.1
      - Reynolds adjust value.2
      - Reynolds adjust value.3
      - Reynolds adjust value.4
      - Reynolds adjust value.5
  - Additional Adjust
    - Expansion factor adjust
    - Built-in Temperature Adjust
      - Temperature gain
      - Temperature offset
    - Cable length

● Signal Controls

- **Signal Controls**
  - Signal Basic Items
    - Signal band
    - Signal level
    - Trigger level mode
    - Trigger level(TLA)
    - Noise balance mode
    - Noise ratio(auto)
    - Noise ratio(manual)
  - Alarm Actions
    - Flow sensor alarm action
    - Temp. sensor alarm action
  - Monitor/Calculated Values
    - Velocity
    - Velocity span
    - Velocity lowcut
    - Vortex frequency
    - Vortex frequency span
    - Vortex frequency lowcut
  - Additional Details
    - Fluctuating level
    - Transient noise count
    - High vibration action
    - High vibration time
    - Critical vibration action
    - Critical vibration level
    - Critical vibration time
    - Clogging time
    - Sensor circuit threshold
    - Sensor capacitance threshold
    - Sensor resistance threshold

● Mode Block Config.

- **Mode Block Config.**
  - Actual Mode
    - IT Block Mode (Actual)
      - Block Mode.Actual
    - MAO Block Mode (Actual)
      - Block Mode.Actual
    - DI1 Block Mode (Actual)
      - Block Mode.Actual
    - DI2 Block Mode (Actual)
      - Block Mode.Actual
    - PID Block Mode (Actual)
      - Block Mode.Actual
    - AR Block Mode (Actual)
      - Block Mode.Actual
  - Target Mode
    - IT Target Mode
      - Block Mode.Target
    - MAO Target Mode
      - Block Mode.Target
    - DI1 Target Mode
      - Block Mode.Target
    - DI2 Target Mode
      - Block Mode.Target
    - PID Target Mode
      - Block Mode.Target
    - AR Target Mode
      - Block Mode.Target
  - Permitted Mode
    - IT Permitted Mode
      - Block Mode.Permitted
    - MAO Permitted Mode
      - Block Mode.Permitted
    - DI1 Permitted Mode
      - Block Mode.Permitted
    - DI2 Permitted Mode
      - Block Mode.Permitted
    - PID Permitted Mode
      - Block Mode.Permitted
    - AR Permitted Mode
      - Block Mode.Permitted
  - Normal Mode
    - IT Normal Mode
      - Block Mode.Normal
    - MAO Normal Mode
      - Block Mode.Normal
    - DI1 Normal Mode
      - Block Mode.Normal
    - DI2 Normal Mode
      - Block Mode.Normal
    - PID Normal Mode
      - Block Mode.Normal
    - AR Normal Mode
      - Block Mode.Normal

MAO FB Setup

- **MAO FB Setup**
  - Actual State
    - Block Mode (Actual)
      - Block Mode.Actual
    - IN_1
      - Input 1.Status
      - Input 1.Value
    - IN_2
      - Input 2.Status
      - Input 2.Value
    - IN_3
      - Input 3.Status
      - Input 3.Value
  - Config. Items
    - Target Mode
      - Block Mode.Target
    - Channel
    - Failstate Config.
      - Fault State Time
      - Fault State Val1
      - Fault State Val2
      - Fault State Val3
      - Fault State Status
    - Options
      - Mo Options

DI1 FB Setup

- **DI1 FB Setup**
  - Block Mode (Actual)
    - Block Mode.Actual
  - Transferred Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value
  - Field Value (after XD State)
    - Field Value Discrete.Status
    - Field Value Discrete.Value
  - PV_D
    - Process Value Discrete.Status
    - Process Value Discrete.Value
  - OUT_D
    - Output Discrete.Status
    - Output Discrete.Value
  - Target Mode
    - Block Mode.Target
  - Channel
  - On/Off State Handling
    - Transducer State
    - Output State
  - Additional Config.
    - Process Value Filter Time
  - Options
    - I/O Options
    - Status Options

● DI2 FB Setup

- **DI2 FB Setup**
  - Block Mode (Actual)
    - Block Mode.Actual
  - Transferred Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value
  - Field Value (after XD State)
    - Field Value Discrete.Status
    - Field Value Discrete.Value
  - PV_D
    - Process Value Discrete.Status
    - Process Value Discrete.Value
  - OUT_D
    - Output Discrete.Status
    - Output Discrete.Value
  - Target Mode
    - Block Mode.Target
  - Channel
  - On/Off State Handling
    - Transducer State
    - Output State
  - Additional Config.
    - Process Value Filter Time
  - Options
    - I/O Options
    - Status Options

Order Information

Order Information	
	Model
	Distributor name
	Device ID
	Sensor MS code 1
	Sensor MS code 2
	Sensor MS code 3
	Sensor MS code 4
	Sensor MS code 5
	Sensor MS code 6
	Sensor style code
	Transmitter MS code 1
	Transmitter MS code 2
	Transmitter MS code 3
	Transmitter MS code 4
	Transmitter MS code 5
	Transmitter MS code 6
	Transmitter style code
	Special order number 1
	Special order number 2
	Sizing number
	Name plate tag number
	Instruction manual number
	Manufact. date
	Connection type
	Process temperature
	Max pressure
	Communication select
	SI Control Codes
	Option display installation
	Option built-in temperature
	Option dual bolt calibration
	Option cryogenic
	Option built-in verification
	Prediction function
	Option bwc

Version/Number information

Version/Number information	
	Manufacturer Id
	Device Type
	Device Revision
	DD Revision
	ITK Version
	Compatibility Revision
	Capability Level
	Software Revision
	Software Description
	Sensor S/N
	Transmitter S/N
	Hardware revision

Memos

Memos	
	Memo 1
	Memo 2
	Memo 3

Process Variables(FDI)

- **Process Variables**
  - Dynamic Variables
    - AI1 FB →Page 204
    - STB to AIFB →Page 204
    - AI2 FB →Page 205
    - AI3 FB →Page 205
    - Sensor Variables →Page 206
  - Additional Variables
    - MAO FB to STB →Page 206
    - DI1 FB →Page 207
    - DI2 FB →Page 207
    - STB to DIFB →Page 207

● AI1 FB

- **AI1 FB**
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value

● STB to AIFB

- **STB to AIFB**
  - Flow
    - Primary Value.Status
    - Primary Value.Value
  - Temperature
    - Secondary Value.Status
    - Secondary Value.Value
  - Totalizer
    - Totalizer.Status
    - Totalizer.Value
  - AI1 Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - AI2 Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - AI3 Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value

● AI2 FB

- **AI2 FB**
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value

● AI3 FB

- **AI3 FB**
  - Transducer Value
    - Simulate.Transducer Status
    - Simulate.Transducer Value
  - FIELD_VAL (after XD Scale)
    - Field Value.Status
    - Field Value.Value
  - PV
    - Process Value.Status
    - Process Value.Value
  - OUT
    - Output.Status
    - Output.Value

Sensor Variables

- **Sensor Variables**
  - Flow
    - Primary Value.Status
    - Primary Value.Value
  - Temperature
    - Secondary Value.Status
    - Secondary Value.Value
  - Total
    - Totalizer.Status
    - Totalizer.Value
  - Sensing Data
    - Vortex frequency
    - Velocity
    - Calc. Temperature
    - Calc. Pressure
    - Built-in temperature
    - Sensor Board temperature

MAO FB to STB

- **MAO FB to STB**
  - IN_1
    - Input 1.Status
    - Input 1.Value
  - IN_2
    - Input 2.Status
    - Input 2.Value
  - IN_3
    - Input 3.Status
    - Input 3.Value
  - External Temperature
    - External temperature.Status
    - External temperature.Value
  - External Pressure
    - External pressure.Status
    - External pressure.Value
  - External Density
    - External density.Status
    - External density.Value
  - Aux input select

● DI1 FB

- **DI1 FB**
  - Transducer Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value
  - FIELD_VAL_D (after XD State)
    - Field Value Discrete.Status
    - Field Value Discrete.Value
  - PV_D
    - Process Value Discrete.Status
    - Process Value Discrete.Value
  - OUT_D
    - Output Discrete.Status
    - Output Discrete.Value

● DI2 FB

- **DI2 FB**
  - Transducer Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value
  - FIELD_VAL_D (after XD State)
    - Field Value Discrete.Status
    - Field Value Discrete.Value
  - PV_D
    - Process Value Discrete.Status
    - Process Value Discrete.Value
  - OUT_D
    - Output Discrete.Status
    - Output Discrete.Value

● STB to DIFB

- **STB to DIFB**
  - Limit Switch 1
    - Limit Switch 1.Status
    - Limit Switch 1.Value
  - Limit Switch 2
    - Limit Switch 2.Status
    - Limit Switch 2.Value
  - DI1 Transducer Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value
  - DI2 Transducer Value
    - Simulate Discrete.Transducer Status
    - Simulate Discrete.Transducer Value

■ Diagnostic(FDI)

- **Diagnostics**
  - Device Status w/ Field Diagnostics
    - Each Block Status →Page 209
    - FD Active Info →Page 210
    - FD Extended Status →Page 210
    - FD Configuration →Page 211
  - Alarm & Prediction Config.
    - Alarm Select →Page 212
    - Prediction Setup →Page 212
  - Alarm Records
    - Alarm Record Setup →Page 213
    - Alarm Records →Page 213
  - RB & TB Alerts
    - RB Alerts →Page 214
    - Block Alerts (STB) →Page 215
    - Block Alerts (LTB) →Page 215
    - Block Alerts (MTB) →Page 215
  - FB Alerts
    - Block Alerts (AI1) →Page 216
    - Block Alerts (AI2) →Page 217
    - Block Alerts (AI3) →Page 218
    - Block Alerts (MAO) →Page 219
    - Block Alerts (DI1) →Page 219
    - Block Alerts (DI2) →Page 220
  - Service
    - Access Control →Page 221
    - Simulation →Page 221
    - Verification Execution →Page 222
    - Sensor Signal →Page 222
    - Display Indication →Page 222
    - Block Mode (RB, TB, AIFB) →Page 223
    - Mode Block (Additional) →Page 224

Each Block Status

- **Each Block Status**
  - RB Block Error
    - Block Error
  - AI1 FB Block Error
    - Block Error
    - Block Error Description
  - AI2 FB Block Error
    - Block Error
    - Block Error Description
  - AI3 FB Block Error
    - Block Error
    - Block Error Description
  - STB Block Error
    - Block Error
    - Block Error Description
    - Transducer Error
  - LTB Block Error
    - Block Error
    - Transducer Error
  - MTB Block Error
    - Block Error
    - Transducer Error
  - IT FB Block Error
    - Block Error
  - MAO FB Block Error
    - Block Error
  - DI1 FB Block Error
    - Block Error
  - DI2 FB Block Error
    - Block Error
  - PID FB Block Error
    - Block Error
  - AR FB Block Error
    - Block Error

FD Active Info

- **FD Active Info**
  - Field Diagnostics Simulate.Diagnostic Simulate Value
  - Recommended Action
  - Device Condition Active
    - Device Condition Active 1
    - Device Condition Active 2
    - Device Condition Active 3
    - Device Condition Active 4
    - Device Condition Active 5
    - Device Condition Active 6
    - Device Condition Active 7
    - Device Condition Active 8
  - Field Diagnostic Simulate
    - Field Diagnostics Simulate.Diagnostic Simulate Value
    - Field Diagnostics Simulate.Diagnostic Value
    - Field Diagnostics Simulate.Simulate En/Disable
  - Field Diagnostic Version
    - Field Diagnostics Revision

FD Extended Status

- **FD Extended Status**
  - FD Extended Active
    - FD Extended Active 1
    - FD Extended Active 2
    - FD Extended Active 3
    - FD Extended Active 4
    - FD Extended Active 5
    - FD Extended Active 6
    - FD Extended Active 7
    - FD Extended Active 8
  - FD Extended Map
    - FD Extended Map 1
    - FD Extended Map 2
    - FD Extended Map 3
    - FD Extended Map 4
    - FD Extended Map 5
    - FD Extended Map 6
    - FD Extended Map 7
    - FD Extended Map 8

● FD Configuration

- **FD Configuration**
  - Fail Diagnostic Alarm
    - Failed Alarm.Unacknowledged
    - Failed Alarm.Alarm State
    - Failed Alarm.Time Stamp
    - Failed Alarm.Subcode
    - Failed Alarm.Value
    - Fail Alarm Setting
      - Failed Map
      - Failed Mask
      - Failed Priority
  - Offspec Alarm
    - Off Specification Alarm.Unacknowledged
    - Off Specification Alarm.Alarm State
    - Off Specification Alarm.Time Stamp
    - Off Specification Alarm.Subcode
    - Off Specification Alarm.Value
    - Offspec Alarm Setting
      - Off Specification Map
      - Off Specification Mask
      - Off Specification Priority
  - Check Alarm
    - Check Function Alarm.Unacknowledged
    - Check Function Alarm.Alarm State
    - Check Function Alarm.Time Stamp
    - Check Function Alarm.Subcode
    - Check Function Alarm.Value
    - Check Alarm Setting
      - Check Function Map
      - Check Function Mask
      - Check Function Priority
  - Maintenance Alarm
    - Maintenance Alarm.Unacknowledged
    - Maintenance Alarm.Alarm State
    - Maintenance Alarm.Time Stamp
    - Maintenance Alarm.Subcode
    - Maintenance Alarm.Value
    - Maintenance Alarm Setting
      - Maintenance Map
      - Maintenance Mask
      - Maintenance Priority

● Alarm Select

Alarm Select		
	Alarm status select	
	Current Detected Alarms	
		System alarm 1
		System alarm 2
		Process alarm 1
		Process alarm 2
		Setting alarm 1
		Setting alarm 2
		Warning 1
		Warning 2

● Prediction Setup

Prediction Setup	
	Prediction function
	Prediction execution
	Prediction select
	Prediction period
	Prediction start date
	Prediction stop date
	Prediction level
	Prediction alarm time
	Prediction estimate time
	Prediction result
	Prediction type

Alarm Record Setup

- **Alarm Record Setup**
  - Alarm record select
  - Alarm record clear (M)
  - Auto delete time

Alarm Records

- **Alarm Records**
  - Alarm record 1 (Oldest)
    - Alarm record 1
    - Alarm record date 1
    - Alarm record operation time 1
  - Alarm record 2
    - Alarm record 2
    - Alarm record date 2
    - Alarm record operation time 2
  - Alarm record 3
    - Alarm record 3
    - Alarm record date 3
    - Alarm record operation time 3
  - Alarm record 4
    - Alarm record 4
    - Alarm record date 4
    - Alarm record operation time 4
  - Alarm record 5
    - Alarm record 5
    - Alarm record date 5
    - Alarm record operation time 5
  - Recent alarm 1 (Latest)
    - Recent alarm 1
    - Recent alarm date 1
    - Recent alarm operation time 1
  - Recent alarm 2
    - Recent alarm 2
    - Recent alarm date 2
    - Recent alarm operation time 2
  - Recent alarm 3
    - Recent alarm 3
    - Recent alarm date 3
    - Recent alarm operation time 3
  - Recent alarm 4
    - Recent alarm 4
    - Recent alarm date 4
    - Recent alarm operation time 4
  - Recent alarm 5
    - Recent alarm 5
    - Recent alarm date 5
    - Recent alarm operation time 5

● RB Alerts

- **RB Alerts**
  - Errors and Alarms
    - Block Error
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - Write Alarm
      - Write Alarm.Unacknowledged
      - Write Alarm.Alarm State
      - Write Alarm.Time Stamp
      - Write Alarm.Subcode
      - Write Alarm.Discrete Value
  - Alert Config.
    - Acknowledge Option
    - Write Priority
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

● Block Alerts (STB)

- **Block Alerts (STB)**
  - Block Error
  - Block Error Description
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

● Block Alerts (LTB)

- **Block Alerts (LTB)**
  - Block Error
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

● Block Alerts (MTB)

- **Block Alerts (MTB)**
  - Block Error
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

Block Alerts (AI1)

- **Block Alerts (AI1)**
  - Errors and Alarms
    - Block Error
    - Block Error Description
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - High High Alarm
      - High High Alarm.Unacknowledged
      - High High Alarm.Alarm State
      - High High Alarm.Time Stamp
      - High High Alarm.Subcode
      - High High Alarm.Float Value
    - High Alarm
      - High Alarm.Unacknowledged
      - High Alarm.Alarm State
      - High Alarm.Time Stamp
      - High Alarm.Subcode
      - High Alarm.Float Value
    - Low Alarm
      - Low Alarm.Unacknowledged
      - Low Alarm.Alarm State
      - Low Alarm.Time Stamp
      - Low Alarm.Subcode
      - Low Alarm.Float Value
    - Low Low Alarm
      - Low Low Alarm.Unacknowledged
      - Low Low Alarm.Alarm State
      - Low Low Alarm.Time Stamp
      - Low Low Alarm.Subcode
      - Low Low Alarm.Float Value
  - Alert Config.
    - Acknowledge Option
    - Alarm Hysteresis
    - Priority/Limits
      - High High Priority
      - High High Limit
      - High Priority
      - High Limit
      - Low Priority
      - Low Limit
      - Low Low Priority
      - Low Low Limit
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

● Block Alerts (AI2)

- **Block Alerts (AI2)**
  - Errors and Alarms
    - Block Error
    - Block Error Description
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - High High Alarm
      - High High Alarm.Unacknowledged
      - High High Alarm.Alarm State
      - High High Alarm.Time Stamp
      - High High Alarm.Subcode
      - High High Alarm.Float Value
    - High Alarm
      - High Alarm.Unacknowledged
      - High Alarm.Alarm State
      - High Alarm.Time Stamp
      - High Alarm.Subcode
      - High Alarm.Float Value
    - Low Alarm
      - Low Alarm.Unacknowledged
      - Low Alarm.Alarm State
      - Low Alarm.Time Stamp
      - Low Alarm.Subcode
      - Low Alarm.Float Value
    - Low Low Alarm
      - Low Low Alarm.Unacknowledged
      - Low Low Alarm.Alarm State
      - Low Low Alarm.Time Stamp
      - Low Low Alarm.Subcode
      - Low Low Alarm.Float Value
  - Alert Config.
    - Acknowledge Option
    - Alarm Hysteresis
    - Priority/Limits
      - High High Priority
      - High High Limit
      - High Priority
      - High Limit
      - Low Priority
      - Low Limit
      - Low Low Priority
      - Low Low Limit
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

● Block Alerts (AI3)

- **Block Alerts (AI3)**
  - Errors and Alarms
    - Block Error
    - Block Error Description
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - High High Alarm
      - High High Alarm.Unacknowledged
      - High High Alarm.Alarm State
      - High High Alarm.Time Stamp
      - High High Alarm.Subcode
      - High High Alarm.Float Value
    - High Alarm
      - High Alarm.Unacknowledged
      - High Alarm.Alarm State
      - High Alarm.Time Stamp
      - High Alarm.Subcode
      - High Alarm.Float Value
    - Low Alarm
      - Low Alarm.Unacknowledged
      - Low Alarm.Alarm State
      - Low Alarm.Time Stamp
      - Low Alarm.Subcode
      - Low Alarm.Float Value
    - Low Low Alarm
      - Low Low Alarm.Unacknowledged
      - Low Low Alarm.Alarm State
      - Low Low Alarm.Time Stamp
      - Low Low Alarm.Subcode
      - Low Low Alarm.Float Value
  - Alert Config.
    - Acknowledge Option
    - Alarm Hysteresis
    - Priority/Limits
      - High High Priority
      - High High Limit
      - High Priority
      - High Limit
      - Low Priority
      - Low Limit
      - Low Low Priority
      - Low Low Limit
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

Block Alerts (MAO)

- **Block Alerts (MAO)**
  - Block Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

Block Alerts (DI1)

- **Block Alerts (DI1)**
  - Errors and Alarms
    - Block Error
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - Disc. Alarm
      - Discrete Alarm.Unacknowledged
      - Discrete Alarm.Alarm State
      - Discrete Alarm.Time Stamp
      - Discrete Alarm.Subcode
      - Discrete Alarm.Discrete Value
  - Alert Config.
    - Acknowledge Option
    - Discrete Priority
    - Discrete Limit
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

● Block Alerts (DI2)

- **Block Alerts (DI2)**
  - Errors and Alarms
    - Block Error
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - Disc. Alarm
      - Discrete Alarm.Unacknowledged
      - Discrete Alarm.Alarm State
      - Discrete Alarm.Time Stamp
      - Discrete Alarm.Subcode
      - Discrete Alarm.Discrete Value
  - Alert Config.
    - Acknowledge Option
    - Discrete Priority
    - Discrete Limit
    - Alarm Summary
      - Alarm Summary.Current
      - Alarm Summary.Unacknowledged
      - Alarm Summary.Unreported
      - Alarm Summary.Disabled

Access Control

- **Access Control**
  - Write Lock Control
    - Write Lock
    - Feature Selection
    - Write Lock Level

Simulation

- **Simulation**
  - SIM Enable Message
  - Analog Input 1
    - Simulation Enable (M)
    - Simulation Disable (M)
  - Analog Input 2
    - Simulation Enable (M)
    - Simulation Disable (M)
  - Analog Input 3
    - Simulation Enable (M)
    - Simulation Disable (M)
  - TB Simulation
    - Simulation mode
    - Simulation vortex frequency
    - Simulation vortex frequency(HW)
    - Simulation built-in temperature
    - Auto release time

Verification Execution

Verification Execution		
	Verification Exe	(M)
	Verification target	
	Verification status	
	Verification select switch	
	Verification date/time	
	Verification operation time	
	Verification result	
	Sensor circuit result	
	Signal circuit result	
	Calculation circuit result	
	Alarm status result	
	Alarm record result	
	Option built-in verification	

Sensor Signal

Sensor Signal		
	Signal latch execution	(M)
	Signal latch target	
	Signal latch alarm	
	Signal latch date	
	Signal latch operation time	
	Signal latch vortex frequency	
	Signal latch velocity	
	Signal latch max band	
	Signal latch noise ratio	
	Signal latch noise band 1	
	Signal latch noise band 2	
	Signal latch TLA	
	Signal latch basic band	

Display Indication

Display Indication		
	Display test	
	Squawk	(M)
	Option display installation	

Block Mode (RB, TB, AIFB)

- **Block Mode (RB, TB, AIFB)**
  - Actual Mode
    - RB Block Mode (Actual)
      - Block Mode.Actual
    - STB Block Mode (Actual)
      - Block Mode.Actual
    - LTB Block Mode (Actual)
      - Block Mode.Actual
    - MTB Block Mode (Actual)
      - Block Mode.Actual
    - AI1 Block Mode (Actual)
      - Block Mode.Actual
    - AI2 Block Mode (Actual)
      - Block Mode.Actual
    - AI3 Block Mode (Actual)
      - Block Mode.Actual
  - Target Mode
    - RB Target Mode
      - Block Mode.Target
    - STB Target Mode
      - Block Mode.Target
    - LTB Target Mode
      - Block Mode.Target
    - MTB Target Mode
      - Block Mode.Target
    - AI1 Target Mode
      - Block Mode.Target
    - AI2 Target Mode
      - Block Mode.Target
    - AI3 Target Mode
      - Block Mode.Target
  - Permitted Mode
    - RB Permitted Mode
      - Block Mode.Permitted
    - STB Permitted Mode
      - Block Mode.Permitted
    - LTB Permitted Mode
      - Block Mode.Permitted
    - MTB Permitted Mode
      - Block Mode.Permitted
    - AI1 Permitted Mode
      - Block Mode.Permitted
    - AI2 Permitted Mode
      - Block Mode.Permitted
    - AI3 Permitted Mode
      - Block Mode.Permitted
  - Normal Mode
    - RB Normal Mode
      - Block Mode.Normal
    - STB Normal Mode
      - Block Mode.Normal
    - LTB Normal Mode
      - Block Mode.Normal
    - MTB Normal Mode
      - Block Mode.Normal
    - AI1 Normal Mode
      - Block Mode.Normal
    - AI2 Normal Mode
      - Block Mode.Normal
    - AI3 Normal Mode
      - Block Mode.Normal

