User's Manual

Vortex Flowmeter VY Series
HART Communication Type

IM 01F07A02-01EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01F07A02-01EN
6th Edition

Vortex Flowmeter VY Series
HART Communication Type

IM 01F07A02-01EN 6th Edition

Contents

1. Introduction

This manual explains basic operations of the Vortex Flowmeter VY Series with HART Communication Protocol.
For items which are not covered in this manual, read the applicable user's manuals listed in "Table 1.1 Related Documents" in the Vortex Flowmeter VY Series Installation Manual. These documents can be downloaded from the Yokogawa Electric Corporation 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.co.jp/library/

Precautions Related to the Protection, Safety, and Alteration of the Product

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

WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in serious injury or death of personnel. This document presents precautions for avoiding such hazards should such a situation arise.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in slight injury to personnel or damage to or destruction of the product. This document presents precautions for avoiding such hazards should there be a physical risk to the user's well-being or damage to equipment.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument 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

Handling precaution
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 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 Electric Corporation 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 Electric Corporation's written permission.
- Yokogawa Electric Corporation 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 Electric Corporation sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made products.
- 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 operation of the product (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 Corporation'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 "®".
- "HART" is the 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 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 Electric Corporation 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 environments. When the cover is open, the stated enclosure protection is not applicable.

Operation

WARNING

Be sure to enable the write protect function to prevent parameters from being overwritten after finishing parameter setting.
Refer to the installation manual for the hardware write protect function, and Section 4.17 for the software write protect function.

Maintenance

WARNING

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

1.2 Warranty

- The warranty shall cover the period described in the quotation presented to the purchaser at the time of purchase. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Contact our sales office if this instrument requires repair.
- If a problem arises with this product, inform Yokogawa Electric Corporation 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.
- The degree of responsibility for repair costs of the problems shall be determined by Yokogawa Electric Corporation based on our investigation.
- The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Improper and/or inadequate maintenance by the purchaser.
  - 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 Electric Corporation, or problems due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa Electric Corporation or an approved representative of Yokogawa Electric Corporation.
  - 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 protect function to prevent parameters from being overwritten after finishing parameter setting.
Refer to the Installation Manual for the hardware write protect function, and Section 4.17 for the software write protect function.

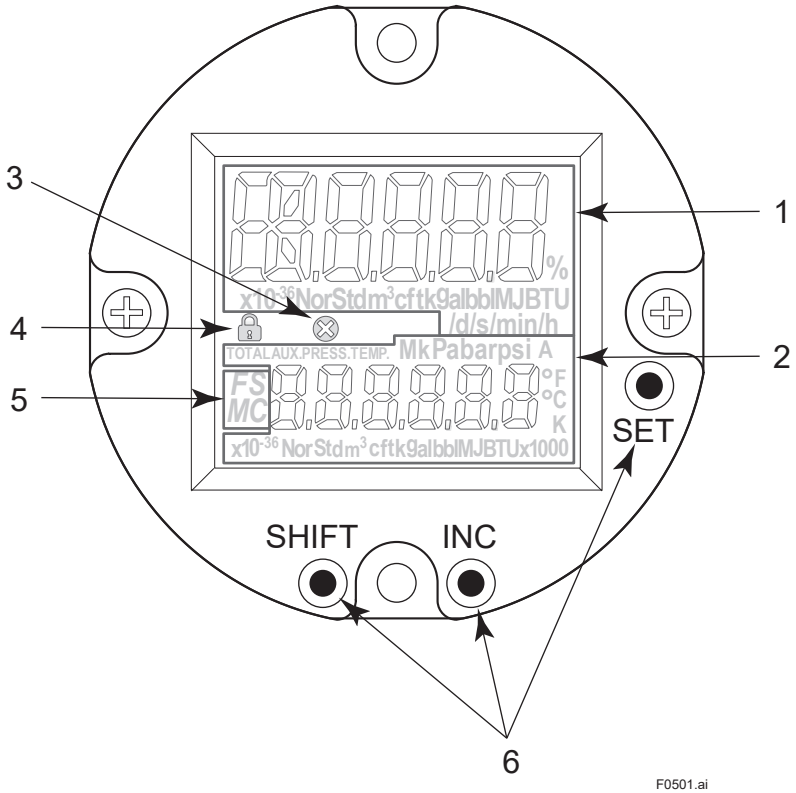
NOTE

Only basic 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 HART 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 process data and alarm No. acquired by total data, temperature data and analog input.
3 Alarm icon	:	This displays if a serious alarm has occurred. Serious alarms are system alarms and process alarms.
4 Write protect icon	:	This displays the write protect 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