● Mode Block (Additional)

- **Mode Block (Additional)**
  - Actual Mode
    - IT Block Mode (Actual)
      - Block Mode.Actual
    - MAO Block Mode (Actual)
      - Block Mode.Actual
    - DI1 Block Mode (Actual)
      - Block Mode.Actual
    - DI2 Block Mode (Actual)
      - Block Mode.Actual
    - PID Block Mode (Actual)
      - Block Mode.Actual
    - AR Block Mode (Actual)
      - Block Mode.Actual
  - Target Mode
    - IT Target Mode
      - Block Mode.Target
    - MAO Target Mode
      - Block Mode.Target
    - DI1 Target Mode
      - Block Mode.Target
    - DI2 Target Mode
      - Block Mode.Target
    - PID Target Mode
      - Block Mode.Target
    - AR Target Mode
      - Block Mode.Target
  - Permitted Mode
    - IT Permitted Mode
      - Block Mode.Permitted
    - MAO Permitted Mode
      - Block Mode.Permitted
    - DI1 Permitted Mode
      - Block Mode.Permitted
    - DI2 Permitted Mode
      - Block Mode.Permitted
    - PID Permitted Mode
      - Block Mode.Permitted
    - AR Permitted Mode
      - Block Mode.Permitted
  - Normal Mode
    - IT Normal Mode
      - Block Mode.Normal
    - MAO Normal Mode
      - Block Mode.Normal
    - DI1 Normal Mode
      - Block Mode.Normal
    - DI2 Normal Mode
      - Block Mode.Normal
    - PID Normal Mode
      - Block Mode.Normal
    - AR Normal Mode
      - Block Mode.Normal

Maintenance(FDI)

- **Maintenance**
  - Maintenance Items
    - Access Control & Block Mode →Page 226
    - Maintenance Information →Page 229
  - Query Device
    - Resource Block
    - Sensor Transducer Block
    - LCD Indicator Transducer Block
    - Maintenance Transducer Block
    - Analog Input 1 Function Block
    - Analog Input 2 Function Block
    - Analog Input 3 Function Block
    - Integrator 1 Function Block
    - Multiple Analog Output Function Block
    - Discrete Input 1 Function Block
    - Discrete Input 2 Function Block
    - PID Function Block
    - Arithmetic Function Block

● Access Control & Block Mode

- **Access Control & Block Mode**
  - Access Control
    - Write Lock Control
      - Write Lock
      - Feature Selection
      - Write Lock Level
  - Block Mode (RB, TB, AIFB)
    - Actual Mode
      - RB Block Mode (Actual)
        - Block Mode.Actual
      - STB Block Mode (Actual)
        - Block Mode.Actual
      - LTB Block Mode (Actual)
        - Block Mode.Actual
      - MTB Block Mode (Actual)
        - Block Mode.Actual
      - AI1 Block Mode (Actual)
        - Block Mode.Actual
      - AI2 Block Mode (Actual)
        - Block Mode.Actual
      - AI3 Block Mode (Actual)
        - Block Mode.Actual
    - Target Mode
      - RB Target Mode
        - Block Mode.Target
      - STB Target Mode
        - Block Mode.Target
      - LTB Target Mode
        - Block Mode.Target
      - MTB Target Mode
        - Block Mode.Target
      - AI1 Target Mode
        - Block Mode.Target
      - AI2 Target Mode
        - Block Mode.Target
      - AI3 Target Mode
        - Block Mode.Target

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- Permitted Mode
  - RB Permitted Mode
    - Block Mode.Permitted
  - STB Permitted Mode
    - Block Mode.Permitted
  - LTB Permitted Mode
    - Block Mode.Permitted
  - MTB Permitted Mode
    - Block Mode.Permitted
  - AI1 Permitted Mode
    - Block Mode.Permitted
  - AI2 Permitted Mode
    - Block Mode.Permitted
  - AI3 Permitted Mode
    - Block Mode.Permitted
- Normal Mode
  - RB Normal Mode
    - Block Mode.Normal
  - STB Normal Mode
    - Block Mode.Normal
  - LTB Normal Mode
    - Block Mode.Normal
  - MTB Normal Mode
    - Block Mode.Normal
  - AI1 Normal Mode
    - Block Mode.Normal
  - AI2 Normal Mode
    - Block Mode.Normal
  - AI3 Normal Mode
    - Block Mode.Normal

- Block Mode (Additional)
  - Actual Mode
    - IT Block Mode (Actual)
      - Block Mode.Actual
    - MAO Block Mode (Actual)
      - Block Mode.Actual
    - DI1 Block Mode (Actual)
      - Block Mode.Actual
    - DI2 Block Mode (Actual)
      - Block Mode.Actual
    - PID Block Mode (Actual)
      - Block Mode.Actual
    - AR Block Mode (Actual)
      - Block Mode.Actual

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- Target Mode
  - IT Target Mode
    - Block Mode.Target
  - MAO Target Mode
    - Block Mode.Target
  - DI1 Target Mode
    - Block Mode.Target
  - DI2 Target Mode
    - Block Mode.Target
  - PID Target Mode
    - Block Mode.Target
  - AR Target Mode
    - Block Mode.Target
- Permitted Mode
  - IT Permitted Mode
    - Block Mode.Permitted
  - MAO Permitted Mode
    - Block Mode.Permitted
  - DI1 Permitted Mode
    - Block Mode.Permitted
  - DI2 Permitted Mode
    - Block Mode.Permitted
  - PID Permitted Mode
    - Block Mode.Permitted
  - AR Permitted Mode
    - Block Mode.Permitted
- Normal Mode
  - IT Normal Mode
    - Block Mode.Normal
  - MAO Normal Mode
    - Block Mode.Normal
  - DI1 Normal Mode
    - Block Mode.Normal
  - DI2 Normal Mode
    - Block Mode.Normal
  - PID Normal Mode
    - Block Mode.Normal
  - AR Normal Mode
    - Block Mode.Normal

● Maintenance Information

- **Maintenance Information**
  - Operation time
  - Current date/time
  - Sensor Backup/Restore
    - Sensor backup/restore (M)
    - Sensor backup/restore result
  - Software Description
  - Software Download
    - Soft DL Protect
    - Soft DL Error
    - Soft DL Count
    - Soft DL Act Area
  - Sensor Calibration
    - Sensor Calibration method
    - Sensor Calibration Location
    - Sensor Calibration Date
    - Sensor Calibration Who

■ RB

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Confirm Time
    - Write Lock Info
      - Write Lock
      - Write Lock Level
    - Feature Info
      - Features
      - Feature Selection
    - Cycle Info
      - Cycle Type
      - Cycle Selection
      - Minimum Cycle Time
    - Notify Info
      - Max Notify
      - Limit Notify
    - Sheding
      - Shed Remote Cascade
      - Shed Remote Out
  - Device Info
    - Hardware Info
      - Hard Types
      - Memory Size
      - Nonvolatile Cycle Time
      - Free Space
      - Free Time
    - Identification
      - Manufacturer Id
      - Device Type
      - Device Revision
      - DD Revision
      - Compatibility Revision
      - Capability Level
      - ITK Version
      - Software Revision
  - Query Device
    - RB Standard Parameters
    - RB Enhanced Parameters

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Field Diagnostics →Page 232
    - Block Alerts →Page 233
  - Service
    - Restart
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny
  - Others
    - Resource State
      - Resource State
    - Failsafe State
      - Fault State
      - Set Fault State
      - Clear Fault State

● Field Diagnostics

- **Field Diagnostics**
  - FD Active Info
    - Field Diagnostics Simulate. Diagnostic Simulate Value
    - Recommended Action
    - Device Condition Active
      - Device Condition Active 1
      - Device Condition Active 2
      - Device Condition Active 3
      - Device Condition Active 4
      - Device Condition Active 5
      - Device Condition Active 6
      - Device Condition Active 7
      - Device Condition Active 8
  - Field Diagnostic Simulate
    - Field Diagnostics Simulate. Diagnostic Simulate Value
    - Field Diagnostics Simulate. Diagnostic Value
    - Field Diagnostics Simulate. Simulate En/Disable
  - Field Diagnostics Info
    - Field Diagnostics Revision
  - FD Extended Status
    - FD Extended Active
      - FD Extended Active 1
      - FD Extended Active 2
      - FD Extended Active 3
      - FD Extended Active 4
      - FD Extended Active 5
      - FD Extended Active 6
      - FD Extended Active 7
      - FD Extended Active 8
    - FD Extended Map
      - FD Extended Map 1
      - FD Extended Map 2
      - FD Extended Map 3
      - FD Extended Map 4
      - FD Extended Map 5
      - FD Extended Map 6
      - FD Extended Map 7
      - FD Extended Map 8
  - Alarm and Setting
    - Fail Diagnostic Alarm
      - Failed Alarm.Unacknowledged
      - Failed Alarm.Alarm State
      - Failed Alarm.Time Stamp
      - Failed Alarm.Subcode
      - Failed Alarm.Value
      - Failed Active
      - Fail Alarm Setting
        - Failed Map
        - Failed Mask
        - Failed Priority
    - Offspec Alarm
      - Off Specification Alarm. Unacknowledged
      - Off Specification Alarm.Alarm State
      - Off Specification Alarm.Time Stamp
      - Off Specification Alarm.Subcode
      - Off Specification Alarm.Value
      - Off Specification Active
      - Offspec Alarm Setting
        - Off Specification Map
        - Off Specification Mask
        - Off Specification Priority

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- Maintenance Alarm
  - Maintenance Alarm. Unacknowledged
  - Maintenance Alarm.Alarm State
  - Maintenance Alarm.Time Stamp
  - Maintenance Alarm.Subcode
  - Maintenance Alarm.Value
  - Maintenance Active
  - Maintenance Alarm Setting
    - Maintenance Map
    - Maintenance Mask
    - Maintenance Priority
- Check Alarm
  - Check Function Alarm. Unacknowledged
  - Check Function Alarm.Alarm State
  - Check Function Alarm.Time Stamp
  - Check Function Alarm.Subcode
  - Check Function Alarm.Value
  - Check Function Active
  - Check Alarm Setting
    - Check Function Map
    - Check Function Mask
    - Check Function Priority

● Block Alerts

- **Block Alerts**
  - Block Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Alarm Summary
    - Alarm Summary.Current
    - Alarm Summary.Unacknowledged
    - Alarm Summary.Unreported
    - Alarm Summary.Disabled
  - Acknowledge Option
  - Write Priority
  - Write Alarm
    - Write Alarm.Unacknowledged
    - Write Alarm.Alarm State
    - Write Alarm.Time Stamp
    - Write Alarm.Subcode
    - Write Alarm.Discrete Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev
    - Update Event.Relative Index

■ STB

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode.Target
    - Block Mode.Actual
    - Block Mode.Permitted
    - Block Mode.Normal
  - Configuration
    - Application Setup
      - Fluid type
      - Flow select
      - Flow Calculation Setup (M)
    - Flow rate setup →Page 236
    - Temperature setup →Page 236
    - Pressure setup →Page 236
    - Totalizer setup
      - Totalizer unit
      - Totalizer start/stop
      - Totalizer reset/preset (M)
      - Totalizer preset value
      - Totalizer rate
      - Totalizer rate unit
      - Totalizer reset mode
    - Flow Setup Additionals →Page 237
    - Aux Input Setup
      - Aux input select
      - Air pressure
      - Air pressure unit
    - Limit Switch Setup →Page 238
    - Sensor Basic Setup
      - Nominal size
      - Body type
      - Sensor type
      - K factor unit
      - K factor
  - Calibration
    - Adjust →Page 239
    - Additional Adjust →Page 240
    - Calibration Information
      - Sensor Calibration method
      - Sensor Calibration Location
      - Sensor Calibration Date
      - Sensor Calibration Who
    - Signal Controls →Page 240
  - Query Device

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- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alerts →Page 241
  - Service
    - Simulation →Page 241

- **Process Variables**
  - Dynamic Variables
    - Device Variables →Page 242

● Flow rate setup

- **Flow rate setup**
  - Flow unit & scale
    - Primary Value Range.Units Index
    - Primary Value Range.EU at 100%
    - Primary Value Range.EU at 0%
  - Sensor Range
    - Sensor Range.Units Index
    - Sensor Range.EU at 100%
    - Sensor Range.EU at 0%
  - Flow span
  - Flow zero
  - Flow damping
  - Flow lowcut
  - Lowcut limit

● Temperature setup

- **Temperature setup**
  - Temperature unit & scale
    - Temperature Unit
    - Temperature URV
    - Temperature LRV
  - Temperature damping

● Pressure setup

- **Pressure setup**
  - Pressure unit & scale
    - Pressure unit
    - Pressure URV
    - Pressure LRV

● Flow Setup Additionals

- **Flow Setup Additionals**
  - Temp./Press. Compensation Select
    - Option built-in temperature
    - Compensation type
    - Temperature select
    - Pressure select
    - Aux input select
  - Additional Selection
    - Steam type
    - Flow Navi. select
  - Density Calculation Items
    - Calculation type
    - Density unit
    - Fixed density
    - Base density
    - Fixed temperature
    - Base temperature
    - Fixed pressure
    - Base pressure
    - Dryness
    - Deviation
    - Temperature coefficient 1
    - Temperature coefficient 2
  - Energy Calculation Items
    - Enthalpy unit
    - Fixed enthalpy
    - Heat difference temp. select
    - Heat diff. conv. factor unit
    - Heat difference conv. factor
  - Monitor/Calculated Values
    - Built-in temperature
    - Calc. Temperature
    - Calc. Pressure
    - Density
    - Density ratio
    - Enthalpy
    - Delta temperature
    - Delta enthalpy

Limit Switch Setup

- **Limit Switch Setup**
  - Limit Switch 1
    - Limit Switch 1.Status
    - Limit Switch 1.Value
  - Limit Switch 1 Configuration
    - Limit Switch 1 Target
    - Limit Switch 1 Setpoint
    - Limit Switch 1 Direction
    - Limit Switch 1 Hysteresis
    - Limit Switch 1 Unit
  - Limit Switch 2
    - Limit Switch 2.Status
    - Limit Switch 2.Value
  - Limit Switch 2 Configuration
    - Limit Switch 2 Target
    - Limit Switch 2 Setpoint
    - Limit Switch 2 Direction
    - Limit Switch 2 Hysteresis
    - Limit Switch 2 Unit

Adjust

- **Adjust**
  - Zero Adjust
    - Tuning at zero (M)
    - Tuning status
  - Flow rate gain
  - Instrumental Adjust
    - Instrument error adjust
    - Each Point Shifting
      - Adjust vortex frequency.1
      - Adjust vortex frequency.2
      - Adjust vortex frequency.3
      - Adjust vortex frequency.4
      - Adjust vortex frequency.5
      - Adjust vortex value.1
      - Adjust vortex value.2
      - Adjust vortex value.3
      - Adjust vortex value.4
      - Adjust vortex value.5
  - Reynolds Adjust
    - Reynolds adjust
    - Viscosity
    - Viscosity unit
    - Reynolds number
    - Density unit
    - Fixed density
    - Each Point Shifting
      - Adjust reynolds number.1
      - Adjust reynolds number.2
      - Adjust reynolds number.3
      - Adjust reynolds number.4
      - Adjust reynolds number.5
      - Reynolds adjust value.1
      - Reynolds adjust value.2
      - Reynolds adjust value.3
      - Reynolds adjust value.4
      - Reynolds adjust value.5

Additional Adjust

- **Additional Adjust**
  - Expansion factor adjust
  - Built-in Temperature Adjust
    - Temperature gain
    - Temperature offset
  - Cable length

Signal Controls

- **Signal Controls**
  - Signal Basic Items
    - Signal band
    - Signal level
    - Trigger level mode
    - Trigger level(TLA)
    - Noise balance mode
    - Noise ratio(auto)
    - Noise ratio(manual)
  - Alarm Actions
    - Flow sensor alarm action
    - Temp. sensor alarm action
  - Monitor/Calculated Values
    - Velocity
    - Velocity span
    - Velocity lowcut
    - Vortex frequency
    - Vortex frequency span
    - Vortex frequency lowcut
  - Additional Details
    - Fluctuating level
    - Transient noise count
    - High vibration action
    - High vibration time
    - Critical vibration action
    - Critical vibration level
    - Critical vibration time
    - Clogging time
    - Sensor circuit threshold
    - Sensor capacitance threshold
    - Sensor resistance threshold

Alerts

- **Alerts**
  - Block Error
  - Block Error Description
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

Simulation

- **Simulation**
  - SIM Enable Message
  - TB Simulation
    - Simulation mode
    - Simulation vortex frequency
    - Simulation vortex frequency(HW)
    - Simulation built-in temperature
    - Auto release time

● Device Variables

- **Device Variables**
  - Flow
    - Primary Value.Status
    - Primary Value.Value
  - Temperature
    - Secondary Value.Status
    - Secondary Value.Value
  - Totalizer
    - Totalizer.Status
    - Totalizer.Value
  - Sensing data
    - Vortex frequency
    - Velocity
    - Calc. Temperature
    - Calc. Pressure
    - Built-in temperature
    - Sensor Board temperature
  - External Temperature
    - External temperature.Status
    - External temperature.Value
  - External Pressure
    - External pressure.Status
    - External pressure.Value
  - External Density
    - External density.Status
    - External density.Value
  - Aux input select

■ LTB

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode.Target
    - Block Mode.Actual
    - Block Mode.Permitted
    - Block Mode.Normal
  - Configuration
    - Display setup
      - Display line upper
      - Display line lower
      - Display period
      - Display startup
      - Display NE107
      - Display format flow
      - Display format temperature
      - Display format pressure
      - Option display installation
  - Query Device

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alerts →Page 244
  - Service
    - Test
      - Display test
      - Squawk (M)
      - Option display installation

- **Process Variables**
  - Dynamic Variables
    - Block Error
    - Transducer Error

● Alerts

- **Alerts**
  - Block Error
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

■ MTB

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode.Target
    - Block Mode.Actual
    - Block Mode.Permitted
    - Block Mode.Normal
  - Configuration
    - Alarm Select →Page 247
    - Alarm Record Setup
      - Alarm record select
      - Alarm record clear
      - Auto delete time
    - Prediction Setup
      - Prediction function
      - Prediction execution
      - Prediction select
      - Prediction period
      - Prediction start date
      - Prediction stop date
      - Prediction level
      - Prediction alarm time
      - Prediction estimate time
      - Prediction result
      - Prediction type
  - Device Information
    - Maintenance Information →Page 247
    - Order Information →Page 248
    - Version/Number information
      - Software Description
      - Sensor S/N
      - Transmitter S/N
      - Hardware revision
    - Memos
      - Memo 1
      - Memo 2
      - Memo 3
  - Query Device

(Continued on next page)

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alerts →Page 249
    - Alarm Select →Page 249
    - Alarm Records →Page 250
  - Service
    - Verification Execution
      - Verification Exe (M)
      - Verification target
      - Verification status
      - Verification select switch
      - Verification date/time
      - Verification operation time
      - Verification result
      - Sensor circuit result
      - Signal circuit result
      - Calculation circuit result
      - Alarm status result
      - Alarm record result
      - Option built-in verification
    - Sensor Signal
      - Signal latch execution (M)
      - Signal latch target
      - Signal latch alarm
      - Signal latch date
      - Signal latch operation time
      - Signal latch vortex frequency
      - Signal latch velocity
      - Signal latch max band
      - Signal latch noise ratio
      - Signal latch noise band 1
      - Signal latch noise band 2
      - Signal latch TLA
      - Signal latch basic band
- **Process Variables**
  - Dynamic Variables
    - Block Error
    - Transducer Error

● Alarm Select

- **Alarm Select**
  - Alarm status select
  - Current Detected Alarms
    - System alarm 1
    - System alarm 2
    - Process alarm 1
    - Process alarm 2
    - Setting alarm 1
    - Setting alarm 2
    - Warning 1
    - Warning 2

● Maintenance Information

- **Maintenance Information**
  - Operation time
  - Current date/time
  - Sensor Backup/Restore
    - Sensor backup/restore (M)
    - Sensor backup/restore result
  - Software Description
  - Software Download
    - Soft DL Protect
    - Soft DL Error
    - Soft DL Count
    - Soft DL Act Area

Order Information

- **Order Information**
  - Major Model Codes
    - Model
    - Distributor name
    - Device ID
    - Sensor MS code 1
    - Sensor MS code 2
    - Sensor MS code 3
    - Sensor MS code 4
    - Sensor MS code 5
    - Sensor MS code 6
    - Sensor style code
    - Transmitter MS code 1
    - Transmitter MS code 2
    - Transmitter MS code 3
    - Transmitter MS code 4
    - Transmitter MS code 5
    - Transmitter MS code 6
    - Transmitter style code
  - Additional Information
    - Special order number 1
    - Special order number 2
    - Sizing number
    - Name plate tag number
    - Instruction manual number
    - Manufact. date
    - Connection type
    - Process temperature
    - Max pressure
    - Communication select
    - SI Control Codes
    - Option dual bolt calibration
    - Option cryogenic
    - Option built-in verification
    - Prediction function
    - Option bwc

Alerts

- **Alerts**
  - Block Error
  - Transducer Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev

Alarm Select

- **Alarm Select**
  - Alarm status select
  - Current Detected Alarms
    - System alarm 1
    - System alarm 2
    - Process alarm 1
    - Process alarm 2
    - Setting alarm 1
    - Setting alarm 2
    - Warning 1
    - Warning 2

● Alarm Records

- **Alarm Records**
  - Alarm record select
  - Alarm record clear (M)
  - Auto delete time
  - Alarm record 1 (Oldest)
    - Alarm record 1
    - Alarm record date 1
    - Alarm record operation time 1
  - Alarm record 2
    - Alarm record 2
    - Alarm record date 2
    - Alarm record operation time 2
  - Alarm record 3
    - Alarm record 3
    - Alarm record date 3
    - Alarm record operation time 3
  - Alarm record 4
    - Alarm record 4
    - Alarm record date 4
    - Alarm record operation time 4
  - Alarm record 5
    - Alarm record 5
    - Alarm record date 5
    - Alarm record operation time 5
  - Recent alarm 1 (Latest)
    - Recent alarm 1
    - Recent alarm date 1
    - Recent alarm operation time 1
  - Recent alarm 2
    - Recent alarm 2
    - Recent alarm date 2
    - Recent alarm operation time 2
  - Recent alarm 3
    - Recent alarm 3
    - Recent alarm date 3
    - Recent alarm operation time 3

(Continued on next page)

- Recent alarm 4
  - Recent alarm 4
  - Recent alarm date 4
  - Recent alarm operation time 4
- Recent alarm 5
  - Recent alarm 5
  - Recent alarm date 5
  - Recent alarm operation time 5

AI1-3

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Basic Settings
      - Channel
      - Process Value Filter Time
    - Scale →Page 253
    - Options
      - Linearization Type
      - Low Cutoff
      - I/O Options
      - Status Options
  - Query Device
    - AI standard parameters
    - AI Enhanced parameters
- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alert →Page 254
    - Priority/Limits
      - High High Priority
      - High High Limit
      - High Priority
      - High Limit
      - Low Priority
      - Low Limit
      - Low Low Priority
      - Low Low Limit
    - Process Alarms →Page 255
  - Service
    - Simulate Enable (M)
    - Simulate Disable (M)
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny

(Continued on next page)

- **Process Variables**
  - Dynamic Variables
    - Field Value
      - Field Value.Status
      - Field Value.Value
    - Process Value
      - Process Value.Status
      - Process Value.Value
    - Output
      - Output.Status
      - Output.Value

● Scale

- **Scale**
  - Transducer Scale
    - Transducer Scale.EU at 100%
    - Transducer Scale.EU at 0%
    - Transducer Scale.Units Index
    - Transducer Scale.Decimal
  - Output Scale
    - Output Scale.EU at 100%
    - Output Scale.EU at 0%
    - Output Scale.Units Index
    - Output Scale.Decimal

Alert

- **Alert**
  - Block Error
  - Block Error Description
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Alarm Summary
    - Alarm Summary.Current
    - Alarm Summary.Unacknowledged
    - Alarm Summary.Unreported
    - Alarm Summary.Disabled
  - Alert Common
    - Acknowledge Option
    - Alarm Hysteresis
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev
    - Update Event.Relative Index

Process Alarms

- **Process Alarms**
  - High High Alarm
    - High High Alarm.Unacknowledged
    - High High Alarm.Alarm State
    - High High Alarm.Time Stamp
    - High High Alarm.Subcode
    - High High Alarm.Float Value
  - High Alarm
    - High Alarm.Unacknowledged
    - High Alarm.Alarm State
    - High Alarm.Time Stamp
    - High Alarm.Subcode
    - High Alarm.Float Value
  - Low Alarm
    - Low Alarm.Unacknowledged
    - Low Alarm.Alarm State
    - Low Alarm.Time Stamp
    - Low Alarm.Subcode
    - Low Alarm.Float Value
  - Low Low Alarm
    - Low Low Alarm.Unacknowledged
    - Low Low Alarm.Alarm State
    - Low Low Alarm.Time Stamp
    - Low Low Alarm.Subcode
    - Low Low Alarm.Float Value

■ D1-2

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Basic Settings
      - Channel
      - Transducer State
      - Output State
      - Process Value Filter Time
    - Options
      - I/O Options
      - Status Options
  - Query Device
    - DI standard parameters
- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alert →Page 257
  - Service
    - Simulate Discrete
      - Simulate Discrete.Simulate Status
      - Simulate Discrete.Simulate Value
      - Simulate Discrete.Transducer Status
      - Simulate Discrete.Transducer Value
      - Simulate Discrete.Simulate En/Disable
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny
- **Process Variables**
  - Dynamic Variables
    - Field Value Discrete
      - Field Value Discrete.Status
      - Field Value Discrete.Value
    - Process Value Discrete
      - Process Value Discrete.Status
      - Process Value Discrete.Value
    - Output Discrete
      - Output Discrete.Status
      - Output Discrete.Value

● Alert

- **Alert**
  - Block Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Alarm Summary
    - Alarm Summary.Current
    - Alarm Summary.Unacknowledged
    - Alarm Summary.Unreported
    - Alarm Summary.Disabled
  - Alert Common
    - Acknowledge Option
    - Discrete Priority
    - Discrete Limit
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev
    - Update Event.Relative Index

■ PID

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Scaling/Filter/Limits →Page 260
    - Control Parameters
      - Gain
      - Reset
      - Rate
      - Bypass
      - Balance Time
    - Feed Forward Control →Page 260
    - Tracking →Page 260
    - Options
      - Control Options
      - Status Options
      - Shed Options
      - Back Calculation Hysteresis
  - Query Device
    - PID Standard Parameters

(Continued on next page)

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Alert →Page 261
    - Priority/Limits
      - High High Priority
      - High High Limit
      - High Priority
      - High Limit
      - Low Priority
      - Low Limit
      - Low Low Priority
      - Low Low Limit
      - Deviation High Priority
      - Deviation High Limit
      - Deviation Low Priority
      - Deviation Low Limit
    - Process Alarms →Page 262
  - Service
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny

- **Process Variables**
  - Dynamic Variables
    - In/Out →Page 263
    - Value →Page 263
    - Bkcal →Page 263
    - Remote I/O →Page 264
    - Others →Page 264

Scaling/Filter/Limits

- **Scaling/Filter/ Limits**
  - Process Value Scale
    - Process Value Scale.EU at 100%
    - Process Value Scale.EU at 0%
    - Process Value Scale.Units Index
    - Process Value Scale.Decimal
  - Output Scale
    - Output Scale.EU at 100%
    - Output Scale.EU at 0%
    - Output Scale.Units Index
    - Output Scale.Decimal
  - Setpoint Rate Down
  - Setpoint Rate Up
  - Process Value Filter Time
  - Setpoint High Limit
  - Setpoint Low Limit
  - Output High Limit
  - Output Low Limit

Feed Forward Control

- **Feed Forward Control**
  - Feed Forward Scale
    - Feed Forward Scale.EU at 100%
    - Feed Forward Scale.EU at 0%
    - Feed Forward Scale.Units Index
    - Feed Forward Scale.Decimal
  - Feed Forward Gain

Tracking

- **Tracking**
  - Tracking Scale
    - Tracking Scale.EU at 100%
    - Tracking Scale.EU at 0%
    - Tracking Scale.Units Index
    - Tracking Scale.Decimal

Alert

- **Alert**
  - Block Error
  - Block Alarm
    - Block Alarm.Unacknowledged
    - Block Alarm.Alarm State
    - Block Alarm.Time Stamp
    - Block Alarm.Subcode
    - Block Alarm.Value
  - Alarm Summary
    - Alarm Summary.Current
    - Alarm Summary.Unacknowledged
    - Alarm Summary.Unreported
    - Alarm Summary.Disabled
  - Alert Common
    - Acknowledge Option
    - Alarm Hysteresis
  - Update Event
    - Update Event.Unacknowledged
    - Update Event.Update State
    - Update Event.Time Stamp
    - Update Event.Static Rev
    - Update Event.Relative Index

● Process Alarms

- **Process Alarms**
  - High High Alarm
    - High High Alarm.Unacknowledged
    - High High Alarm.Alarm State
    - High High Alarm.Time Stamp
    - High High Alarm.Subcode
    - High High Alarm.Float Value
  - High Alarm
    - High Alarm.Unacknowledged
    - High Alarm.Alarm State
    - High Alarm.Time Stamp
    - High Alarm.Subcode
    - High Alarm.Float Value
  - Low Alarm
    - Low Alarm.Unacknowledged
    - Low Alarm.Alarm State
    - Low Alarm.Time Stamp
    - Low Alarm.Subcode
    - Low Alarm.Float Value
  - Low Low Alarm
    - Low Low Alarm.Unacknowledged
    - Low Low Alarm.Alarm State
    - Low Low Alarm.Time Stamp
    - Low Low Alarm.Subcode
    - Low Low Alarm.Float Value
  - Deviation High Alarm
    - Deviation High Alarm.Unacknowledged
    - Deviation High Alarm.Alarm State
    - Deviation High Alarm.Time Stamp
    - Deviation High Alarm.Subcode
    - Deviation High Alarm.Float Value
  - Deviation Low Alarm
    - Deviation Low Alarm.Unacknowledged
    - Deviation Low Alarm.Alarm State
    - Deviation Low Alarm.Time Stamp
    - Deviation Low Alarm.Subcode
    - Deviation Low Alarm.Float Value

● In/Out

- **In/Out**
  - Cascade Input
    - Cascade Input.Status
    - Cascade Input.Value
  - Input
    - Input.Status
    - Input.Value
  - Output
    - Output.Status
    - Output.Value

● Value

- **Value**
  - Setpoint
    - Setpoint.Status
    - Setpoint.Value
  - Process Value
    - Process Value.Status
    - Process Value.Value

● Bkcal

- **Bkcal**
  - Back Calculation Input
    - Back Calculation Input.Status
    - Back Calculation Input.Value
  - Back Calculation Output
    - Back Calculation Output.Status
    - Back Calculation Output.Value

Remote I/O

- **Remote I/O**
  - Remote Cascade Input
    - Remote Cascade Input.Status
    - Remote Cascade Input.Value
  - Remote Out Input
    - Remote Out Input.Status
    - Remote Out Input.Value
  - Remote Cascade Output
    - Remote Cascade Output.Status
    - Remote Cascade Output.Value
  - Remote Out Output
    - Remote Out Output.Status
    - Remote Out Output.Value

Others

- **Others**
  - Feed Forward Value
    - Feed Forward Value.Status
    - Feed Forward Value.Value
  - Tracking Value
    - Tracking Value.Status
    - Tracking Value.Value
  - Tracking Input Discrete
    - Tracking Input Discrete.Status
    - Tracking Input Discrete.Value

■ MAO

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Channel
    - Mo Options
    - Failsafe
      - Fault State Time
      - Fault State Val1
      - Fault State Val2
      - Fault State Val3
      - Fault State Val4
      - Fault State Val5
      - Fault State Val6
      - Fault State Val7
      - Fault State Val8
  - Query Device
    - MAO Standard Parameters

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Block Error
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
    - Fault State Status

(Continued on next page)

- **Process Variables**
  - Dynamic Variables
    - Input 1
      - Input 1.Status
      - Input 1.Value
    - Input 2
      - Input 2.Status
      - Input 2.Value
    - Input 3
      - Input 3.Status
      - Input 3.Value
    - Input 4
      - Input 4.Status
      - Input 4.Value
    - Input 5
      - Input 5.Status
      - Input 5.Value
    - Input 6
      - Input 6.Status
      - Input 6.Value
    - Input 7
      - Input 7.Status
      - Input 7.Value
    - Input 8
      - Input 8.Status
      - Input 8.Value

■ IT

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Basic Settings →Page 269
    - Scaling/Limits →Page 269
    - Options
      - Integration Options
      - Status Options
      - Operator Command Integration
  - Query Device
    - IT Standard Parameters
    - IT Enhanced Parameters

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Block Error
    - Number of Reset
    - Rejected Total
    - Percentage Included
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
  - Service
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny

(Continued on next page)

- **Process Variables**
  - Dynamic Variables
    - Input 1
      - Input 1.Status
      - Input 1.Value
    - Input 2
      - Input 2.Status
      - Input 2.Value
    - Output
      - Output.Status
      - Output.Value
    - Reset Input
      - Reset Input.Status
      - Reset Input.Value
    - Reset Confirm
      - Reset Confirm.Status
      - Reset Confirm.Value
    - Reverse Flow1
      - Reverse Flow1.Status
      - Reverse Flow1.Value
    - Reverse Flow2
      - Reverse Flow2.Status
      - Reverse Flow2.Value
    - Output Trip
      - Output Trip.Status
      - Output Trip.Value
    - Output Pre-Trip
      - Output Pre-Trip.Status
      - Output Pre-Trip.Value
    - Total/Snapshots
      - Snapshot of Total
      - Snapshot of Rejected Total
      - Snapshot of Setpoint
      - Accumulate Total

Basic Settings

- **Basic Settings**
  - Integration Type
  - Total Setpoint
  - Pre Trip
  - Clock Period
  - Unit Conversions
    - Time Unit1
    - Time Unit2
    - Unit Conversion
    - Pulse Val1
    - Pulse Val2

Scaling/Limits

- **Scaling/Limits**
  - Good Limit
  - Uncertain Limit
  - Outage Limit
  - Output Range
    - Output Range.EU at 100%
    - Output Range.EU at 0%
    - Output Range.Units Index
    - Output Range.Decimal

■ AR

- **Device Configuration**
  - Block Info
    - Characteristics.Block Tag
    - Tag Description
    - Strategy
    - Alert Key
  - Block Mode
    - Block Mode
      - Block Mode.Target
      - Block Mode.Actual
      - Block Mode.Permitted
      - Block Mode.Normal
  - Configuration
    - Input Parameters →Page 271
    - Algorithm Parameters
      - Arithmetic Type
      - Compensation High Limit
      - Compensation Low Limit
    - Output Parameters →Page 271
  - Query Device
    - AR Standard Parameters

- **Device Diagnostics**
  - Diagnostics/Alerts
    - Block Error
    - Block Alarm
      - Block Alarm.Unacknowledged
      - Block Alarm.Alarm State
      - Block Alarm.Time Stamp
      - Block Alarm.Subcode
      - Block Alarm.Value
    - Update Event
      - Update Event.Unacknowledged
      - Update Event.Update State
      - Update Event.Time Stamp
      - Update Event.Static Rev
      - Update Event.Relative Index
  - Service
    - Grant Deny
      - Grant Deny.Grant
      - Grant Deny.Deny

- **Process Variables**
  - Dynamic Variables
    - Inputs →Page 272
    - Outputs →Page 272

Input Parameters

- **Input Parameters**
  - Range Extension
    - Range High
    - Range Low
  - Bias/Gain
    - Bias Input 1
    - Gain Input 1
    - Bias Input 2
    - Gain Input 2
    - Bias Input 3
    - Gain Input 3
  - Input Options
  - Process Value Scale
    - Process Value Scale.EU at 100%
    - Process Value Scale.EU at 0%
    - Process Value Scale.Units Index
    - Process Value Scale.Decimal

Output Parameters

- **Output Parameters**
  - Balance Time
  - Bias
  - Gain
  - Output High Limit
  - Output Low Limit
  - Output Range
    - Output Range.EU at 100%
    - Output Range.EU at 0%
    - Output Range.Units Index
    - Output Range.Decimal

● Inputs

- **Inputs**
  - Input
    - Input.Status
    - Input.Value
  - Input Low
    - Input Low.Status
    - Input Low.Value
  - Input 1
    - Input 1.Status
    - Input 1.Value
  - Input 2
    - Input 2.Status
    - Input 2.Value
  - Input 3
    - Input 3.Status
    - Input 3.Value

● Outputs

- **Outputs**
  - Output
    - Output.Status
    - Output.Value
  - Process Value
    - Process Value.Status
    - Process Value.Value
  - Pre Output
    - Pre Output.Status
    - Pre Output.Value

Appendix 1. Setting and Changing Parameters

This section describes procedures to set and change the parameters for each block. Obtaining access to each parameter differs depending on the configuration system used. For details, refer to the instruction manual for each configuration system.

(1) Access the block mode (MODE_BLK) of each block.

(2) Set the block mode (MODE_BLK) target(note 1) to Auto, Man or O/S(note 2) in accordance with the Write Mode of the parameter to be set or changed.

(3) Access the parameter to set or change.

(4) Make setting or change in accordance with each parameter.

(5) Set the Target of block mode (MODE_BLK) to Auto(note 2).

IMPORTANT

Do not turn the power OFF immediately after setting parameters. To improve the reliability of the device, processing to store data to EEPROM is duplexing. If the power is turned OFF within 30 seconds after setting of parameters, changed parameters are not saved and may return to their original values.

Note 1: Block mode consists of the following four modes that are controlled by the universal parameter that displays the operating condition of each block.
Target (target mode) : Sets the operating condition of the block.
Actual (actual mode) : Indicates the current block operating condition.
Permit (permit mode) : Indicates the operating condition that the block is allowed to take.
Normal (normal mode) : Indicate the operating condition that the block will usually take.

Note 2: The write modes a block can assume are as shown below for each block.

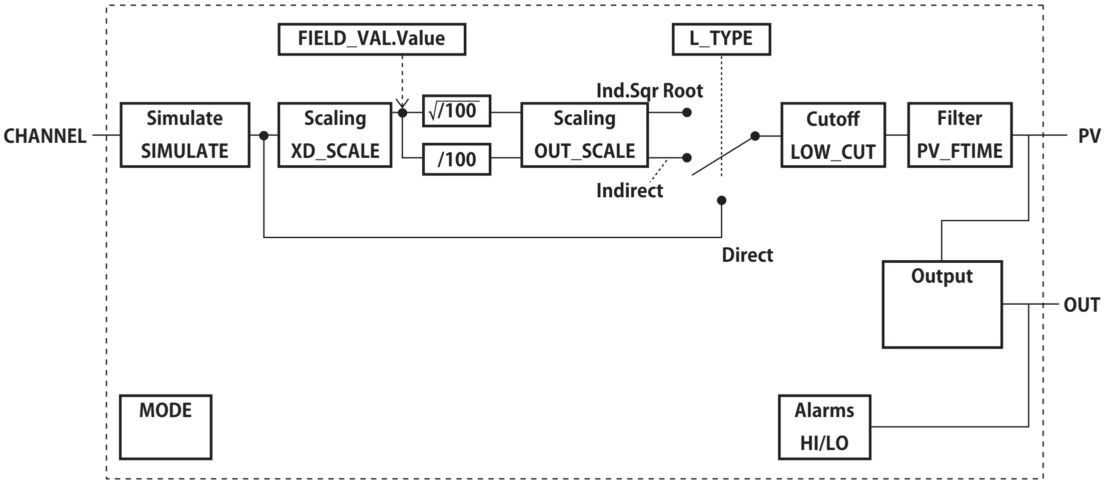
	AI Function Block	IT Function Block	DI Function Block	AR Function Block	PID Function Block	MAO Function Block	Transducer Block	Resource Block
Automatic (Auto)	◦	◦	◦	◦	◦	◦	◦	◦
Manual (Man)	◦	◦	◦	◦	◦			
Out of Service (O/S)	◦	◦	◦	◦	◦	◦	◦	◦

NOTE

For various setting changes, there is a mode which allows each parameter to be written.
If a parameter cannot be rewritten, check for write mode columns in parameter lists in Chapter 7.

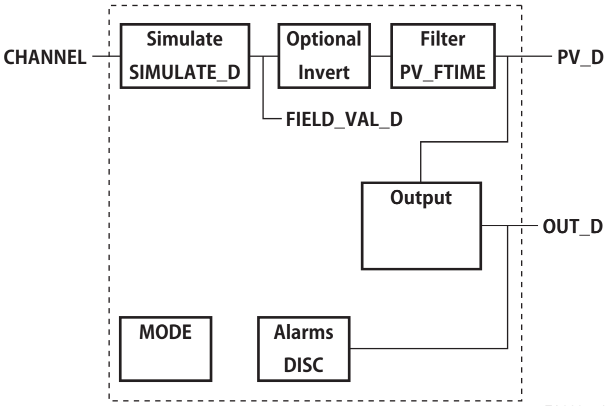
Appendix 2. Function Block Diagrams

A2.1 AI Function Block



FA0206.ai

A2.2 DI Function Block



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Appendix 3. Integrator (IT) Block

The IT block adds two main inputs and integrates them for output. The block compares the outputs with TOTAL_SP and PRE_TRIP and generates signals when the limits are reached (OUT_TRIP output, OUT_PTRIP output).
The output is as represented by the following equation (for counting UP and RATE conversion).

OUT = Integration start value + Total

Total = Total + Current Integral

Current Integral = (x + y) × Δt

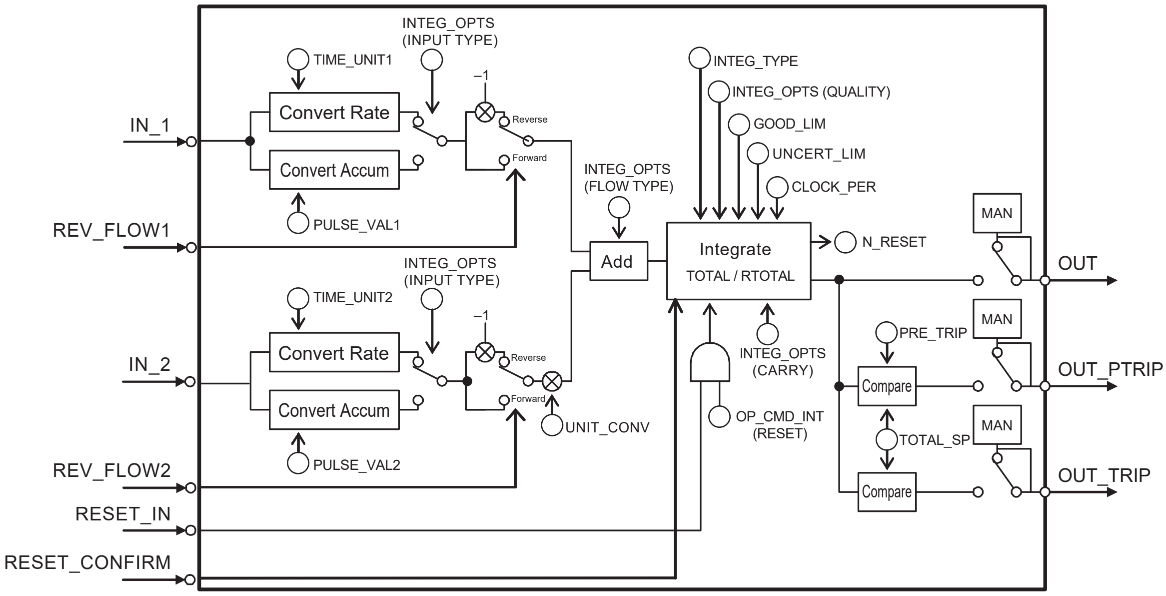
x : IN_1 value whose unit has been converted

y : IN_2 value whose unit has been converted

Δt : block execution period

A3.1 Schematic Function Diagram of Integrator Block

The functional block diagram of the IT block is shown below.



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IN_1 .... Block input 1 (value & status).
IN_2 .... Block input 2 (value & status).
REV_FLOW1.................. Indicates whether the sign of IN_1 is reversed. Discrete signal.
REV_FLOW2.................. Indicates whether the sign of IN_2 is reversed. Discrete signal.
RESET_IN .... RESET signal of the integrated values. Discrete signal.
RESET_CONFIRM......... RESET confirmation input. Discrete signal.
OUT .... Output (value & status).
OUT_PTRIP.................... Set if the target value PRE_TRIP is exceeded. Discrete signal.
OUT_TRIP...................... Set when the target value exceeds TOTAL_SP (or 0). Discrete signal.

The IT block is classified into the following five sections for each function:

- Input process section........ Determines the input value status, converts RATE and ACCUM, and determines the input flow direction.
- Adder .... Adds the two inputs.
- Integrator .... Integrates the result of the adder into the integrated value.
- Output process section..... Determines the status and value of each output parameter.
- Reset process section ...... Resets the integrated value.

A3.2 Input Process Section

When executed, the IT block first performs input processing. The processing is executed in the following order: "Determining input status" => "Converting RATE or ACCUM" => "Determining the input flow direction". Switching between Convert RATE and Convert ACCUM is made using bit 0 (for IN_1) or bit 1 (for IN_2) of INTEG_OPTS. INTEG_OPTS is one of the system parameters, and should be set by the user.
IN_1 and IN_2 are not be retained if the power is turned OFF.

A3.2.1 Determining Input Value Statuses

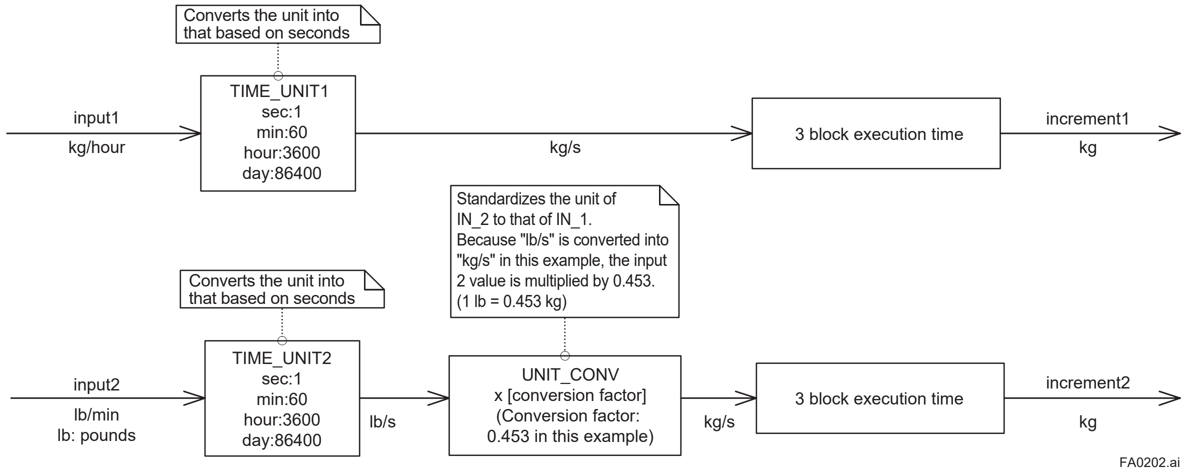
The following shows the correlation between the statuses of input parameters (IN_1, IN_2) and the statuses of input values used in the IT block.