2.2.2 Operation Levels

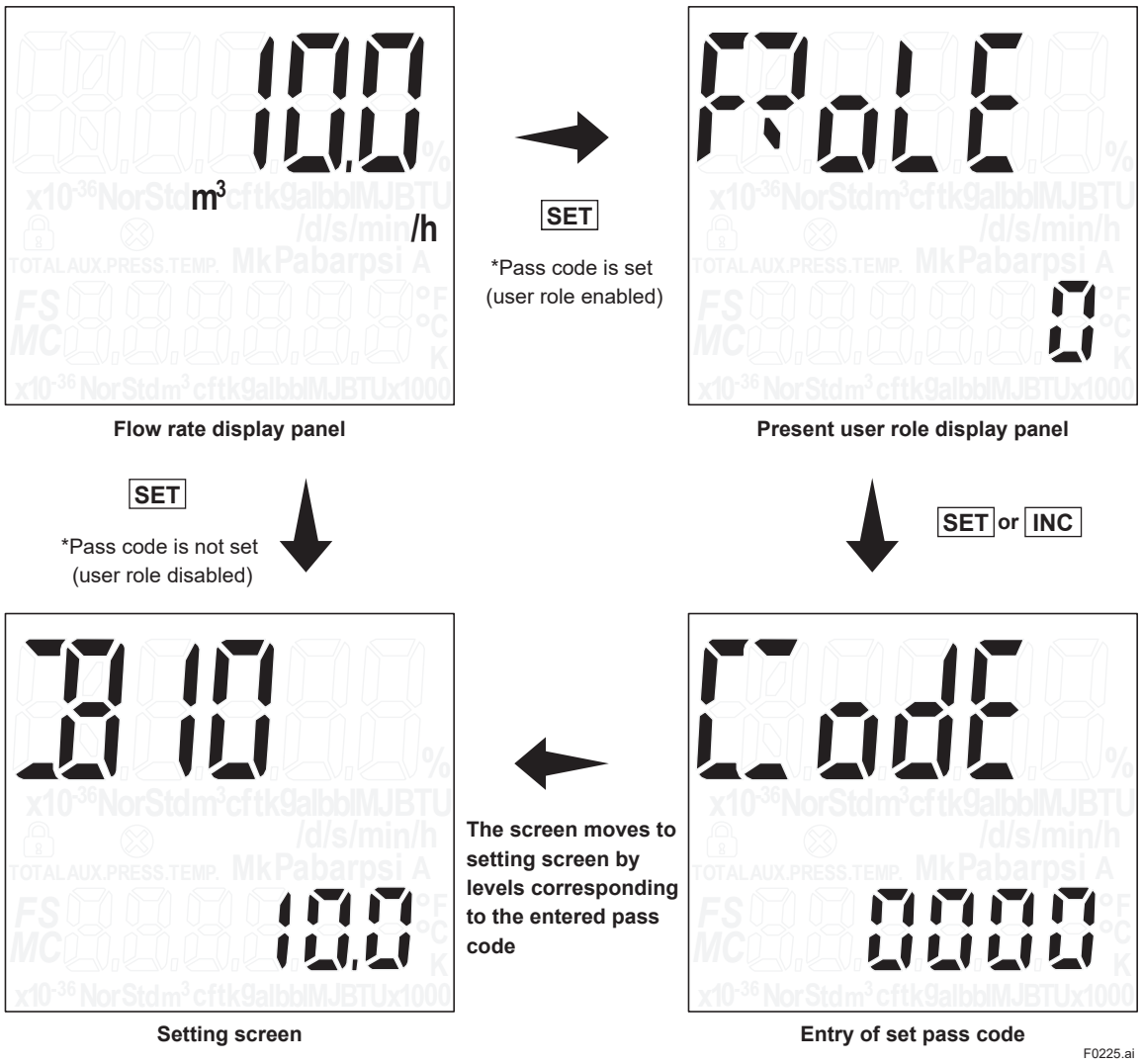
On this product, parameters that can be accessed can be restricted by assigning operation levels (user roles) to parameter settings.
The following table summarizes the operation levels that can be assigned on this product.

Table 2.2.2 Parameters Settable on The Display and Operation Rights

Operation Rights	Parameter	
	Read	Write
Operator	All parameters	Display parameter settings that do not affect processes can be set
Maintenance	All parameters	Parameters that can be set by Operator levels and test- and adjustment-related parameters can be set.
Specialist	All parameters	All parameters that can be written can be set

By default, operation levels are disabled. When operation levels are disabled, the only levels that can be accessed is the Specialist levels.
To enable operation levels, HART communication must be used. Operation levels cannot be enabled on the display. For details about settings, see 4.17.2.