Status of input parameter (IN_1, IN_2)	Bit4 of INTEG_OPTS (Use uncertain)	Bit5 of INTEG_OPTS* (Use Bad)	Status of input value handled in the IT block
Good	Irrelevant	Irrelevant	Good
Bad	Irrelevant	H (=1)	Good
Bad	Irrelevant	L (=0)	Bad
Uncertain	H (=1)	Irrelevant	Good
Uncertain	L (=0)	Irrelevant	Bad

For addition (see A3.3), if the status of an input value is "Bad", the "Good" value just before the status changed to "Bad" is used.
* Even if the Use Bad option is applied and the internal status is "Good", the value of "Good" just before the status changed to "Bad" is used.

A3.2.2 Converting RATE

The following shows an example of RATE conversion.
In the RATE conversion, firstly convert the time system unit of two inputs to the unit of second.
Next, convert the unit of the inputs to the same unit to be added together. The unit of IN_2 is standardized to that of IN_1.
Then, calculates a weight, volume, or energy by multiplying the block execution time by each of the two input values.
The unit information is not entered into the IT block as an input value. Because unit information is not input to the integrator block as an input value, the user must input tuned values to the TIME_UNIT1/2 and UNIT_CONV settings in advance.



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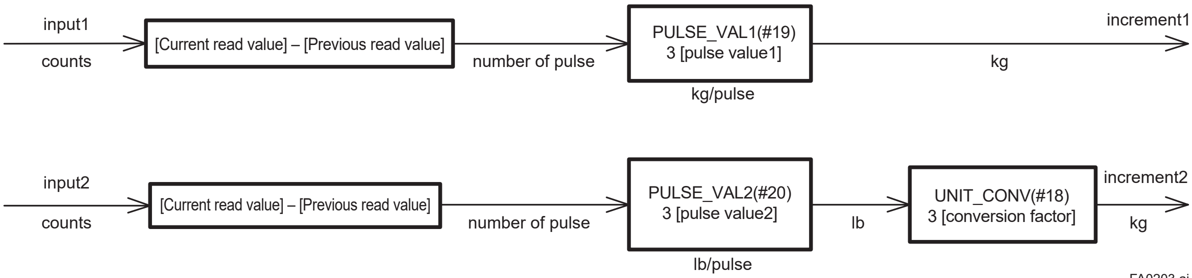
A3.2.3 Converting ACCUM

The following shows an example of the ACCUM conversion.
In the ACCUM conversion, the difference between the value executed previously and the value executed this time is integrated or accumulated. This conversion applies when the output of a function block used as a counter is input to the input process of the IT block.
In order to convert the rate of change of an input to a value with an engineering unit, the user must configure the conversion factor to the appropriate engineering unit in the PULSE_VAL1 and PULSE_VAL2 parameters.
Moreover, the unit of IN_2 is standardized to that of IN_1 in the same way as the RATE conversion. Thus, the user must also set an appropriate value to UNIT_CONV.



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A3.2.4 Determining the Input Flow Direction

The IT block also considers the input flow direction. Information about the input flow direction is contained in REV_FLOW1 and REV_FLOW2 (0: FORWARD, 1: REVERSE).
In input processing, the sign of the value after the RATE/ACCUM conversion is reversed if the REV_FLOW1 and REV_FLOW2 parameters are set to REVERSE. When determination of the flow direction of two input values is complete, these two inputs are passed to the adder. The settings in REV_FLOW will be retained even if the power is turned OFF.

A3.3 Adder

When input processing is complete, two arguments that have been RATE/ACCUM-converted will be passed to the adder.
The adder adds these two values in accordance with the option.

A3.3.1 Status of Value after Addition

If one of the statuses of the two arguments is “Bad” or if two of them are both “Bad”, the status of the value after addition becomes “Bad”. In this case, the value of “Good” just before the status changed to “Bad” is used as the addition value.
When the statuses of the two arguments are both “Good”, the status of the value after addition becomes “Good”. In this case, the status of the value after addition will be used for the status applied to integration.

A3.3.2 Addition

The following three options are available for addition:

- TOTAL.................... Adds two arguments values as is.
- FORWARD .... Adds two argument values, regarding a negative value as “0”.
- REVERSE .... Adds two argument values, regarding a positive value as “0”.

You can choose these options using bit 2 and bit 3 of INTEG_OPTS as follows:

Bit 2 of INTEG_OPTS (Flow forward)	Bit 3 of INTEG_OPTS (Flowr everse)	Adder Options
H	H	TOTAL
L	L	TOTAL
H	L	FORWARD
L	H	REVERSE

The result of the adder is passed to the integrator.
If only one of the inputs is connected, the value of a non-connected input will be ignored.

When bit 7 of INTEG_OPTS (Add zero if bad) has been set, if the status of a value after addition is “Bad”, the value after addition (increment) becomes “0”.

A3.4 Integrator

When addition is complete, its result will be passed to the integrator.
An integration method consists of combinations of a reset method and counting up/down. There are the following seven integration types, which can be set using INTEG_TYPE.

1. UP_AUTO: 0 to TOTAL_SP - auto reset at TOTAL_SP; Integrates from 0 to the setpoint (TOTAL_SP), and automatically resets when reaching the setpoint.
2. UP_DEM: 0 to TOTAL_SP - demand reset; Integrates from 0 to the setpoint, and is reset on demand.
3. DN_AUTO: TOTAL_SP to 0 - auto reset at TOTAL_SP; Integrates from 0 to the setpoint, and automatically reset when reaching zero.
4. DN_DEM: TOTAL_SP to 0 - demand reset; Integrates from 0 to the setpoint, and is reset on demand.
5. PERIODIC: 0 to ? - periodic reset; Integrates from 0, and reset periodically in accordance with CLOCK_PER.
6. DEMAND: 0 to ? - demand reset; Integrates from 0, and is reset on demand.
7. PER&DEM: 0 to ? - periodic & demand reset; Integrates from 0, and is reset periodically or on demand.

Each type of integration works independently as a function.
There are the following three types of integrated values:

1. Total .... Integrates the result of the adder as is.
2. ATotal .... Integrates the absolute value of the result of the adder.
3. RTotal........... Integrates the absolute value of the result of the adder only if the status of the result is “Bad”. This value is used for the RTOTAL value.

The table shows the details of INTEG_TYPE.

Name	Integration Method	Integration Range	Reset Trigger (Reset if one of the following conditions is established)	Trip Output
UP_AUTO(1)	CountUP Counting up from “0”	-INF< Total <TOTAL_SP 0< ATotal <+INF 0< RTotal <+INF	•OUT reaches TOTAL_SP. •RESET_IN = 1 •OP_CMD_INT = 1	◦
UP_DEM(2)	CountUP Counting up from “0”	-INF< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•RESET_IN = 1 •OP_CMD_INT = 1	◦
DN_AUTO(3)	CountDown Counting down from TOTAL_SP	0< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•OUT reaches 0 •RESET_IN = 1 •OP_CMD_INT = 1	◦
DN_DEM(4)	CountDown Counting down from TOTAL_SP	-INF< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•RESET_IN = 1 •OP_CMD_INT = 1	◦
PERI ODIC(5)	CountUP Counting up from “0”	-INF< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•Period defined by CLOCK_PER •OP_CMD_INT = 1	x
DEMAND(6)	CountUP Counting up from “0”	-INF< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•RESET_IN = 1 •OP_CMD_INT = 1	x
PER&DEM(7)	CountUP Counting up from “0”	-INF< Total <+INF 0< ATotal <+INF 0< RTotal <+INF	•Period defined by CLOCK_PER •RESET_IN = 1 •OP_CMD_INT = 1	x

A3.5 Output Process

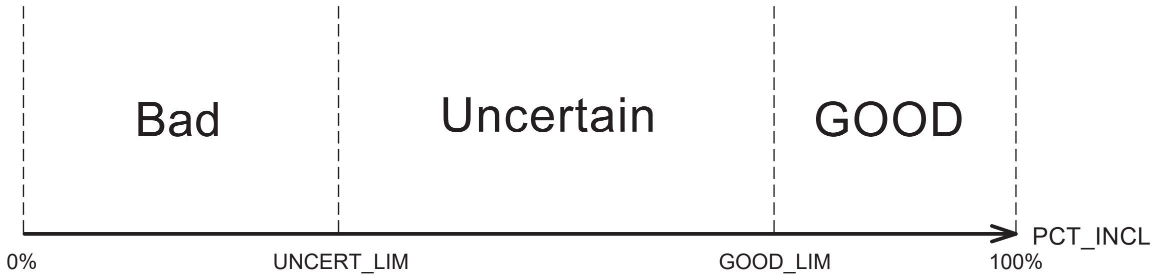
There are the following three output parameters:

1. OUT
2. OUT_TRIP
3. OUT_PTRIP

Parameters OUT_TRIP and OUT_PTRIP are used only when INTEG_TYPE is from 1 to 4.
In case that IT block related memory failed, the status of OUT, OUT_TRIP, OUT_PTRIP becomes "Bad-Device Failure".

A3.5.1 Status Determination

The same criteria for determining the status of the output of the IT block are used in common for the above three parameters.



PCT_INCL=1003(1 - (msp of RTotal)/(msp of ATotal))

msp of RTotal: RTotal value that is converted into a short floating-point number
msp of ATotal: ATotal value that is converted into a short floating-point number
RTotal: Integrated value of the absolute values of the increments whose status is bad
ATotal: Integrated value of the absolute values of the increments regardless of the output status

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OUT.Value, OUT_TRIP.Status, and OUT_PTRIP.Status are determined by the ratio of the "Good" integrated values to all integrated values, which is stored in PCT_INCL (0% to 100%). The user must set the threshold of each status to UNCERT_LIM and GOOD_LIM.
The IT block determines the status of the output using the three parameters: PCT_INCL, UNCERT_LIM, and GOOD_LIM.

- PCT_INCL ≥ GOOD_LIM

  =>Good

- UNCERT_LIM ≤ PCT_INCL < GOOD_LIM

  =>Uncertain

- PCT_INCL < UNCERT_LIM

  =>Bad

If INTEG_TYPE is 5, 6, or 7, the status of the trip output becomes "Good-NS-Constant".

A3.5.2 Determining the Output Value

The value of OUT.Value is determined as follows:

- For counting up

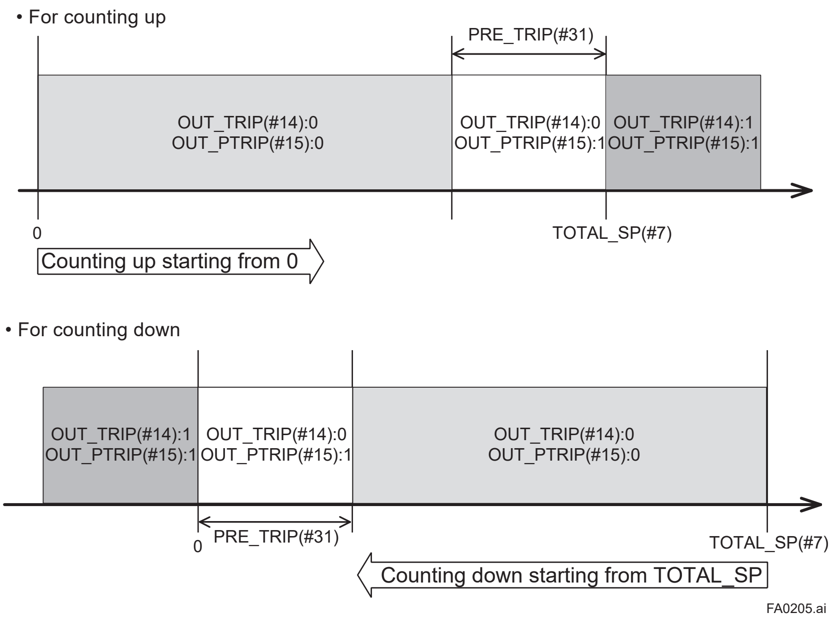
  OUT = Integration start value (0) + Total

- For counting down

  OUT = Integration start value (TOTAL_SP) - Total

Total...Total of integrated values. This value is retained even if INTEG_TYPE is changed during integration (in AUTO).

If OUT is rewritten in the MAN mode, integration starts with the value rewritten in the MAN mode after the mode was returned to AUTO.
The values in OUT_TRIP and OUT_PTRIP are determined in accordance with the correlation between OUT and TOTAL_SP/PRE_TRIP.



For counting up, the OUT value is as follows:

- OUT < TOTAL_SP - PRE_TRIP

  =>OUT_TRIP = 0, OUT_PTRIP = 0

- TOTAL_SP - PRE_TRIP <= OUT < TOTAL_SP

  =>OUT_TRIP = 0, OUT_PTRIP = 1

- TOTAL_SP <= OUT

  =>OUT_TRIP = 1, OUT_PTRIP = 1

For counting down, the OUT value is as follows:

- PRE_TRIP < OUT

  =>OUT_TRIP = 0, OUT_PTRIP = 0

- 0 < OUT <= PRE_TRIP

  =>OUT_TRIP = 0, OUT_PTRIP = 1

- OUT <= 0

  =>OUT_TRIP = 1, OUT_PTRIP = 1

Note that the given conditions do not apply to the following cases:

- If INTEG_TYPE is 5, 6, or 7, OUT_TRIP and OUT_PTRIP always output “0”.
- If INTEG_TYPE is 1 or 3, occurrence of AutoRESET (reset caused if the threshold is exceeded) causes OUT_TRIP to hold “1” for five seconds.

A3.5.3 Mode Handling

<table>
<tr><th>Mode</th><th>Action</th><th>Output</th></tr>
<tr><td>AUTO</td><td>Normal action</td><td>Normal output</td></tr>
<tr><td>MAN</td><td rowspan="2">Integration function is stopped. OUT will not be updated unless you set a value to it. No reset is accepted.</td><td rowspan="2">OUT rewritable. If no value is rewritten, the value with which the mode was running in AUTO immediately before is held. After returning to AUTO, integration starts with the written value or from the value just before running in AUTO.</td></tr>
<tr><td>O/S</td></tr>
</table>

When you rewrite the value in OUT and RTOTAL while at MAN or O/S, N_RESET is incremented.

A3.6 Reset Processing

A3.6.1 Reset Trigger

There are the following five types of reset triggers:

(1) An integrated value exceeds TOTAL_SP.

(2) An integrated value falls below “0”.

(3) RESET_IN is “H”.

(4) Every period specified in CLOCK_PER.

(5) OP_CMD_INT is 1.

The table shows the correlation between INTEG_TYPE and RESET triggers.

	(1)	(2)	(3)	(4)	(5)
1:UP_AUTO	◦	x	◦	x	◦
2:UP_DEM	x	x	◦	x	◦
3:DN_AUTO	x	◦	◦	x	◦
4:DN_DEMO	x	x	◦	x	◦
5:PERIODIC	x	x	x	◦	◦
6:DEMAND	x	x	◦	x	◦
7:PER&DEM	x	x	◦	◦	◦

When OP_CMD_INT has become “H” and a reset was executed, OP_CMD_INT automatically returns to “L”.
Even if RESER_IN becomes “H”, executing RESET, RESET_IN does not automatically return to “L”. The RESET_IN setting will not be retained if the power is turned OFF.

A3.6.2 Reset Timing

All items are reset during the execution of the function block. Therefore, the minimum period of a reset is the block execution period.

- **5-second rule**

If a reset is made, the next reset will not be accepted for 5 seconds after that.
Even if UP_AUTO (or DN_AUTO) is activated and TOTAL_SP (or 0) is reached within 5 seconds, the next reset will not be made for 5 seconds from the previous reset.

- **CLOCK_PER**

If INTEG_TYPE is PERIODIC (5) or PER&DEM (7), a reset is made at the period (sec) set to the CLOCK_PER parameter.
If the value in CLOCK_PER is smaller than the function block’s execution period, bit 1 of BLOCK_ERR “Block Configuration Error” is set.

A3.6.3 Reset Process

The basic reset process sequence is as follows:

1. Snapshot
2. Clearing the integrated values
3. Reset count increment
4. Judging OUT_TRIP and OUT_PTRIP (see A3.5)

1. Snapshot

Saves the following values in the specified parameters before clearing the integrated values. These values will be retained until the next reset is made.

STOTAL = Total
SRTOTAL = RTotal
SSP = TOTAL_SP

2. Clearing the integrated values

The reset process clears the Total, ATotal, and RTotal values in the internal registers.

Total = 0
ATotal = 0
RTotal = 0

3. Reset count increment

Each time a reset is executed, the N_RESET parameter will be incremented.
The high limit is 999,999, and if this limit is exceeded, the count returns to “0”.

4. Judging OUT_TRIP and OUT_PTRIP (see A3.5)

OUT_TRIP and OUT_PTRIP are judged again on the basis of the cleared integrated values.

There are three options relating to a reset:

i Confirm reset (bit 8 of INTEG_OPTS)
ii Carry (bit 6 of INTEG_OPTS)
iii Generate reset event (bit 9 of INTEG_OPTS)

i Confirm reset (bit 8 of INTEG_OPTS)

If this option is enabled, the next reset is rejected until “1” is written to RESET_CONFIRM.

ii Carry (bit 6 of INTEG_OPTS)

If this option is enabled while INTEG_TYPE is UP_AUTO or DN_AUTO, the value exceeding the threshold at a reset will be carried into the next integration.
If INTEG_TYPE is any setting other than UP_AUTO or DN_AUTO, this option is irrelevant.

iii Generate reset event (bit 9 of INTEG_OPTS)

If this option is enabled, an alert event is generated if a reset occurs.

A3.7 List of Integrator Block Parameters

Index	Parameter Name	Default Value	Write Mode	View 1	View 2	View 3	View 4	Description
0	Block Header	TAG: “IT”	Block Tag=O/S					Information relating to this function block, such as block tag, DD revision, execution time
1	ST_REV	0	---	2	2	2	2	The revision level of the set parameters associated with the Integrator block
2	TAG_DESC	Space (32 characters)	---					Stores comments describing tag information.
3	STRATEGY	1					2	The strategy field is used by the high-level system to identify the function block.
4	ALERT_KEY	1					1	Key information used to identify the location at which an alert occurred
5	MODE_BLK			4		4		Integrator block mode. O/S, MAN, and AUTO are supported.
6	BLOCK_ERR		---	2		2		Indicates the active error conditions associated with the function block in bit strings.
7	TOTAL_SP	1000000.0		4		4		The target value of an integrated value or a start value for counting down
8	OUT		MAN	5		5		Output
9	OUT_RANGE	1000000.0 0.0 m3(1034) 0			11			Sets scaling for output display. Does not affect the block operation. For note.
10	GRANT_ DENY	0			2			The parameter for checking if various operations have been executed
11	STATUS_ OPTS	0	OS				2	Allows you to select a status-related option. The Integrator block uses “Uncertain if Man mode” only.
12	IN_1	0.0		5		5		Inputs flow rate (RATE, ACCUM) signals from the AI block or PI block.
13	IN_2	0.0		5		5		
14	OUT_TRIP	0		2		2		An output parameter informing the user that the integrated value has exceeded the target value
15	OUT_PTRIP	0		2		2		An output parameter informing the user that the integrated value is reaching the target value
16	TIME_UNIT1	sec(1)	MAN		1			Specifies the time unit of the RATE (kg/s, lb/min, kg/h...etc.) of the corresponding IN.
17	TIME_UNIT2	sec(1)	MAN		1			
18	UNIT_CONV	1.0					4	Specifies the unit conversion factor for standardizing the unit of IN_2 into that of IN_1.
19	PULSE_VAL1	1.0	MAN				4	Specifies the factor for converting the number of pulses for the corresponding IN into an appropriate engineering unit.
20	PULSE_VAL2	1.0	MAN				4	
21	REV_FLOW1	0		2		2		Selector switch used to specify the fluid flow direction (forward/reverse) with respect to the corresponding IN
22	REV_FLOW2	0		2		2		
23	RESET_IN	0		2		2		The parameter that receives a reset request from an external block to reset the integrated values
24	STOTAL	0.0				4		Indicates the snapshot of OUT just before a reset.
25	RTOTAL	0.0	MAN	4		4		Indicates the integrated value of the absolute values of the increments if the input status is “Bad”.
26	SRTOTAL	0.0				4		Indicates the snapshot of RTOTAL just before a reset.
27	SSP	0.0				4		Indicates the snapshot of TOTAL_SP just before a reset.

<table>
<tr><th rowspan="2">Index</th><th rowspan="2">Parameter Name</th><th rowspan="2">Default Value</th><th rowspan="2">Write Mode</th><th colspan="4">View</th><th rowspan="2">Description</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>28</td><td>INTEG_TYPE</td><td>UP_AUTO (1)</td><td></td><td></td><td></td><td></td><td>1</td><td>Integration Type Setting
<table>
<tr><th>Value</th><th>Name</th><th>Description</th></tr>
<tr><td>1</td><td>UP_AUTO</td><td>Counts up and is automatically reset when TOTAL_SP is reached.</td></tr>
<tr><td>2</td><td>UP_DEM</td><td>Counts up and is reset as demanded.</td></tr>
<tr><td>3</td><td>DN_AUTO</td><td>Counts down and is automatically reset when “0” is reached.</td></tr>
<tr><td>4</td><td>DN_DEM</td><td>Counts down and is reset as demanded.</td></tr>
<tr><td>5</td><td>PERIODIC</td><td>Counts up and is reset at periods specified in CLOCK_PER.</td></tr>
<tr><td>6</td><td>DEMAND</td><td>Counts up and is reset as demanded.</td></tr>
<tr><td>7</td><td>PER&DEM</td><td>Resets periodically or as demanded.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th rowspan="2">Index</th><th rowspan="2">Parameter Name</th><th rowspan="2">Default Value</th><th rowspan="2">Write Mode</th><th colspan="4">View</th><th rowspan="2">Description</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>29</td><td>INTEG_OPTS</td><td>0x0004</td><td></td><td></td><td></td><td></td><td>2</td><td>Specifies an integration optional function.
<table>
<tr><th>bit</th><th>Option Name</th><th>Description</th></tr>
<tr><td>0</td><td>Input 1 accumulate</td><td>Selects RATE or ACCUM input of IN_1.</td></tr>
<tr><td>1</td><td>Input 2 accumulate</td><td>Selects RATE or ACCUM input of IN_2.</td></tr>
<tr><td>2</td><td>Flow forward</td><td>Integrates forward flow (interprets reverse flow as zero).*</td></tr>
<tr><td>3</td><td>Flow reverse</td><td>Integrates reverse flow (interprets forward flow as zero).*</td></tr>
<tr><td>4</td><td>Use uncertain</td><td>Uses the input value of IN_1 or IN_2 whose status is “Uncertain” regarding it as a value of “Good”.</td></tr>
<tr><td>5</td><td>Use bad</td><td>Uses the input value of IN_1 or IN_2 whose status is “Bad” regarding it as a value of “Good”.</td></tr>
<tr><td>6</td><td>Carry</td><td>Carries over an excess exceeding the threshold at reset to the next integration.
(Note that this does not apply to UP_AUTO or DN_AUTO.)</td></tr>
<tr><td>7</td><td>Add zero if bad</td><td>Interprets an increment as zero if the status of the increment is “Bad”.</td></tr>
<tr><td>8</td><td>Confirm reset</td><td>After reset, rejects the next reset until “Confirm” is set to RESET_CONFIRM.</td></tr>
<tr><td>9</td><td>Generate reset event</td><td>Generates an alert event at reset.</td></tr>
<tr><td>10 to 15</td><td>Reserved</td><td></td></tr>
</table>
*If both forward and reverse flows are enabled or disabled, both forward and reverse flows are integrated.</td></tr>
<tr><td>30</td><td>CLOCK_PER</td><td>86400.0[sec]</td><td></td><td></td><td></td><td></td><td>4</td><td>Specifies the period at which a periodic reset is made.</td></tr>
<tr><td>31</td><td>PRE_TRIP</td><td>100000.0</td><td></td><td></td><td></td><td></td><td>4</td><td>Specifies an allowance applied before an integrated value exceeds the setpoint.</td></tr>
<tr><td>32</td><td>N_RESET</td><td>0.0</td><td></td><td>4</td><td></td><td>4</td><td></td><td>Indicates the number of resets in the range of 0 to 999999.</td></tr>
<tr><td>33</td><td>PCT_INCL</td><td>0.0[%]</td><td></td><td>4</td><td></td><td>4</td><td></td><td>The ratio of “the integrated values of the absolute values of the increments whose status is Good” to the “integrated values of the absolute values of the increments irrelevant to the status” PCT_INCL = 100 x (1−(msp of RTotal)/msp of ATotal))</td></tr>
<tr><td>34</td><td>GOOD_LIM</td><td>0.0[%]</td><td></td><td></td><td></td><td></td><td>4</td><td>The threshold of the ratio of “the integrated values of the increments whose status is Good” to all integrated values in which the status of OUT is “Good”</td></tr>
</table>

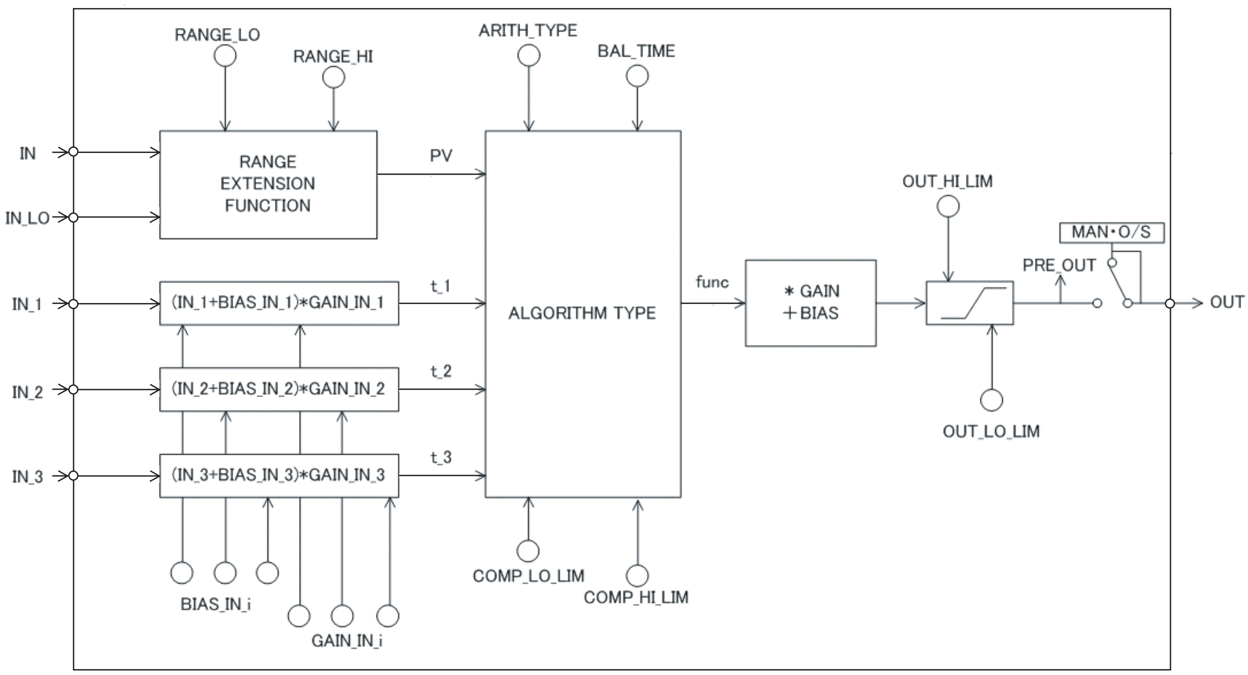
Index	Parameter Name	Default Value	Write Mode	View 1	View 2	View 3	View 4	Description
35	UNCERT_ LIM	0.0[%]					4	The threshold of the ratio of “the integrated values of the increments whose status is Good” to all the integrated values in which the status of OUT is “Uncertain”
36	OP_CMD_ INT	0		1		1		Operator command that resets integrated values
37	OUTAGE_ LIM	0.0					4	Maximum time for which values can be retained in the event of power failure. Does not affect the block operation.
38	RESET_ CONFIRM	0		2		2		Reset confirmation input Valid when the Confirm reset option of INTEG_OPTS is chosen
39	UPDATE_ EVT	0 0 0 0 0						Indicates event information if an update event occurs.
40	BLOCK_ALM	0 0 0 0 0						Indicates alarm information if a block alarm occurs.
41	ACCUM_ TOTAL	0	---					Cumulative totalized value (extended parameters are not reset)

Appendix 4. Arithmetic (AR) Block

The AR block switches two main inputs of different measurement ranges bumplessly and combines the result with three auxiliary inputs through the selected compensation function (10 types) to calculate the output.

A4.1 Functional Block Diagram

The diagram below shows the functional block diagram of the AR block.



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The AR block is divided into three sections to explain each function.

1. Input section...Makes a go/no-go decision on the use of an input value, switches the range, and determines the PV status.
2. Computation section...Makes calculations through ARITH_TYPE.
3. Output section...
   Applies GAIN multiplication and BIAS addition to the calculated result to perform limitation processing for output.

* The range extension function compensates the IN and IN_LO input values and realizes smooth input switching when two devices with different ranges are connected.

A4.2 Input Section

There are five inputs: IN and IN_LO main inputs and IN_1, IN_2, and IN_3 auxiliary inputs. IN and IN_LO are intended to connect devices with different measurement ranges and allow the use of switching a measurement range by selecting the measuring device. However, because there are slight differences between IN and IN_LO values even when the same item is measured, instantaneous switching causes abrupt changes in the output. To prevent this phenomenon, the Arithmetic block uses a function known as range extension to compensate the IN and IN_LO values between RANGE_HI and RANGE_LO. This enables the input to be switched smoothly. The result of the range extension function is substituted into PV to be used for calculations.

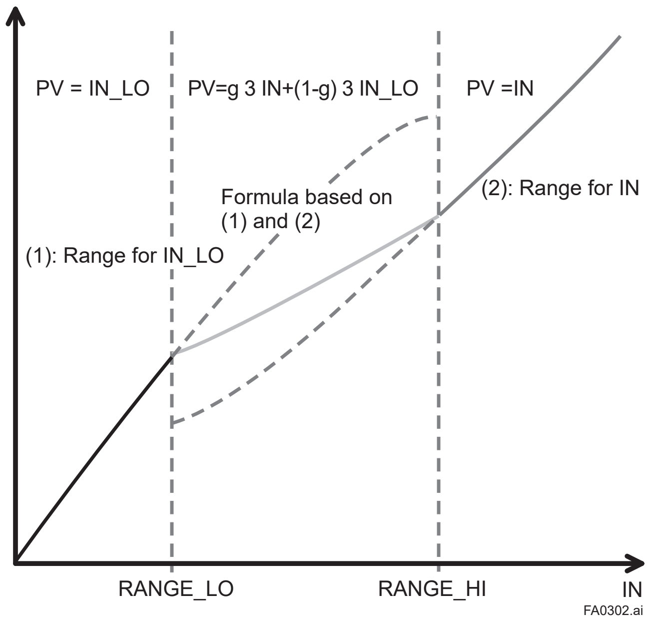
A4.2.1 Main Inputs

The range extension function determines the PV value in the following order:

1. If IN ≥ RANGE_HI => PV = IN
2. If IN ≤ RANGE_LO => PV = IN_LO
3. If RANGE_HI > IN > RANGE_LO => PV = g x IN + (1 - g) x IN_LO

g = (IN - RANGE_LO) / (RANGE_HI - RANGE_LO)

RANGE_HI and RANGE_LO are threshold values for switching two main inputs bumplessly.



PV is a parameter with status information, and PV status is determined with the value of “g”.

If “g” < 0.5 => The status of IN_LO is used
If “g” ≥ 0.5 => The status of IN is used

The determination of the status is made with a hysteresis of 10% provided for 0.5.

If RANGE_LO > RANGE_HI, the statuses of PV and OUT are “Bad.Configuration Error”. Then, “Configuration Error”. is output to BLOCK_ERR.

If the main input is one input, the input is reflected as is, RANGE_HI and RANGE_LO are not taken into account.

Example

RANGE_LO	20
RANGE_HI	300

In the above case, the followings are established:

IN = 310, IN_LO = 20 => PV = 310
IN = 230, IN_LO = 20 => g = (230−20) / (300−20) = 0.75
PV = 0.75 x 230 + (1−0.75) x 20 = 177.5
IN = 90, IN_LO = 20 => g = (90− 20) / (300−20) = 0.25
PV = 0.25 x 230 + (1-0.25) x 20 = 37.5
IN = 19, IN_LO = 10 => PV = 10

A4.2.2 Auxiliary Inputs

There are bias and gain parameters for the IN_1, IN_2, and IN_3 auxiliary inputs. The following shows the equation using them.

t_i = (IN_i + BIAS_IN_i) x GAIN_IN_i

The bias parameter is used for calculating absolute temperature or absolute pressure, while the gain parameter is used for normalization of square root extraction.

A4.2.3 INPUT_OPTS

INPUT_OPTS has an option that handles an input with “uncertain” or “bad” status as a “good” status input.

Bit	Function
0	Handles IN as a “good” status input if its status is “uncertain”.
1	Handles IN_LO as a “good” status input if its status is “uncertain”.
2	Handles IN_1 as a “good” status input if its status is “bad”.
3	Handles IN_1 as a “good” status input if its status is “uncertain”.
4	Handles IN_2 as a “good” status input if its status is “bad”.
5	Handles IN_2 as a “good” status input if its status is “uncertain”.
6	Handles IN_3 as a “good” status input if its status is “bad”.
7	Handles IN_3 as a “good” status input if its status is “uncertain”.
8 to 15	Reserved

There are options called “IN Use uncertain” and “IN_LO Use uncertain” for the IN and IN_LO inputs. When these options are valid, IN and IN_LO are internally interpreted as “good” IN and IN_LO even if their statuses are “uncertain”. (There is no option for “bad” status.)

For the IN_1, IN_2, and IN_3 auxiliary inputs, there are options known as “IN_i Use uncertain” and “IN_i Use bad”. If these options are valid, an IN_i with “uncertain” or “bad” status is internally interpreted as a “good” IN_i.

* The exception is that if each input status is “Bad.NotConnected”, INPUT_OPTS does not apply and the input remains bad.

A4.2.4 Relationship between the Main Inputs and PV

The value and PV status are determined with the statuses of two main inputs, INPUT_OPTS, and RANGE_LO and RANGE_HI.

- If the statuses of two main inputs are both "good",

  or both statuses of two main inputs are other than "good",

  See A4.2.1 Main Inputs.

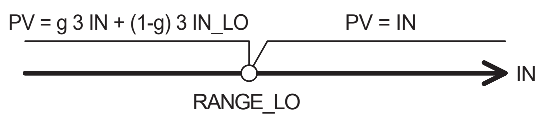
- If only one of the main inputs has "good" status after application of INPUT_OPTS,

  the PV value is determined as follows:

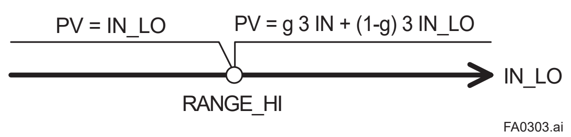
  − If the status of IN is "good" and the status of "IN_LO" is anything other than "good",
    IN > RANGE_LO => PV = IN
    IN ≤ RANGE_LO => See A4.2.1.

  − When the status of IN is other than Good and the status of IN_LO is Good,
    IN_LO < RANGE_HI => PV = IN_LO
    IN_LO ≥ RANGE_HI => See A4.2.1.

If the status of IN is "good" and that of "IN_LO" is anything other than "good"



If the status of IN is anything other than "good" and that of "IN_LO" is "good"



A4.3 Computation Section

A4.3.1 Computing Equations

This subsection shows computing equations used in the computation section:

1) Flow rate compensation (linear)

func = PV x f

f = (t_1/t_2)

2) Flow rate compensation (square root)

func = PV x f

f = sqrt(t_1/t_2/t_3)

3) Flow rate compensation (approximate formula)

func = PV x f

f = sqrt(t_1 x t_2 x t_3 x t_3)

4) Calorie calculation

func = PV x f

f = (t_1−t_2)

5) Multiplication and division

func = PV x f

f = ((t_1/t_2) + t_3)

6) Average calculation

func = (PV + t_1 + t_2 + t_3)/N

where N: number of inputs

7) Summation

func = PV + t_1 + t_2 + t_3

8) Polynomial computation

func = PV + t_1^2 + t_2^3 + t_3^4

9) HTG level compensation

func = (PV−t_1)/(PV−t_2)

10) Polynomial computation

func = PV + t_1 x PV^2 + t_2 x PV^3 + t_3 x PV^4

* Precaution for computation

Division by 0 => If a value is divided by “0”, the calculation result is interpreted as $10^{37}$and, depending with core, a plus sign is added to it

Negative square root => The square root of an absolute value is extracted and a minus sign is added to it.

A4.3.2 Compensated Values

In computing equations 1) to 5) in A4.3.1, the value “f” is restricted by the COMP_HI_LIM or COMP_LO_LIM parameter. In this case, the value “f” is treated as follows:

If “f” > COMP_HI_LIM

f = COMP_HI_LIM

If “f” < COMP_LO_LIM

f = COMP_LO_LIM

A4.3.3 Average Calculation

In computing equation 6) in A4.3.1, the average of input value is calculated. Here, since it is necessary to obtain N, the number of inputs, determine to see if the sub-status of each input is “Not Connected”. Note that the main inputs may be accepted if IN or IN_LO is not in “Not Connected” sub-status. In this case, the number of inputs that are not in “Not Connected” sub-status is regarded as “N”.

A4.4 Output Section

After executing the computing equation, the block applies a gain to the calculated result and then adds a bias to it.
It then substitutes the result into PRE_OUT and if the mode is in AUTO, the value of PRE_OUT is taken as OUT.

PRE_OUT = func x GAIN + BIAS

Where func: result of computing equation execution

OUT = PRE_OUT (when the mode is in AUTO)

Next, the block performs limitation processing (OUT_HI_LIM, OUT_LO_LIM). This processing is described as follows with respect to the value of PRE_OUT.

If PRE_OUT > OUT_HI_LIM
PRE_OUT = OUT_HI_LIM

The “High Limited” processing is applied to the status of PRE_OUT.

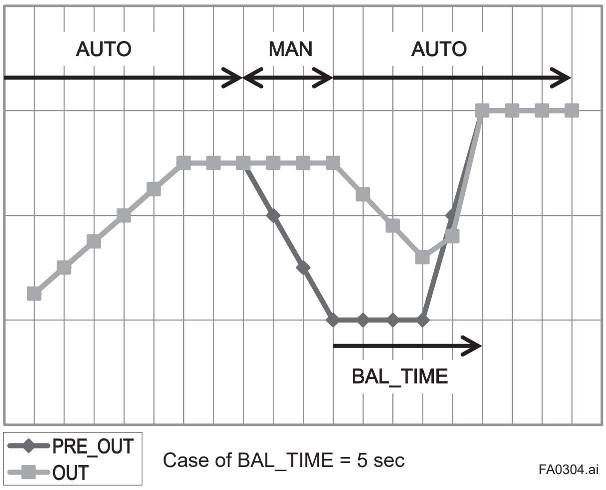
If PRE_OUT< OUT_LO_LIM
PRE_OUT = OUT_LO_LIM

The “Low Limited” processing is applied to the status of PRE_OUT.

A4.4.1 Mode Handling

Mode	Output
Auto	OUT=PRE_OUT
MAN	For output of OUT, the OUT value in the Auto mode just before change to MAN or O/S is retained.
O/S	

In the Manual mode (including O/S), the value of OUT in the Auto mode just before a change to the Manual mode is held, or the value written to OUT is output.
If the mode is switched from Manual to Auto, the output value of OUT that is linearly changed with respect to the value of PRE_OUT for time set by BAL_TIME is output. The PRE_OUT always indicates the results of calculation. After elapse of BAL_TIME, OUT = PRE_OUT is established.
Note that if the value of BAL_TIME is changed during the linear change of the OUT value, it is not reflected. The value of BAL_TIME will be reflected only after the mode is changed the next time.



Case of BAL_TIME = 5 sec

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The value of OUT is represented with the following equation.

$$y_n = y_{n-1} + (x_n - y_{n-1}) / (\alpha - n)$$

The value of $\alpha = (T / t_c) + 1$ *...The value of T/t_c truncates digits to the right of the decimal point.

where y : OUT
x : PRE_OUT
t_c : period of execution
T : BAL_TIME
n : period

A4.4.2 Status Handling

The setting of INPUT_OPTS is applied to the input status. When INPUT_OPTS is applied, there are cases where the PV status becomes “good” even if the status of main inputs is “uncertain”, or the status of auxiliary inputs is “uncertain” or “bad”.
The PV status is classified by the following:

- If the statuses of two main inputs are both “good”,

  Or if both statuses of two main inputs are other than “good”

  See A4.2.1 Main Inputs.

- If only one of the statuses of two main inputs is “good”

  - If the status of IN is “good” and the status of “IN_LO” is anything other than “good”

    IN > RANGE_LO => The status of IN applies.

    IN ≤ RANGE_LO => See A4.2.1 Main Inputs.

  - If the status of IN is anything other than “good” and the status of “IN_LO” is “good”

    IN_LO < RANGE_HI => The status of IN_LO applies

    IN_LO ≥ RANGE_HI => See A4.2.1 Main Inputs.

The exception is that if RANGE_LO > RANGE_HI, the PV status is made “Bad. ConfigurationError”.

The input status irrelevant to the computing equation selected by ARITH_TYPE will be ignored and does not affect other statuses. The statuses of outputs (OUT.Status and PRE_OUT.Status) are interpreted as the status of the worst input among the statuses of PV and auxiliary inputs (IN_1, IN_2, and IN_3) to which INPUT_OPTS has been applied.

Example)

<table>
<tr><th colspan="2"></th><th>Case 1</th><th>Case 2</th><th>Case 3</th></tr>
<tr><td colspan="2">PV</td><td colspan="3">Good</td></tr>
<tr><td colspan="2">IN_1</td><td colspan="3">Uncertain</td></tr>
<tr><td colspan="2">IN_2</td><td colspan="3">Bad</td></tr>
<tr><td colspan="2">IN_3</td><td colspan="3">Bad</td></tr>
<tr><td rowspan="3">INPUT_OPTS</td><td>IN_1</td><td>Handled as a “good” input if its status is “uncertain”.</td><td colspan="2">No option</td></tr>
<tr><td>IN_2</td><td colspan="2">Handled as a “good” input if its status is “bad”.</td><td>No option</td></tr>
<tr><td>IN_3</td><td colspan="3">No option</td></tr>
<tr><td colspan="2">ARITH_TYPE</td><td colspan="3">1) Flow rate compensation (linear) in A4.3.1, “Computing Equations”</td></tr>
<tr><td colspan="2">OUT.Status</td><td>Good</td><td>Uncertain</td><td>Bad</td></tr>
</table>

A4.5 List of the Arithmetic Block Parameters

Relative Index	Parameter Name	Write mode	Valid Range	Default Value	Description / Remarks
0	Block Header	O/S		TAG="AR"	Information on this block such as block tag, DD revision, and execution time.
1	ST_REV			0	Indicates the revision level of the set parameters associated with the Arithmetic function block. This revision is updated if the setting value is changed. Used to check for parameter change, etc.
2	TAG_DESC			Space (32 characters)	Universal parameter to store a comment explaining tag contents.
3	STRATEGY			1	Universal parameter intended to be used for the high-level system to separate function blocks.
4	ALERT_KEY		1-255	1	Key information to identify where an alert takes place. Generally, this parameter is used by the high-level system to identify specific areas in a plant that are under the control of specific operators, to separate necessary alerts only. This is one of the universal parameters.
5	MODE_BLK			AUTO	Universal parameter to show a block operation state. Consists of Actual mode, Target mode, Permit mode and Normal mode.
6	BLOCK_ERR			0	Indicates the error statuses related to the own block. The bit used by the AR function block is as follows: bit1: Block Configuration Error bit15: O/S Mode
7	PV			0	The result of a range extension function is substituted into this. From the viewpoint of the computing equation, PV is the main input.
8	OUT	MAN		0	Output
9	PRE_OUT			0	Always indicates the calculation result. The value is substituted into OUT in the AUTO mode.
10	PV_SCALE	O/S			Indicates PV scaling. (for making a memo)
11	OUT_RANGE				Output scaling for the host (for making a memo)
12	GRANT_DENY			0	The parameter for checking if various operations have been executed. Set a bit corresponding to the GRANT parameter before various operations are executed. Check the DENY parameter after the operation. If the bit for the operation is not set, it indicates that the operation was executed.

<table>
<tr><th>Relative Index</th><th>Parameter Name</th><th>Write mode</th><th>Valid Range</th><th>Default Value</th><th>Description / Remarks</th></tr>
<tr><td>13</td><td>INPUT_OPTS</td><td></td><td></td><td>0</td><td>Determines whether an input is used as a “good” input when the input status is “bad” or “uncertain”.
<table>
<tr><th>Bit</th><th>Function</th></tr>
<tr><td>0</td><td>Handles IN as a “good” status input if its status is “uncertain”.</td></tr>
<tr><td>1</td><td>Handles IN_LO as a “good” status input if its status is “uncertain”.</td></tr>
<tr><td>2</td><td>Handles IN_1 as a “good” status input if its status is “uncertain”.</td></tr>
<tr><td>3</td><td>Handles IN_1 as a “good” status input if its status is “bad”.</td></tr>
<tr><td>4</td><td>Handles IN_2 as a “good” status input if its status is “uncertain”.</td></tr>
<tr><td>5</td><td>Handles IN_2 as a “good” status input if its status is “bad”.</td></tr>
<tr><td>6</td><td>Handles IN_3 as a “good” status input if its status is “uncertain”.</td></tr>
<tr><td>7</td><td>Handles IN_3 as a “good” status input if its status is “bad”.</td></tr>
<tr><td>8 to 15</td><td>Reserved</td></tr>
</table></td></tr>
<tr><td>14</td><td>IN</td><td></td><td></td><td>0</td><td>Input block</td></tr>
<tr><td>15</td><td>IN_LO</td><td></td><td></td><td>0</td><td>Input for a low-range process value.
This is used for the range extension function.</td></tr>
<tr><td>16</td><td>IN_1</td><td></td><td></td><td>0</td><td>Auxiliary input 1</td></tr>
<tr><td>17</td><td>IN_2</td><td></td><td></td><td>0</td><td>Auxiliary input 2</td></tr>
<tr><td>18</td><td>IN_3</td><td></td><td></td><td>0</td><td>Auxiliary input 3</td></tr>
<tr><td>19</td><td>RANGE_HI</td><td></td><td></td><td>0</td><td>High limit for switching to a high-range process value (IN) by the range extension function.</td></tr>
<tr><td>20</td><td>RANGE_LO</td><td></td><td></td><td>0</td><td>Low limit for switching to a low-range process value (LO_IN) by the range extension function.</td></tr>
<tr><td>21</td><td>BIAS_IN_1</td><td></td><td></td><td>0</td><td>IN_1 bias</td></tr>
<tr><td>22</td><td>GAIN_IN_1</td><td></td><td></td><td>0</td><td>IN_1 gain</td></tr>
<tr><td>23</td><td>BIAS_IN_2</td><td></td><td></td><td>0</td><td>IN_2 bias</td></tr>
<tr><td>24</td><td>GAIN_IN_2</td><td></td><td></td><td>0</td><td>IN_2 gain</td></tr>
<tr><td>25</td><td>BIAS_IN_3</td><td></td><td></td><td>0</td><td>IN_3 bias</td></tr>
<tr><td>26</td><td>GAIN_IN_3</td><td></td><td></td><td>0</td><td>IN_3 gain</td></tr>
<tr><td>27</td><td>COMP_HI_LIM</td><td></td><td></td><td>+INF</td><td>High limit of compensation factor f</td></tr>
<tr><td>28</td><td>COMP_LO_LIM</td><td></td><td></td><td>-INF</td><td>Low limit of compensation factor f</td></tr>
</table>

<table>
<tr><th>Relative Index</th><th>Parameter Name</th><th>Write mode</th><th>Valid Range</th><th>Default Value</th><th>Description / Remarks</th></tr>
<tr><td>29</td><td>AR IT H_TY PE</td><td>1 to 10</td><td></td><td>0x01</td><td>Computation algorithm identification no.
<table>
<tr><th>Value</th><th>Selection Name</th><th>Description</th></tr>
<tr><td>1</td><td>Flow compensation, linear</td><td>Flow rate compensation (linear)</td></tr>
<tr><td>2</td><td>Flow compensation, square root</td><td>Flow rate compensation (square root)</td></tr>
<tr><td>3</td><td>Flow compensation, approximate</td><td>Flow rate compensation (approximate formula)</td></tr>
<tr><td>4</td><td>BTU flow (*)</td><td>Calorie calculation</td></tr>
<tr><td>5</td><td>Traditional Multiply Divide</td><td>Multiplication and division</td></tr>
<tr><td>6</td><td>Average</td><td>Average calculation</td></tr>
<tr><td>7</td><td>Traditional summer</td><td>Summation</td></tr>
<tr><td>8</td><td>Fourth order Polynomial, Type1</td><td>4th-order (auxiliary input) polynomial</td></tr>
<tr><td>9</td><td>HTG level compensation (*)</td><td>HTG level compensation</td></tr>
<tr><td>10</td><td>Fourth order Polynomial, Type2</td><td>4th-order (main input) polynomial computation</td></tr>
</table>
* BTU stands for British thermal unit.
HTG stands for hydrostatic tank gauging.</td></tr>
<tr><td>30</td><td>BAL_TIME</td><td>More than 0</td><td></td><td>0</td><td>Time taken to return to the set value</td></tr>
<tr><td>31</td><td>BIAS</td><td></td><td></td><td>0</td><td>Bias value used to calculate the output</td></tr>
<tr><td>32</td><td>GAIN</td><td></td><td></td><td>1</td><td>Gain value used to calculate the output</td></tr>
<tr><td>33</td><td>OUT_HI_LIM</td><td></td><td></td><td>+INF</td><td>Maximum output value</td></tr>
<tr><td>34</td><td>OUT_LO_LIM</td><td></td><td></td><td>-INF</td><td>Minimum output value</td></tr>
<tr><td>35</td><td>UPDATE_EVT</td><td></td><td></td><td></td><td>Indicates contents of the event when an update event (a change to the setpoint) occurs.</td></tr>
<tr><td>36</td><td>BLOCK_ALM</td><td></td><td></td><td></td><td>Indicates contents of the alarm when a block alarm occurs.</td></tr>
</table>

Appendix 5. Link Master Functions

A5.1 Link Active Scheduler (LAS)

A link active scheduler (LAS) is a device to perform the network control function for Fieldbus. Fieldbus always needs one LAS on the link.
This product supports the following LAS functions.

1	PN transmission function	Identifies a fieldbus device newly connected to the bus.* PN (ProbeNode)
2	PT transmission function	Passes a token to a device on the link.* PT (PassToken)
3	CD transmission function	Starts up a scheduled transmission to a device on the link. *CD (CompleData)
4	Time synchronization function	Periodically transmits the time information to the link. Also, returns the time information in response to a request from a device.
5	Live list equalization function	Sends the live list information to the link master device on the link.
6	LAS transfer function	Function to transfer the right to be the LAS to another link master device.

A5.2 Link Master (LM)

Any devices having the function as LAS are called a link master (LM). Though there must be always one LAS on the link, there can be multiple LM devices. (Figure A5.1)
When the LAS stops working, another LM device on the link starts functioning as the LAS.

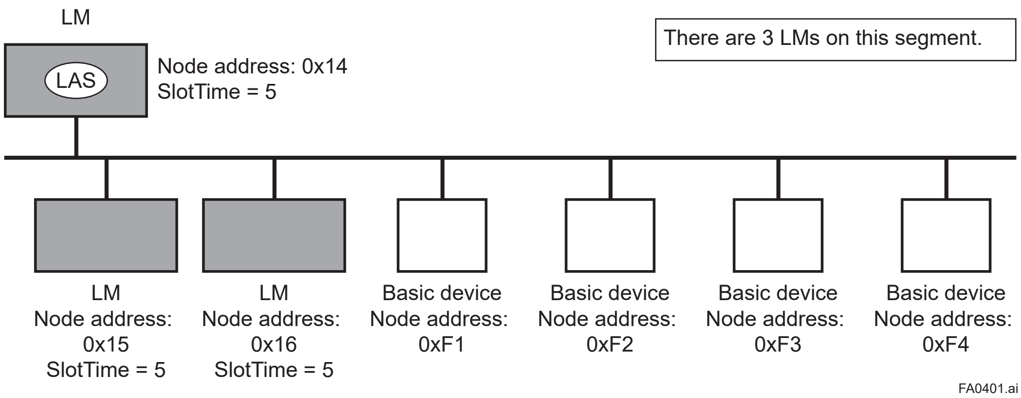


Figure A5.1 LM Device and Basic Device

A5.3 Transition of LM Function

There are the following procedures for an LM device to become the LAS:

(1) If the LM device judges that there is no LAS on the link, in such a case as when the link starts up or when the LAS fails*, the LM declares itself as the LAS, and then becomes the LAS.* Backup for LAS (Figure A5.2)

(2) The LM device requests the LAS on the link to transfer the right of being the LAS, and then becomes the LAS.

In either case, if there are multiple LM devices on the link, the LM device which has the smallest V(ST) x V(TN) value becomes the LAS.

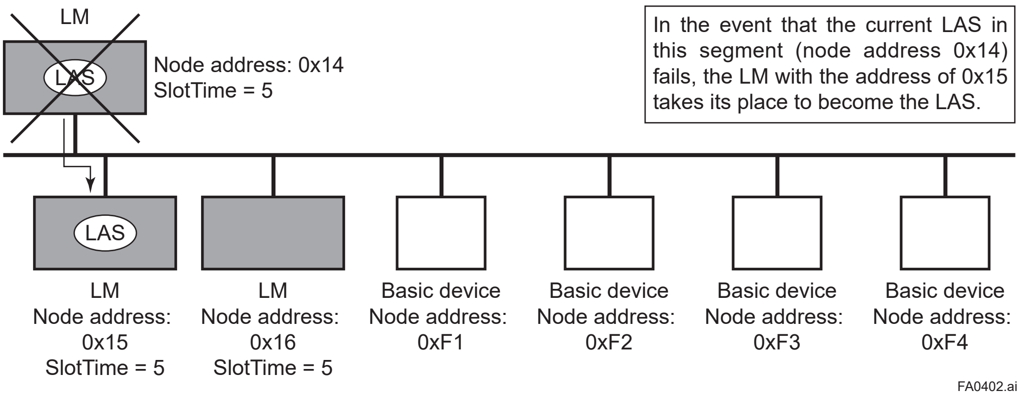
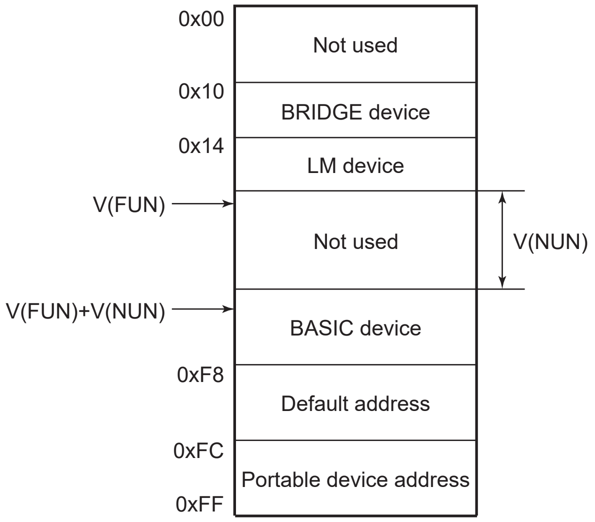


Figure A5.2 Backup of LM Function

To set up this product as a device that is capable of backing up the LAS, follow the procedures (1), (2) and (3) below.

Note: When changing the settings of this product, add this product to the link where an LAS is running. After making changes to the settings, do not turn off the power to this product for at least 30 seconds.

(1) Set the node address of this product. In general, set an address from 0x14 to [V(FUN) - 1] for the LM device.



Note 1: BRIDGE device: A linking device which brings data from one or more H1 networks.
Note 2: LM device: with bus control function (Link Master function)
Note 3: BASIC device: without bus control function

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Figure A5.3 Node Address Ranges

(2) In the LAS settings of this product, set the values of V(ST), V(MRD), and V(MID) to the lowest capability values in all the devices on the link.

(Ex.) <Check of capacity value of each device>

DlmeBasicInfo (Index 282(SM))

Subindex	Element	This Device	Device 1	Device 2	Device 3	Description
1	SlotTime	4	8	10	20	Capability value for V (ST)
3	MaxResponse Delay	3	6	3	5	Capability value for V (MRD)
6	MinInterPdu Delay	4	8	12	10	Capability value for V (MID)

In the above case, the settings for this product should be as follows.

ConfiguredLinkSettingsRecord (Index 293(SM))

Subindex	Element	Setting Value (Default Value)	Description
1	SlotTime	20(4095)	V (ST)
3	MaxResponseDelay	6(5)	V (MRD)
6	MinInterPduDelay	12(12)	V (MID)

(3) Set the values of LAS setting V(FUN) and V(NUN) of this product so that they include the node addresses of all devices on the link. (See Figure A5.3.)

ConfiguredLinkSettingsRecord (Index 293(SM))

Subindex	Element	Default Value	Description
4	FirstUnpolledNodeId	0x25	V (FUN)
7	NumConsecUnpolledNodeId	0xBA	V (NUN)

A5.4 LM Functions

A5.4.1 LM Function List

No.	Function Name	Function
1	LM initialization function	Among LM devices, at startup, the device with the smallest [V(ST) x V(TN)] value becomes the LAS. At all times, each LM device is monitoring whether or not the BUS line is in a no-signal state.
2	StartUp of other nodes (PN and Node Activation SPDU transmissions)	Transmits a PN (Probe Node). Sends Node Activation SPDU to the device which returns a new PR (Probe Response) message.
3	PT transmission processing (including FinalBit processing)	Passes a PT (Pass Token) message to devices included in the live list sequentially. Monitors the RT (Return Token) and final bit returned in reply to the PT.
4	CD transmission function	Transmits a CD (Compel Data) message at the scheduled times.
5	Time synchronization function	Supports periodic TD (Time Distribution) transmissions and transmissions of a reply to a CT (Compel Time).
6	DomainDownload Server	Sets the schedule information. The schedule information can be equalized only when the Domain Download command is carried out from outside the LM in question. (The version information of the schedule is usually monitored, but no action is taken even when it is different.)
7	Live list equalization	Transmits SPDU messages to the LM device to equalize live lists.
8	LAS transfer function	Function to transfer the right of being the LAS to another LM device.
9	Reading/writing function of LM-related NMIB	See Section A5.5.
10	Round Trip Delay Reply (RR) DLPDU reply function	Not yet supported in the current version.
11	Long Address	Not yet supported in the current version.

A5.5 LM Parameters

A5.5.1 LM Parameter List

The tables below show the list of LM parameters.

Index(SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Value	Write mode	Description/ Remarks
283	PLME_BASIC_ CHARACTERISTICS	0		R	
		1 ChannelStatisticsSupported	0x00		
		2 MediumAndDataRatesSupported	0x4900000000000000		
		3 IecVersion	1 (0x1)		
		4 NumOfChannels	1 (0x1)		
		5 PowerMode	0 (0x0)		
284	CHANNEL_STATES	0		R	
		1 channel-1	0 (0x0)		
		2 channel-2	128 (0x80)		
		3 channel-3	128 (0x80)		
		4 channel-4	128 (0x80)		
		5 channel-5	128 (0x80)		
		6 channel-6	128 (0x80)		
		7 channel-7	128 (0x80)		
		8 channel-8	128 (0x80)		
285	PLME_BASIC_INFO	0		R	
		1 InterfaceMode	0 (0x0)		
		2 LoopBackMode	0 (0x0)		
		3 XmitEnabled	1 (0x1)		
		4 RcvEnabled	1 (0x1)		
		5 PreferredReceiveChannel	1 (0x1)		
		6 MediaTypeSelected	73 (0x49)		
		7 ReceiveSelect	1 (0x1)		
286	DLME_LINK_MASTER_CAPABILITIES_VARIABLE		0x04	RW	
287	DLME_LINK_ MASTER_ INFO_RECORD	0		RW	
		1 MaxSchedulingOverhead	0		
		2 DefMinTokenDelegTime	100		
		3 DefTokenHoldTime	300		
		4 TargetTokenRotTime	4096		
		5 LinkMaintTokHoldTime	400		
		6 TimeDistributionPeriod	5000		
		7 MaximumInactivityToClaimLasDelay	2		
		8 LasDatabaseStatusSpduDistributionPeriod	6000		
288	PRIMARY_LINK_MASTER_FLAG_VARIABLE		0	RW	LAS: True = 0xFF; Non-LAS: False = 0x00
289	LIVE_LIST_STATUS_ARRAY_VARIABLE		0	R	
290	MAX_TOKEN_ HOLD_ TIME_ARRAY	0		RW	
		1 Element1	0x0000(x16), 0x012C(x16)		
		2 Element2	0x012C(x5), 0x0000(x27)		
		3 Element3	0x0000(x32)		
		4 Element4	0x0000(x32)		
		5 Element5	0x0000(x32)		
		6 Element6	0x0000(x32)		
		7 Element7	0x0000(x31), 0x012C(x1)		
		8 Element8	0x012C(x32)		

Index(SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Value	Write mode	Description/ Remarks
291	BOOT_OPERAT_ FUNCTIONAL_ CLASS		Specified at the time of ordering	RW	0x01 (basic device); 0x02 (LM)
292	CURRENT_LINK_ SETTING_RECORD	0		R	Settings for LAS
		1 SlotTime	0		
		2 PerDlpduPhlOverhead	0		
		3 MaxResponseDelay	0		
		4 FirstUnpolledNodeId	0		
		5 ThisLink	0		
		6 MinInterPduDelay	0		
		7 NumConseeUnpolledNodeId	0		
		8 PreambleExtension	0		
		9 PostTransGapExtension	0		
		10 MaxInterChanSignalSkew	0		
		11 TimeSyncClass	0		
293	CONFIGURED_ LINK_ SETTING_RECORD	0		RW	
		1 SlotTime	4095		
		2 PerDlpduPhlOverhead	4		
		3 MaxResponseDelay	5		
		4 FirstUnpolledNodeId	37		
		5 ThisLink	0		
		6 MinInterPduDelay	12		
		7 NumConseeUnpolledNodeId	186		
		8 PreambleExtension	2		
		9 PostTransGapExtension	1		
		10 MaxInterChanSignalSkew	0		
		11 TimeSyncClass	4		
294	LINK_SCHEDULE_ACTIVATION_VARIABLE		0 (0x0)	RW	
295	LINK_ SCHEDULE_LIST_ CHARACTERISTICS_ RECORD	0		R	
		1 NumOfSchedules	2		
		2 NumOfSubSchedulesPerSchedule	5		
		3 ActiveScheduleVersion	0		
		4 ActiveSheduleOdIndex	0		
		5 ActiveScheduleStartingTime	0		
296	DLME_SCHEDULE_ DESCRIPTOR.1	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
297	DLME_SCHEDULE_ DESCRIPTOR.2	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
298	DOMAIN.1				Read/write impossible. Get-OD is possible.
299	DOMAIN.2				Read/write impossible. Get-OD is possible.

A5.5.2 Descriptions for LM Parameters

The following describes LM parameters of this product.
Do not turn off the power to this product for 60 seconds after making a change to parameter settings.

(1) DlmeLinkMasterCapabilitiesVariable

Bit Position	Meaning	Description	Value
B3: 0x04	LAS Schedule in Non-volatile Memory	Indicates whether the LAS schedule can (= 1) or cannot (= 0) be saved to the non-volatile memory	1
B2: 0x02	Last Values Record Supported	Indicates whether to support (= 1) or not to support (= 0) LastValuesRecord.	0
B1: 0x01	Link Master Statistics Record Supported	Indicates whether to support (= 1) or not to support (= 0) DlmeLinkMasterStatisticsRecord.	0

(2) DlmeLinkMasterInfoRecord

Sub-index	Element	Size [B]	Description
1	MaxSchedulingOverhead	1	V(MSO)
2	DefMinTokenDelegTime	2	V(DMDT)
3	DefTokenHoldTime	2	V(DTHT)
4	TargetTokenRotTime	2	V(TTRT)
5	LinkMaintTokHoldTime	2	V(LTHT)
6	TimeDistributionPeriod	4	V(TDP)
7	MaximumInactivityToClaimLasDelay	2	V(MICD)
8	LasDatabaseStatusSpduDistributionPeriod	2	V(LDDP)

(3) PrimaryLinkMasterFlagVariable

Variable which explicitly declares the LAS. Writing “TRUE” (0xFF) to this parameter in a device causes that device to attempt to become the LAS. The request of writing “TRUE” to this parameter in a device is rejected if the value of the same parameter in any other device that has a smaller node address is true.

(4) LiveListStatusArrayVariable

The parameter is a variable of 32[B] and each bit represents the status of whether a device is live (1) or not (0).
The leading bit corresponds to the device address 0x00, and the final bit to the device address 0xFF.
For example, if there are device addresses 0x10 and 0x15 on the bus, the value is as follows:

```
0x00 00 84 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00
     Bit corresponds    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 ...
                       0x00                           0x10      0x15
```

(5) MaxTokenHoldTimeArray

An 8 (64 byte array variable, in which each set of 2 bytes represents the delegation time (set as an octet time) assigned to a device. The delegation time denotes a time period that is given to a device by means of a PT message sent from the LAS within each token circulation cycle.
The unit is in octet time.
The leading 2 bytes correspond to the device address 0x00, and the final 2 bytes to the device address 0xFF.
Specify the subindex to access this parameter.

(6) BootOperatFunctionalClass

Writing 1 to this parameter in a device and restarting the device causes the device to start as a basic device.
On the contrary, writing 2 to this parameter and restarting the device causes the device to start as an LM.

(7) CurrentLinkSettingRecord/ConfiguredLinkSettingsRecord

CurrentLinkSettingRecord indicates the bus parameter currently used.
On the other hand, ConfiguredLinkSettingsRecord indicates the bus parameter to be used when the device becomes the LAS.
If the device is LAS, both parameters have the same value.

Sub-index	Element	Size [B]	Description
1	SlotTime	2	V(ST)
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	V(MRD)
4	FirstUnpolledNodeId	1	V(FUN)
5	ThisLink	2	V(TL)
6	MinInterPduDelay	1	V(MID)
7	NumConsecUnpolledNodeId	1	V(NUN)
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)
11	TimeSyncClass	1	V(TSC)

(8) DlmeBasicInfo

Sub-index	Element	Size [B]	Description
1	SlotTime	2	Indicates the capability value for V(ST) of the device.
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	Indicates the capability value for V(MRD) of the device.
4	ThisNode	1	V(TN), Node Address
5	ThisLink	2	V(TL), link-id
6	MinInterPduDelay	1	Indicates the capability value for V(MID) of the device.
7	TimeSyncClass	1	Indicates the capability value for V(TSC) of the device.
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)

(9) PlmeBasicCharacteristics

Sub-index	Element	Size [B]	Value	Description
1	Channel Statistics Supported	1	0	Statistics information are not supported.
2	Medium AndData Rates Supported	8	0x4900000000000000	Wire medium, voltage mode, and 31.25 kbps are supported.
3	IceVersion	2	1	Indicates the version for IEC Physical Layer Entity.
4	NumOf Channels	1	1	
5	Power Mode	1	1	0: Bus Powered 1: Self Powered

(10) ChannelStates

Sub-index	Element	Size [B]	Value	Description
1	Channel 1	1	0x00	In Use, No Bad since last read, No Silent since last read, No Jabber since last read, Tx Good, Rx Good
2	Channel 2	1	0x80	Unused
3	Channel 3	1	0x80	Unused
4	Channel 4	1	0x80	Unused
5	Channel 5	1	0x80	Unused
6	Channel 6	1	0x80	Unused
7	Channel 7	1	0x80	Unused
8	Channel 8	1	0x80	Unused

(11) PlmeBasicInfo

Sub-index	Element	Size [B]	Value	Description
1	InterfaceMode	1	0	0: Half Duplex 1: Full Duplex
2	LoopBackMode	1	0	0: Disabled 1: MAU 2: MDS
3	XmitEnabled	1	0x01	Channel 1 is enabled.
4	RcvEnebled	1	0x01	Channel 1 is enabled.
5	PreferredReceive Channel	1	0x01	Channel 1 is used for reception.
6	MediaType Selected	1	0x49	wire medium, voltage mode, 31.25 kbps are selected.
7	ReceiveSelect	1	0x01	Channel 1 is used for reception.

(12) LinkScheduleActivationVaribale

Writing the version number of an LAS schedule, which has already been downloaded to the domain, to this parameter causes the corresponding schedule to be executed.
On the other hand, writing 0 to this parameter stops the active schedule which is being executed.

(13) LinkScheduleListCharacteristicsRecord

Sub-index	Element	Size [B]	Description
1	NumOf Schedules	1	Indicates the total number of LAS schedules that have been downloaded to the domain.
2	NumOfSub SchedulesPer Schedule	1	Indicates the maximum number of sub-schedules an LAS schedule can contain.
3	ActiveSchedule Version	2	Indicates the version number of the schedule currently executed.
4	ActiveSchedule OdIndex	2	Indicates the index number of the domain that stores the schedule currently executed.
5	ActiveSchedule StaringTime	6	Indicates the time when the current schedule began being executed.

(14) DlmeScheduleDescriptor

This parameter exists for the same number as the total number of domains, and each describes the LAS schedule downloaded to the corresponding domain.
For the domain to which a schedule has not yet been downloaded, the values in this parameter are all zeros.

Sub- index	Element	S ize	Description
1	Version	2	Indicates the version number of the LAS schedule downloaded to the corresponding domain.
2	Macrocycle Duration	4	Indicates the macro cycle of the LAS schedule downloaded to the corresponding domain.
3	TimeResolution	2	Indicates the time accuracy that is required to execute the LAS schedule downloaded to the corresponding domain.

(15) Domain

This parameter is impossible to read/write. Get-OD is possible.
To this parameter, the LAS schedule can be downloaded with GenericDomainDownload.

NOTE

When downloading a LAS schedule to this product, the maximum allowable linkages between devices are 45.

A5.6 FAQs

Q1. When the LAS stops, this products does not back it up by becoming the LAS. Why?

A1-1. Is this product running as the LM device?
-> Check that the value of BootOperatFunctionalClass (index 291) is 2 (indicating that it is an LM).

A1-2. Check that the relation of V(ST) and V(TN) as LM device of this product is as follows:

This Device		Other LM devices
V(ST) x V(TN)	<	V(ST) x V(TN)

Q2. How can I make this product become the LAS while LAS is running?

A2-1. Check that the version numbers of the active schedules in the current LAS and this product are the same by reading:
-> LinkScheduleListCharacteristicsRecord (index 295 for this product)
- ActiveScheduleVersion(SubIndex-3)

A2-2. Make this product declare itself to become the LAS.
-> Set PrimaryLinkMasterFlagVariable in the current LAS to 0x00(FALSE).
Then, set PrimaryLinkMasterFlagVariable (index 288) in this product to 0xFF(TRUE).

Q3. On a link where this product works as the LAS, another device cannot be connected. How come?

A3-1. Check that the bus parameter as being the LAS for this product and the bus parameter indicating the capabilities of the device that cannot be connected are as follows:

This product		Problematic device
V(ST)	>	V(ST)
V(MID)	>	V(MID)
V(MRD)	>	V(MRD)

-> This product: ConfiguredLinkSettingsRecord (index 293) V(ST), V(MID), V(MRD)
-> Problematic device: DlmeBasicInfo V(ST), V(MID), V(MRD)

A3-2. Check that the node address of the problematic device is not included in the V(FUN) + V(NUN) address of this product.

Q4. There is no LAS on the bus, and communication with the LAS cannot be established.

A4-1. Check that LAS is connected to the bus. (To use this product as LAS, perform the following operations in A5.3 (1), (2) and (3).)

A4-2. Set the LAS parameter to the operating parameter of this product. (Reference: 5.2 Network Definition)

LAS		This product	
V(ST)	>	V(ST)	(4 or more)
V(MID)	>	V(MID)	(4 or more)
V(MRD)	>	V(MRD)	(3 or more)

A4-3. Check that the address of this product is correct. (Reference: 5.2 Network Definition) The address of this product is;

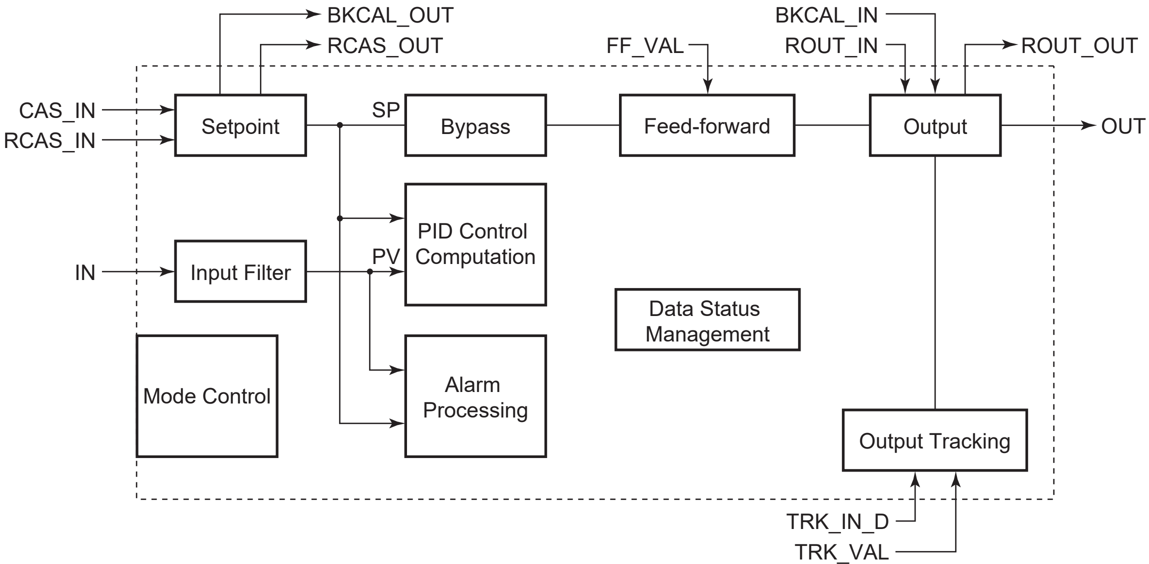
- Outside the LAS parameter V(FUN) to V(FUN) + V(NUN).
- Not the default address (0xF8 to 0xFB).

Appendix 6. PID Block

The PID block performs the PID calculation based on the deviation of the measured value (PV) from the setpoint (SP).
The PID block is generally used for constant-setpoint and tracking control.

A6.1 Functional Block Diagram

The functional block diagram of the PID block is shown below.



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A6.2 Functions of PID Block

The control calculation processing provided in the PID block has the following functions.

Control Calculation Processing	Description
PID control	Calculates the control output using the PID control algorithm.
Control output action	Converts the change in control output (ΔMV) for each control period to the manipulated value (MV) that is to be actually output. Supports “velocity type” as an operation of operational output.
Direction of control action	Switches the action direction of output between forward and reverse based on the changes in the deviation.
Control action bypass	When the bypass is set, the SP value is scaled to the OUT range and output as OUT.
Feed-forward	Adds the external compensation value FF_VAL to the output signal from the PID computation.
Measured-value tracking	Equalizes the setpoint (SP) to the measured value (PV).
Setpoint limiter	Limits the value of setpoint (SP) within the high/low limits.
External-output tracking	Converts TRK_VAL to the scale of OUT and outputs it.
Mode change	The PID block has the following eight modes: O/S, IMan, Lo, Man, Auto, Cas, RCas, and ROut.
Bumpless transfer	Switches the operational output value (OUT) without a sudden change at changing block modes and switching the operational output value (OUT) at the cascade downstream block.
Initialization and manual fallback	Changes MODE_BLK to IMan and temporarily suspends the control action. Operates when initialization and manual fallback conditions are met.
MAN fallback	Changes MODE_BLK to the Man mode and temporarily aborts the control action forcibly.
Auto fallback	Changes MODE_BLK to Auto when MODE_BLK is running in the Cas mode, and continues the control action using the setpoint set by the operator.
Mode shedding	Specifies the block mode with SHED_OPT after a failure.
Block alarm processing	Supports block alarms, process alarms, and event updates.

A6.3 Parameter List of PID Block

A blank in the Write Mode column indicates that the corresponding parameter can be written in all modes.

Index	Parameter Name	Default Value	Write mode	Valid Range	Description
0	Block Header	TAG: “PID”	Block Tag = O/S		Same as that for the AI block.
1	ST_REV		---		Same as that for the AI block.
2	TAG_DESC	Space (32 characters)			Same as that for the AI block.
3	STRATEGY	1			Same as that for the AI block.
4	ALERT_KEY	1		1 to 255	Same as that for the AI block.
5	MODE_BLK				
6	BLOCK_ERR		---		Same as that for the AI block.
7	PV		---		Measured value; Non-dimensional value that is converted from the input (IN) value based on the PV_SCALE values and filtered.
8	SP	0	AUTO	PV_SCALE ±10%	Setpoint
9	OUT		Man		Output value.
10	PV_SCALE	100 0 1342 1	O/S		Scale conversion value for the input (IN) value.
11	OUT_SCALE	100 0 1342 1	O/S		Scale values used for converting the control output (OUT) value to actual amount.
12	GRANT_DENY	0	AUTO		Same as that for the AI block.
13	CONTROL_ OPTS	0	O/S		Defines settings for control action. See Subsection A6.13.1 for details.
14	STATUS_OPTS	0	O/S		See Subsection A6.15.3 for details.
15	IN	0			Measurement input
16	PV_FTIME	2	AUTO	non negative	Time constant (in seconds) of the first-order lag filter applied to measurement input
17	BYPASS	1 (OFF)	Man	1, 2	Switch whether to set the BYPASS operation; set ON to bypass the control operation.
18	CAS_IN	0			Cascade setpoint
19	SP_RATE_DN	+INF		Positive	Rate-of-decrease limit for setpoint (SP)
20	SP_RATE_UP	-INF		Positive	Rate-of-increase limit for setpoint (SP)
21	SP_HI_LIM	100		PV_SCALE ±10%	Upper limit for setpoint (SP)
22	SP_LO_LIM	0		PV_SCALE ±10%	Lower limit for setpoint (SP)
23	GAIN	1			Proportional gain
24	RESET	10			Integration time (seconds)
25	BAL_TIME	0		Positive	Unused
26	RATE	0		Positive	Derivative time (seconds)
27	BKCAL_IN	0			Read-back of control output
28	OUT_HI_LIM	100		OUT_ SCALE ±10%	Upper limit for control output (OUT)
29	OUT_LO_LIM	0		OUT_ SCALE ±10%	Lower limit for control output (OUT)
30	BKCAL_HYS	0.5(%)		0 to 50%	Hysteresis for release from a limit for OUT. status
31	BKCAL_OUT	0	---		Read-back value to be sent to the BKCAL_ IN in the high-level block

Index	Parameter Name	Default Value	Write mode	Valid Range	Description
32	RCAS_IN	0			Remote setpoint set from a high-level computer, etc.
33	ROUT_IN	0			Remote control output value set from a high-level computer, etc.
34	SHED_OPT	1			Defines action of mode shedding. SHED_OPT defines the changes to be made to MODE.BLK.target and MODE.BLK.actual when the value of RCAS_IN.status or ROUT_IN.status becomes BAD if MODE_BLK.actual = RCas or ROut. See Subsection A6.17.1 for details.
35	RCAS_OUT	0	---		Remote setpoint sent to a high-level computer, etc.
36	ROUT_OUT	0	---		Remote control output value
37	TRK_SCALE	100 0 1342 1	O/S		Scale value used to convert the external operation output value (TRK_VAL) to non-dimensional.
38	TRK_IN_D	0			Switch for output tracking. See Section A6.12 for details.
39	TRK_VAL	0			Output tracking value. When MODE_BLK.actual = LO, the value scaled from the TRK_VAL value is set in OUT.
40	FF_VAL	0			Input value for feed-forward control. The FF_VAL value is scaled to a value with the same scale as for OUT, multiplied with the FF_GAIN value, and then added to the output of the PID calculation.
41	FF_SCALE	100 0 1342 1	O/S		Scale value used for converting FF_VAL to a non-dimensional value.
42	FF_GAIN	0	Man		Gain for FF_VAL
43	UPDATE_EVT		---		Same as that for the AI block.
44	BLOCK_ALM		---		Same as that for the AI block.
45	ALARM_SUM	E nable			Same as that for the AI block.
46	ACK_OPTION	0xFFFF			Same as that for the AI block.
47	ALARM_HYS	0.5%		0 to 50%	Hysteresis set to prevent each alarm from hunting.
48	HI_HI_PRI	0		0 to 15	Defines the priority order of the HI_HI_ALM alarm.
49	HI_HI_LIM	+INF		PV_SCALE	Threshold for HI_HI_ALM alarm.
50	HI_PRI	0		0 to 15	Defines the priority order of the HI_ALM alarm.
51	HI_LIM	+INF		PV_SCALE	Threshold for HI_ALM alarm.
52	LO_PRI	0		0 to 15	Priority order of LO_ALM alarm.
53	LO_LIM	-INF		PV_SCALE	Threshold for LO_ALM alarm.
54	LO_LO_PRI	0		0 to 15	Priority order of LO_LO_ALM alarm.
55	LO_LO_LIM	-INF		PV_SCALE	Threshold for LO_LO_ALM alarm.
56	DV_HI_PRI	0		0 to 15	Priority order of DV_HI_ALM alarm.
57	DV_HI_LIM	+INF			Threshold for DV_HI_ALM alarm.
58	DV_LO_PRI	0		0 to 15	Priority order of DV_LO_ALM alarm.
59	DV_LO_LIM	-INF			Threshold for DV_LO_ALM alarm.
60	HI_HI_ALM	---	---		Alarm that is generated when the PV value has exceeded the HI_HI_LIM value. The priority of the alarm is determined by HI_HI_PRI (Only one alarm is generated at a time and alarm having the highest priority). When the PV value decreases below HI_HI_LIM - ALM_HYS, HI_HI_ALM is cleared.

Index	Parameter Name	Default Value	Write mode	Valid Range	Description
61	HI_ALM	---	---		Same as HI_HI_ALM.
62	LO_ALM	---	---		Same as HI_HI_ALM. Cleared when the PV value increases above LO_LIM + ALM_HYS.
63	LO_LO_ALM	---	---		Same as LO_ALM.
64	DV_HI_ALM	---	---		Alarm that is generated when the value of (PV - SP) has exceeded the DV_HI_LIM value. Other features are the same as HI_HI_ALM.
65	DV_LO_ALM	---	---		Alarm that is generated when the value of (PV - SP) decreases below the DV_LO_LIM value. Other features are the same as LO_LO_ALM.

A6.4 PID Computation Details

As the PID calculation method, the I-PD method (PI-D method for some modes) is employed.

A6.4.1 Proportional Derivative Leading Type PID Control Algorithm (I-PD)

The proportional derivative leading type PID control algorithm (I-PD) ensures control stability against sudden changes in the setpoint, such as when the user enters a new setpoint value. At the same time, the I-PD algorithm ensures excellent controllability by performing proportional, integral, and derivative control actions in response to changes of characteristics in the controlled process, changes in load, and occurrences of disturbances. If the mode of the PID block is Auto and RCas, calculation is done with this I-PD method. When the mode of the block is Cas, the proportional derivative leading type PID control algorithm is employed in order to obtain better performance against the changes in the setpoint. The control algorithm is automatically switched by the block in accordance with the mode.
The basic form of each algorithm is expressed in the equation below.

Proportional Derivative Leading Type PID (I-PD method)

$$\Delta MVn = K\left\{\Delta PVn + \frac{\Delta T}{Ti}(PVn - SPn) + \frac{Td}{\Delta T}\Delta(\Delta PVn)\right\}$$

Derivative Leading Type PID (PI-D method)

$$\Delta MVn = K\left\{\Delta (PVn - SPn) + \frac{\Delta T}{Ti}(PVn - SPn) + \frac{Td}{\Delta T}\Delta(\Delta PVn)\right\}$$

ΔMVn : change in control output

ΔPVn : change in measured (controlled) value ΔPVn=PVn- PVn-1

ΔT : control period (Block Header.period_of_execution)

K : proportional gain (GAIN)

Ti :i ntegral time (RESET)

Td : derivative time (RATE)

The subscripts, n and n-1, represent the time of sampling such that PVn and PVn-1 denote the PV value sampled most recently and the PV value sampled at the preceding control period, respectively.

A6.4.2 PID Control Algorithm Parameters

The table below shows setting parameters for the PID control algorithm.

Parameter	Description	Valid Range
GAIN	Proportional gain	0.05 to 20
RESET	Integral time	0.1 to 10000 (seconds)
RATE	Derivative time	0 to infinity (seconds)

A6.5 Control Output Action

The control output action is the function to convert the change in operation output (ΔMVn) at each control period to the actual operation output value (OUT).
The control output action for the PID block of EJX supports the velocity-type.

A6.5.1 Velocity Type

The PID block determines the value of the new control output (OUT) by adding the change in control output calculated in the current control period (ΔMVn) to the value read back from the output destination (BKCAL_IN).

The calculation expression for the control output action of speed type is shown below.

ΔMVn'= ΔMVn*(OUT_SCALE. EU100 - OUT_SCALE. EU_0) / (PV_SCALE.
EU_100 - PV_SCALE. EU_0)

(Direct Acting is False in CONTROL_OPTS)

OUT = BKCAL_IN - ΔMVn'

(Direct Acting is True in CONTROL_OPTS)

OUT = BKCAL_IN + ΔMVn'

A6.6 Direction of Control Action

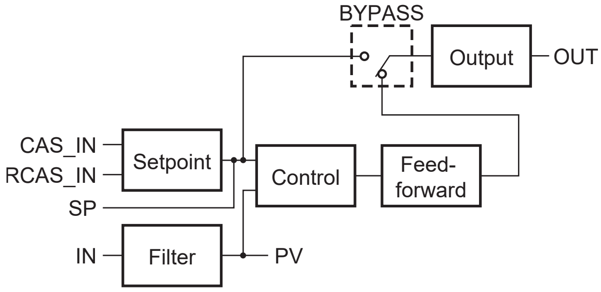
The operating direction of the output is switched for the increase or decrease of the deviation.

The direction is specified with Direct Acting of CONTROL_OPTS.

Value of Direct Acting	Description
True	The output increases when the measured value (PV) is greater than the setpoint (SP).
False	The output decreases when the measured value (PV) is greater than the setpoint (SP).

A6.7 Control Action Bypass

The PID calculation processing can be bypassed so as to set the SP value as the operation output (OUT).
The bypass setting is performed if the parameter BYPASS is set to “On”.
The block diagram is shown in the figure below.



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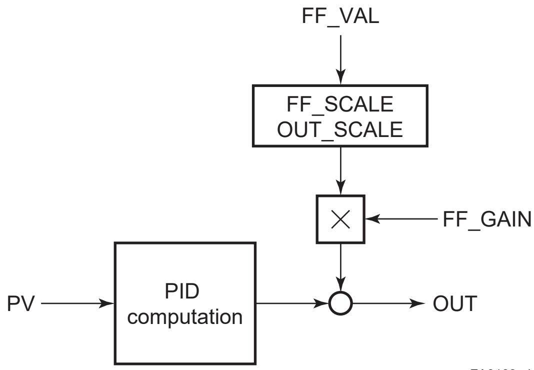
A6.8 Feed-forward

Feed-forward is a control action to add a compensation output value (FF_VAL) to the output signal of the PID calculation.
This is typically used for feed-forward control.
The figure below illustrates the action.



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A6.9 Block Modes

The block mode is defined with the parameter MODE_BLK.

MODE_ BLK	Target	Defines the target mode.
	Actual	Indicates the current block mode. Changes depending on the status of input data and target contents.
	Permitted	Defines constraints of the target mode. If constraints are not defined here, it becomes impossible to transition to the mode.
	Normal	Defines the normal mode.

There are eight modes for the PID block as shown below.

Block Mode	Description
ROut	Remote output mode. The mode outputs the value given by ROUT_IN.
RCas	By the remote cascade connection, the setpoint (SP) is received from the host computer, etc., and results of the PID control calculation processing are output.
Cas	By the cascade connection, the setpoint (SP) is received from other function block, and results of the PID control calculation processing are output.
Auto	The PID block carries out automatic control and outputs the result calculated by the PID control computation.
Man	The block goes into manual mode, and outputs OUT, the value set by the user manually.
LO	The PID block outputs the operation output value set in TRK_VAL.
IMan	Initialization and manual mode. This mode temporarily interrupts the control operation. The mode which operates when the initialization and manual fallback conditions shown in Section A6.14 are met.
O/S	Control calculation processing is carried out. The output of the previous value is kept.

A6.9.1 Mode Transitions

	Destination	Condition	Other Condition
(1)	O/S	If O/S is specified in MODE_BLK.target (or if O/S is set in target inside the resource block)	
(2)	IMan	If the Initialization and manual fallback conditions are met (Section A6.14)	NOT if condition (1) is met
(3)	LO	If Track Enable is specified in CONTROL_OPTS and the value of TRK_IN_D is true	NOT if either or both of conditions (1) and (2) are met
(4)	Man	If MAN is specified in MODE_BLK.target or if IN.status (input status) is BAD	NOT if any one or more of conditions (1) to (3) are met
(5)	Auto	If Auto is specified in MODE_BLK.target - AND - if IN.status (input status) is other than BAD	NOT if any one or more of conditions (1) to (3) are met
(6)	Cas	If Cas is specified in MODE_BLK.target - AND - if IN.Status (input status) and CAS_IN.Status are other than BAD	NOT if any one or more of conditions (1) to (3) are met
(7)	RCas	If RCas is specified in MODE_BLK.target - AND - if IN.Status (input status) and RCAS_IN.Status are other than BAD	NOT if any one or more of conditions (1) to (3) are met
(8)	ROut	If ROut is specified in MODE_BLK.target - AND - if ROUT_IN.status (input status) is other than BAD	NOT if any one or more of conditions (1) to (3) are met

Note 1: To activate mode transitions to Auto, Cas, RCas, and ROut, the respective target modes must be permitted beforehand with MODE_BLK.permitted.

Note 2: A transition to Cas, RCas, or ROut requires that initialization of the cascade connection has been completed.

Note 3: In case of the mode shedding (the data status of RCAS_IN, ROUT_IN is BAD), it transitions to the mode which has been specified with SHED_OPT. (For details, refer to A6.17.1.)

A6.10 Bumpless Switching

Bumpless switching is the function to allow the bumpless switch of MODE_BLK and of operation output values at the cascade downstream without a sudden change in the control output.
The action to perform a bumpless switching differs depending on the MODE_BLK values.

A6.11 Setpoint Limiter

The setpoint limiter function is to limit the settings of the setpoint (SP).
The operation of the setpoint limiter differs based on the block mode of the function block.

A6.11.1 When PID Block Is in Auto Mode

When the block mode (MODE_BLK) is Auto, the limiters of the setpoint (SP) in force are high/low limit and change-rate limit.

A6.11.1.1 High/Low Limit

A value exceeding the set high limit (SP_HI_LIM) cannot be set for SP.
A value smaller than the set low limit (SP_LO_LIM) cannot be set for SP.

A6.11.1.2 Change-rate Limit

The change-rate limits are used to restrict the magnitude of changes in the SP value so as to change the SP value gradually towards a new setpoint.

The increase of the SP value at each execution period of PID (period of execution in the Block Header) is limited to the value of SP_RATE_UP or less.

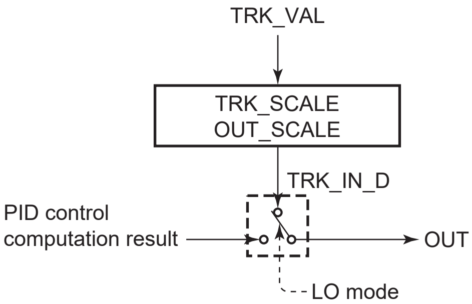
The decrease of the SP value at each execution period of PID (period of execution in the Block Header) is limited to the value of SP_RATE_DOWN or less.

A6.11.2 When PID Block Is in Cas or RCas Mode

By selecting Obey SP Limits if Cas or RCas in CONTROL_OPTS (see Subsection A6.13.1), the setpoint (SP) high/low limits can be put into force when the block mode (MODE_BLK) is Cas or RCas.

A6.12 External-output Tracking (LO)

External tracking is the action of outputting the set value of the operation output (TRK_VAL).
External tracking functions when the block mode is LO.
The flow of the processing is shown below.



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To change the block mode to LO:

Set Track Enable in CONTROL_OPTS.
If TRK_IN_D is set to true, the block mode becomes LO.

However, to change the block mode from Man to LO, both Track Enable and Track in Manual must also be specified in CONTROL_OPTS.

A6.13 Measured-value Tracking

Measured-value tracking is an action to equalize the setpoint (SP) to the measured value (PV) when the block mode (MODE_BLK) is running in Man in order to prevent a sudden change in control output from being caused by a mode change to Auto.
If the mode of the cascade secondary loop is changed from the Cas mode to the Auto mode while the cascade primary loop is controlling in the Auto or Cas mode, the cascade connection is opened and the control action of the primary loop stops. The setpoint (SP) of the secondary loop can also be equalized to its cascade input (CAS_IN) by tracing the measured value.

The settings for measured-value tracking are made in the parameter CONTROL_OPTS.

A6.13.1 CONTROL_OPTS

Setting contents of CONTROL_OPTS are shown.

Selection item for CONTROL_OPT	Operation Contents
Bypass Enable	This parameter allows BYPASS to be changed.
SP-PV Track in Man	Equalizes SP to PV when MODE_BLK.target is set to the Man mode.
SP-PV Track in ROut	Equalizes SP to PV when the ROut mode is specified with MODE_BLK.target.
SP-PV Track in LO or IMan	Equalizes SP to PV when Actual is the LO mode or the IMan mode.
SP Track retained Target	Equalizes SP to RCAS_IN when RCas bit is set in the target mode, and to CAS_IN when Cas bit is set when the actual mode is IMan, LO, Man and ROut.
Direct Acting	Set the PID block to a direct acting controller.
Track Enable	Transitions to LO if TRK_IN_D becomes 1 with this option being set.
Track in Manual	With the previously mentioned Track Enable alone, this is not valid when the target mode is Man. Sets this option even in Man when the user would like to transition to LO. Even if this option is set while Track Enable is not set, there is no effect.
Use PV for BKCAL_OUT	Sets the value of PV in BKCAL_OUT and RCAS_OUT, instead of the value of SP.
Obey SP limits if Cas or RCas	Puts the setpoint high/low limits in force in the Cas or RCas mode.
No OUT limits in Manual	Disables the high/low limits for OUT in the Man mode.

A6.14 Initialization and Manual Fallback (IMan)

Initialization and manual fallback denotes an abnormality processing function in which the PID block changes mode to IMan (initialization and manual) and suspends the control action. The function operates when the initialization and manual fallback conditions (IMan condition) are met.

A6.14.1 IMan condition

The IMan conditions are transition conditions of the mode to temporarily suspend control action by changing the block mode to the IMan mode.
Please note that the IMan mode is the mode to transition only when the IMan conditions are established.

A6.14.2 Establishment of IMan condition

The IMan conditions are established in the following cases.

- When quality=BAD in Data status of BKCAL_IN (Status).
- When substatus=Good(c)-FSA, LO, NI and IR in Data status of BKCAL_IN (Status).

A6.15 Manual Fallback

MAN fallback denotes an abnormality processing function in which the PID block changes a mode to Man and suspends the control action.

A6.15.1 Condition of MAN Fallback

The condition is established when the input data status (IN.Status) is BAD.
(Excluding when BYPASS)

A6.15.2 Specification of MAN Fallback

Specifies Target to Manual if BAD IN with STATUS_OPTS.

A6.15.3 STATUS_OPTS

The table below shows settings of STATUS_OPTS.

Options in STATUS_OPTS	Setting Contents
IFS if BAD IN	Sets the sub-status component of OUT.status to IFS if IN.status is Bad. Does not set while PID control bypass is on.
IFS if BAD CAS IN	When CAS_IN.Status is BAD, the substatus of OUT.Status is set to IFS.
Use Uncertain as Good	When IN.Status is Uncertain, tries not to handle as BAD. (When IN.Status is Uncertain, tries not to influence on mode transfer.)
Target to Manual if BAD IN	When IN becomes BAD, automatically changes MODE_BLK.Target to MAN.
Target to next permitted mode if BAD CAS IN	When CAS_IN becomes BAD, changes MODE_BLK.Target to Auto. (When Auto is not permitted as the destination of transition by Permitted, the destination of transition is changed to Man.)

A6.16 AUTO Fallback

AUTO fallback denotes a mode in which the PID block changes a mode from Cas to Auto and continues automatic PID control with the user-set setpoint.

A6.16.1 Condition of AUTO Fallback

The condition is established when the data status of the cascade setpoint (CAS_IN.Status) is BAD,
(Excluding when BYPASS)

A6.16.2 Specification of AUTO Fallback

Specifies “Target to next permitted mode if BAD CAS IN” with STATUS_OPTS.
(Also, specify the destination of transition to AUTO with MODE_BLK.Permitted.)

A6.17 Mode Shedding upon Computer Failure

When the data status of RCAS_IN or ROUT_IN falls to BAD while the PID block is running in the RCas or ROut mode, the mode shedding functions. If the RCAS_IN data is not renewed within the time specified by SHED_RCAS in the resource block, the data status of RCAS_IN falls to Bad.
At this time, change to the mode (Mode Shedding) specified in SHED_OPT.

A6.17.1 SHED_OPT

The SHED_OPT setting stipulates the specifications of mode shedding.

Available Setting for SHED_OPT	Operation Contents
Normal shed, normal return	Sets MODE_BLK.actual to Cas(*1), and leaves MODE_BLK.target unchanged.
Normal shed, no return	Sets both MODE_BLK.Actual and MODE_BLK.Target to Cas (*1).
Shed to Auto, normal return	Sets MODE_BLK.actual to Auto(*2), and leaves MODE_BLK.target unchanged.
Shed to Auto, no return	Sets both MODE_BLK.actual and MODE_BLK.target to Auto(*2).
Shed to Manual, normal return	Sets MODE_BLK.actual to Man, and leaves MODE_BLK.target unchanged.
Shed to Manual, no return	Sets both MODE_BLK.actual and MODE_BLK.target to Man.
Shed to retained target, normal return	1. If Cas is specified in MODE_BLK.target, sets MODE_BLK.actual to Cas(*1), and leaves MODE_BLK.target unchanged. 2. If Cas is not specified in MODE_BLK.target, sets MODE_BLK.actual to Auto(*2), and leaves MODE_BLK.target unchanged.
Shed to retained target, no return	1. If Cas is specified in MODE_BLK.target, sets both MODE_BLK.Actual and MODE_BLK.Target to Cas (*1). 2. If Cas is not specified in MODE_BLK.target, sets MODE_BLK.actual to Auto(*2), and MODE_BLK.target to Cas.

The modes to which a PID block can transfer are limited to those specified in MODE_BLK.permitted.
The priority of block modes is as shown below.
For this reason, in fact, (*1) transitions to Cas, Auto, or MAN, whichever is set permitted in MODE_BLK.Permitted and has the lowest priority level.

Lower priority level → Higher priority level

ROut RCas Cas Auto Man

FA0105.ai

(*2) is only when Auto is set as permitted mode by MODE_BLK.Permitted.

Note: Due to initialization of the cascade connection, if the upstream is a control block, the transition to the Cas mode occurs in the following sequence:

RCas/ROut -> Auto -> Cas

A6.18 Alarm Processing of Block

There are two kinds of alarms generated by the PID block: Block and process alarms.

A6.18.1 Block Alarm (BLOCK_ALM)

The block alarm (BLOCK_ALM) is generated upon the occurrence of either of the following errors (values set in BLOCK_ERR) and notifies the content of BLOCK_ERR.

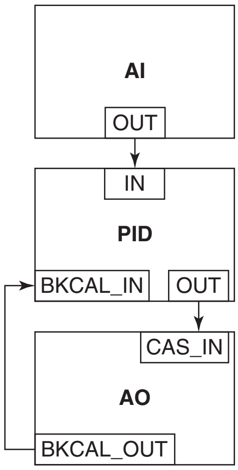
Name	Condition
Local Override	If MODE_BLK actual of PID block is LO.
Input Failure	If the PV status is Bad, that is, the IN status is Bad, or the IN status is Uncertain and when the “Use Uncertain as Good” bit of STATUS_OPTS is not set
Out of Service	If MODE_BLK.target of the PID block is the OS mode.

A6.18.2 Process Alarms

There are six types of process alarms. Only one process alarm can be generated at the same time, and the process alarm having the highest priority level from among those occurring at the same time is generated. To activate an alarm on communication, it is necessary to specify the priority for alarm activation in advance. To activate an alarm, set 3 or more. By sending with priority information being added in a communication frame when the alarm is activated, for example, the alarm is used to apply a filter to ignore values below the specified priority on the host side.
The priority level should be set for each process alarm type.

Parameter Name	Cause of Occurrence	Parameter Containing Priority Level Setting
HI_HI_ALM	Occurs when the PV increases above the HI_HI_LIM value.	HI_HI_PRI
HI_ALM	Occurs when the PV increases above HI_LIM value.	HI_PRI
LO_ALM	Occurs when the PV decreases below the LO_LIM value.	LO_PRI
LO_LO_ALM	Occurs when the PV decreases below the LO_LO_LIM value.	LO_LO_LIM
DV_HI_ALM	Occurs when the value of [PV - SP] increases above the DV_HI_LIM value.	DV_HI_PRI
DV_LO	Occurs when the value of PV - SP decreases below the DV_LO_LIM value.	DV_LO_PRI

A6.19 Example of Block Connections



To use a simple PID control loop by combining a valve positioner (device with AO) with a sensor device, the setting procedures for each block are explained based on the basic connection example of PID.

(1) Connect the AI block and PID block of the sensor device, and the AO block of the valve positioner as shown above.

(2) Set GAIN, RESET, and RATE parameters by setting the MODE_BLK target of the PID block to O/S.

(3) Check that the value of MODE_BLK actual of the AI block is Auto.

(4) Set the MODE_BLK target of the AO block to Cas|Auto.

(5) Check that the value of BKCAL_IN status of the PID block is not BAD.

(6) Check that the value of IN status of the PID block is not BAD.

(7) Check that Auto is set to the permitted mode in MODE_BLK of the PID block.

(8) Set the MODE_BLK target of the PID block to Auto.

When finishing up to No. 8 with this setting, the PID block and AO block exchange the respective information and initialize the cascade connection.

By following the above steps, the actual of MODE_BLK of the PID block changes to Auto and the automatic PID control starts.

Appendix 7. Software Download Function

A7.1 Benefits of Software Download Function

The software download function is to update software used in field devices via FOUNDATION Fieldbus. Typical uses are to add new features such as function blocks and diagnostic function to the existing devices, and to optimize the existing field devices for your plant.

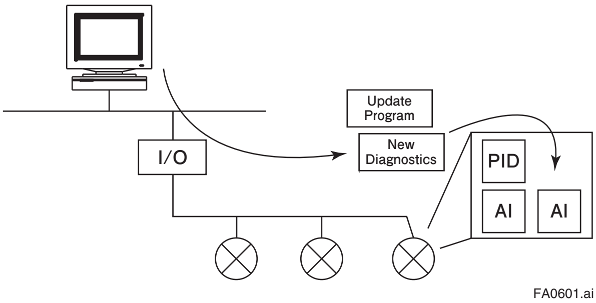


Figure A7.1 Concept of Software Downloading

A7.2 Specifications of Software Download Function

Power consumption: 15mA Max
Based on FOUNDATION Fieldbus Download Specifications FF-883 Download Class: Class 1

CAUTION

Class 1 devices can continue the specified measurement and/or control actions even while software is being downloaded to them. Upon completion of a download, however, the devices will be reset internally to activate the new, downloaded software. This will halt Fieldbus communication and function block executions for about two minutes.

A7.3 Preparations for Software Downloading

For software downloading, you need to prepare the following:

- Software download tool
- Software for downloading file for each of the target field devices

  (Software)

For the software download tool, use only a program developed for that purpose. For details, see the software's User's Manual. For information about updates of software binary files for field devices and how to obtain them, visit the following web site.

https://www.yokogawa.com/library/

CAUTION

The communication may be disturbed if the software download tool is connected to a Fieldbus segment. Connect the software download tool to the Fieldbus segment before starting operation.

A7.4 Software Download Sequence

The flowchart below outlines the software download procedures. Although the time taken for the entire procedures varies depending on the size of the fieldbus device's software, it generally takes about 20 minutes where there is a one-to-one connection between the fieldbus device and the download tool. If multiple devices are connected to Fieldbus, it takes longer to download the software.

(1) Start the download tool

(2) Select file(s) (Select the software file(s) you want to download.)

(3) Select device(s) (Select the device(s) to which you want to download software.)

(4) Carry out download (Transmit the software to the field device(s).)

(5) Activate device(s) (Activate the device(s) to start with new software.)

CAUTION

If software download is executed, the PD tag, node address, and transducer block calibration parameters retained in the nonvolatile memory inside the target device are retained, but it may reset other parameters to their defaults (except a minor update that does not change the number of parameters). Hence, where necessary, save the parameters using an engineering tool, parameter setting utility, or the like before downloading the software, and then reconfigure the field device(s) after the download. For details, see Section A7.6.

CAUTION

The current dissipation of the target field device temporarily increases immediately after a download due to erasing of the FlashROM's contents. Use a Fieldbus power supply which has sufficient capacity to cover such increases in feed current.

CAUTION

Upon the completion of the activation(*1), the target fieldbus device performs resetting internally. The reset breaks communication with the field device and stops function block execution.

*1 Processing which automatically replaces the downloaded software in the software download processing

CAUTION

Do not turn off the power to a field device or disconnect the download tool during a download or activation. The device may fail as a result. Be careful about the noise on the Fieldbus link. If the fieldbus is noisy, the downloading may take a very long time or fail.

A7.5 Download Files

Download files have the following filenames (with the filename extension of ".ffd"). The device type and device family are " 0015". Take care to choose the correct download file for the target field device:

"594543" + "Device Family" + "_" + "Device Type" + "_"
+ "Domain Name" " + "_" +"Software Name" + "_"
+"Software Revision" + "." + "ffd"

(File name example)

5945430015_0015_VY_ORIGINAL_R101.ffd

The software name is "ORIGINAL" or "UPDATE". The former indicates an original file and the latter an update file. Whenever performing a download to update the device revision, be sure to obtain the original file. In general, device revision is updated when a parameter or block is added.

A7.6 Steps after Activating a Field Device

After the communication with a field device is recovered after activating the device, check that the software revision of the field device is updated accordingly by using the download tool. The software revision of the field device can be checked with the SOFTWARE_REV parameter of the resource block.

The PD tag, node address, and transducer block calibration parameters that are retained in the nonvolatile memory inside the target device will remain unchanged after software download is executed. However, after a software update which causes an addition to the block parameters or blocks, or to the system/network management VFD parameters, some parameters may be reset to the defaults, thus requiring parameter setup and re-engineering. For details, see the table below.

Note that a change in the number of parameters or blocks requires the DD and capabilities files corresponding to the new software revision.

Table A7.1 Actions after Software Update

Contents of Software Update	Required Work
Software update without change in the number of parameters	Re-setup of parameters not needed.
Software update that adds a block parameter	Set up the added parameter.
Software update that adds a block	Carry out re-engineering. Set the parameters for the additional block.
Software update that changes the number of system/ network management VFD parameters	Carry out re-engineering.

A7.7 Troubleshooting

For information on the download tool's error messages, see also the software's User's Manual.

Table A7.2 Problems after Software Update

Symptom	Cause	Remedy
An error occurs before starting a download, disabling the download.	The selected download file is not for the selected field device.	Check SOFTDL_ERROR in the maintenance transducer block and obtain the correct file.
An error occurs after starting a download, disabling the download.	You attempted to update the device revision by downloading a file which is not an original file.	Check SOFTDL_ERROR in the maintenance transducer block and obtain the original file.
	The voltage on the Fieldbus segment falls below the specified limit (9 volts).	Check the capacity of the Fieldbus power supply used and the voltage at the terminal.
	There was an error in a checksum or the number of transmission bytes.	Check SOFTDL_ERROR in the maintenance transducer block and obtain the correct file.
	The download tool does not allow download with same software revision.	Check the setting of the download tool.
The download takes far longer than expected or fails frequently.	The Fieldbus segment is noisy.	Check the noise level on the Fieldbus.
An error occurs after activation.	Transient error caused by the internal resetting of the field device	Check whether communication with the field device is recovered after a while.
The new software does not work after the activation.	The file of the current revision was downloaded.	Obtain the correct file.
	Failure of the memory in field device, etc.	Contact Yokogawa service center.

A7.8 Maintenance Block's Parameters Relating to Software Download

Table A7.3 Maintenance Transducer Block's Parameters Relating to Software Download

Relative Index	Index	Parameter Name	Default Value	Write Mode	Description
31	3031	SOFTDL_PROTECT	1	Auto	Mask for software download function. 0x01: No mask 0x02: With mask
32	3032	SOFTDL_ERROR	0	-	Indicates the error when downloading the software. See Table A7.4 Download Error Codes.
33	3033	SOFTDL_COUNT	0	-	Number of times the software is downloaded.
34	3034	SOFTDL_ACT_AREA	0	-	Indicates the the ROM number of the currently working FlashROM. 0: FlashROM #0 working 1: FlashROM #1 working

Table A7.4 Download Error Codes

Code	Description
0	No error.
32768	Version error of file header (other than 1).
32769	Size error of file header (other than 44).
32770	Manufacturer ID No. error (other than 0x594543)
32771	Device family error (other than RB.DEV_TYPE)
32772	Device revision error (less than RB.DEV_REV)
32773	File revision error (other than 3).
32774	File type error (other than 0, 1).
32775	Error of the number of modules (more than 9).
32776	Error of the number of EEPROM data adjustment (places not taken over) (more than 11)
32777	Size error of program module (less than 13 bytes or more than 655373 bytes)
32778	Size error of EEPROM data (less than 13 bytes or more than A area size + 13 bytes)
32779	Module type error (other than 0, 1).
32780	Module address error (less than 32768 (0x8000) or more than 786432 (0xC0000))
32781	Module CRC error.
32782	Block size error (The block size of the downloaded EEPROM data is less than the existing block size.)
32783	Block ID error (The existing block does not exist in the downloaded EEPRPM data.)
32784	ID error of the module which adjusts EEPRPM data (other than 1, 2).
32785	ID error of the EEPROM block which adjusts EEPROM data.
32786	Offset error of the data which adjusts EEPROM data from the beginning of the block (larger than block size).
32787	Size error of the data which adjusts EEPROM data.
32788	Type error of EEPROM data adjustment.
32789	File CRC error.
32790	File end code error (The first byte of the end code is other than 0X00).
32791	Write verify error of external Serial Flash ROM.
32792	Access error of external Serial Flash ROM.
32793	Timeout error when accessing to external Serial Flash ROM.
32794	Error of Generic Initiate Download Sequence.
32795	Error of Generic Download Segment.
32796	Error of Generic Terminate Download Sequence.
32797	State error at staring up (other than DWNLD_NOT_READY, DWNLD_READY, DWNLD_OK).
32798	Take-over processing error (built-in Flash ROM failure, EEPROM failure).

A7.9 System/Network Management VFD Parameter related to Software Download

Table A7.5 System/Network Management VFD Parameter Write Mode R/W: Read/Write, R: Read Only

Index (SM)	Parameter Name	(Sub-Index)	Sub-parameter Name	Default Value	Write Mode	Remarks
310	DWNLD_PROPERTY	0			R	
		1	Download Class	1	R	
		2	Write Rsp Returned For ACTIVATE	1	R	
		3	Write Rsp Returned For PREPARE	1	R	
		4	Reserved	0	-	
		5	ReadyForDwnld Delay Secs	120	R	
		6	Activation Delay Secs	120	R	
313	DOMAIN_ DESCRIPTOR	0			R/W	Read/write-permitted only for sub-index 1
		1	Command	3	R/W	
		2	State	1	R	
		3	Error Code	0	R	
		4	Download Domain Index	316	R	
		5	Download Domain Header Index	314	R	
		6	Activated Domain Header Index	315	R	
		7	Domain Name	VY	R	
314	DOWNLOAD_ DOMAIN_HEADER	0				
		1	Header Version Number	1	R	
		2	Header Size	0	R	
		3	Manufacturer ID	0x594543	R	
		4	Device Family	(DEV_TYPE of RB)	R	
		5	Device Type	(DEV_TYPE of RB)	R	
		6	Device Revision	(DEV_REV of RB)	R	
		7	DD Revision	(DD_REV of RB)	R	
		8	Software Revision	(SOFTWARE_ REV of RB)	R	
		9	Software Name	ORIGINAL	R	
		10	Domain Name	(Device name)	R	
315	ACTIVATED_ DOMAIN_HEADER	0				
		1	Header Version Number	1	R	
		2	Header Size	44	R	
		3	Manufacturer ID	0x594543	R	
		4	Device Family	(DEV_TYPE of RB)	R	
		5	Device Type	(DEV_TYPE of RB)	R	
		6	Device Revision	(DEV_REV of RB)	R	
		7	DD Revision	(DD_REV of RB)	R	
		8	Software Revision	(SOFTWARE_ REV of RB)	R	
		9	Software Name	ORIGINAL	R	
		10	Domain Name	(Device name)		

Index (SM)	Parameter Name	(Sub-Index)	Sub-parameter Name	Default Value	Write Mode	Remarks
316	DOWNLOAD_DOMAIN					Read/write: prohibited, Get-OD: permitted

A7.10 Comments on System/Network Management VFD Parameters Relating to Software Download

IMPORTANT

Do not turn off the power to a field device immediately after changing parameter settings. To improve the reliability of the device, processing to store data to EEPROM is duplexing. If the power is turned off within 30 seconds after setup, the parameters may not be saved and revert to the previous settings.

(1) DWNLD_PROPERTY

Sub Index	Element	Size [B]	Description
1	Download Class	1	Indicates the download class. 1: Class 1
2	Write Rsp Returned For ACTIVATE	1	Indicates whether a write response is returned to the ACTIVATE command. 1: Write Response Returned
3	Write Rsp Returned For PREPARE	1	Indicates whether a write response is returned to the PREPARE command. 1: Write Response Returned
4	Reserved	1	(Reserved)
5	ReadyForDwnld Delay Secs	2	Indicates the maximum waiting time after receiving the PREPARE_FOR_DWNLD command to proceed to transition from DWNLD_NOT_READY to DWNLD_READY.
6	Activation Delay Secs	2	Indicates the maximum waiting time after receiving the ACTIVATE command to proceed to transition from DWNLD_OK to DWNLD_NOT_READY.

(2) DOMAIN_DESCRIPTOR

Sub Index	Element	Size [B]	Description
1	Command	1	Reads/writes software download commands. 1: PREPARE_FOR_DWNLD (instruction of download preparation) 2: ACTIVATE (activation instruction) 3: CANCEL_DWNLD (instruction of download cancellation)
2	State	1	Indicates the current download status. 1: DWNLD_NOT_READY (download not ready) 2: DWNLD_PREPARING (download under preparation) 3: DWNLD_READY (ready for download) 4: DWNLD_OK (download complete) 5: DOWNLOADING (download underway) 6: CHECKSUM_FAIL (not used in this product) 7: FMS_DOWNLOAD_FAIL (failure during download) 8: DWNLD_INCOMPLETE (download error detected at restart) 9: VCR_FAIL (not used in this product) 10: OTHER (download error other than 6 and 7 detected)
3	Error Code	2	Indicates the error during a download and activation. 0: success, configuration retained (download successfully completed) 32768 _ 65535: Download error (indicating error codes)
4	Download Domain Index	4	Indicates the index number of the domain for software downloading.
5	Download Domain Header Index	4	Indicates the index number of the domain header to which the download is performing.
6	Activated Domain Header Index	4	Indicates the index numbers of the domain header currently running.

Sub Index	Element	Size [B]	Description
7	Domain Name	8	Indicates the domain name. In this product, Domain Name indicates the field device name.

(3) DOMAIN_HEADER

Sub Index	Element	Size [B]	Description
1	Header Version Number	2	Indicates the version number of the header.
2	Header Size	2	Indicates the header size.
3	Manufacturer ID	6	Indicates the value of resource block's MANUFAC_ID (manufacturer ID) as character string data.
4	Device Family	4	Indicates the device family. In this product, Device Family indicates the value of resource block's DEV_TYPE as character string data.
5	Device Type	4	Indicates the value of resource block's DEV_TYPE as character string data.
6	Device Revision	1	Indicates the value of resource block's DEV_REV.
7	DD Revision	1	Indicates the value of resource block's DD_REV.
8	Software Revision	8	Indicates the value of resource block's SOFT_REV.
9	Software Name	8	Indicates the attribute of the binary file. In this product, Software Name indicates either of the following: "ORGINAL _": followed by one space: Original file "UPDATE _ _": followed by two spaces: Update file
10	Domain Name	8	Indicates the domain name. In this product, Domain Name indicates the field device name.

Revision Information

- Title : Vortex Flowmeter VY Series FOUNDATION Fieldbus Communication Type
- Manual No. : IM 01F07A02-02EN

Edition	Date	Page	Revised Item
1st	Oct. 2023	-	New issue