When operation levels are enabled, the pass code must be entered before moving to the setting screen. The screen moves to the setting screen by levels corresponding to the entered pass code.



2.3 Display Items in Display Area

Display Items are categorized into the following three items.

NOTE

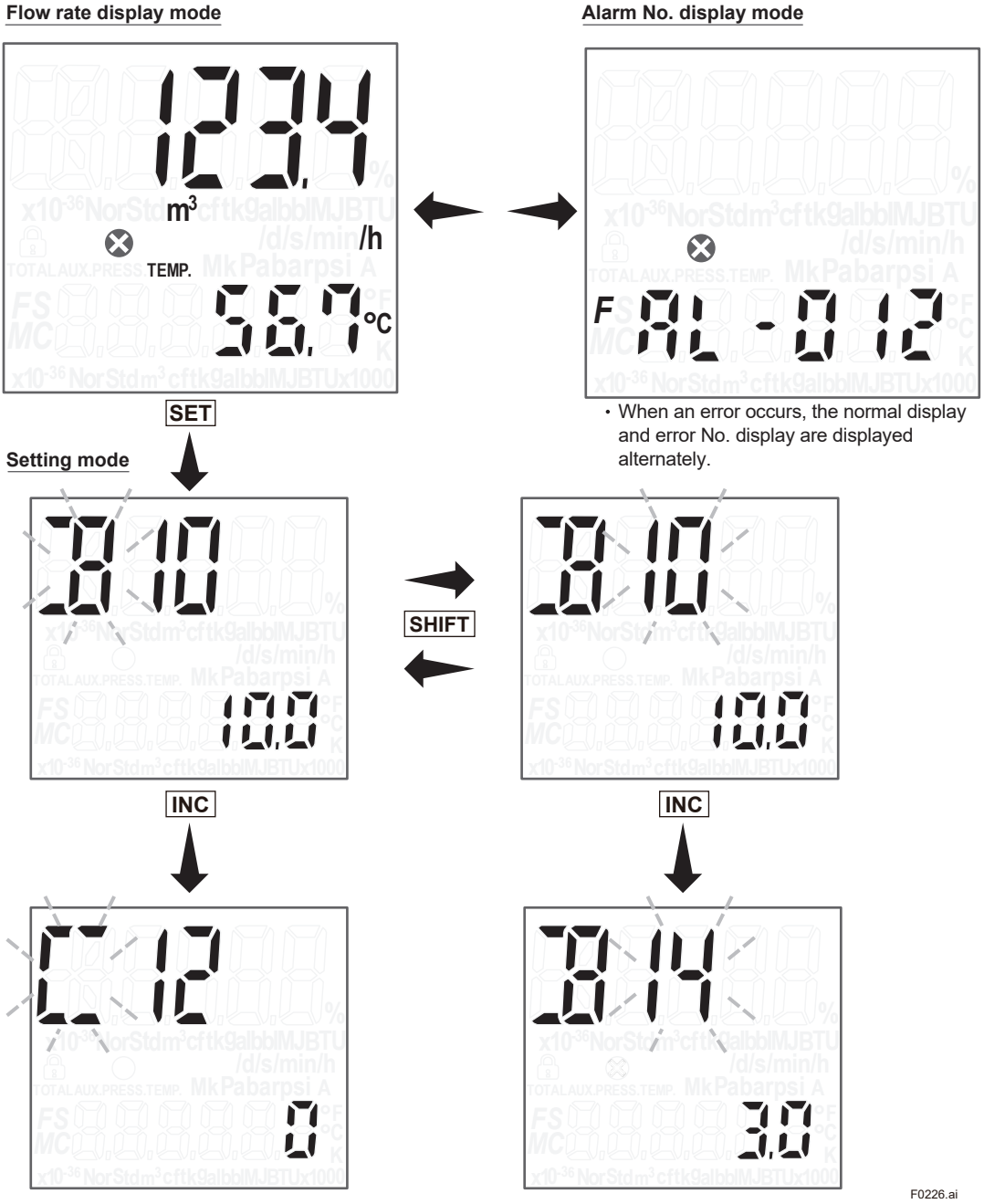
There are some influence by changing the setting of display period, see the follows.

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)



- When an error occurs, the normal display and error No. display are displayed alternately.

- 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
Actual temperature display*1	The measured temperature is displayed.	x	○
Analog input process value	The process value acquired by analog input is displayed by engineering unit.	x	○
Without display	Nothing is displayed.	x	○

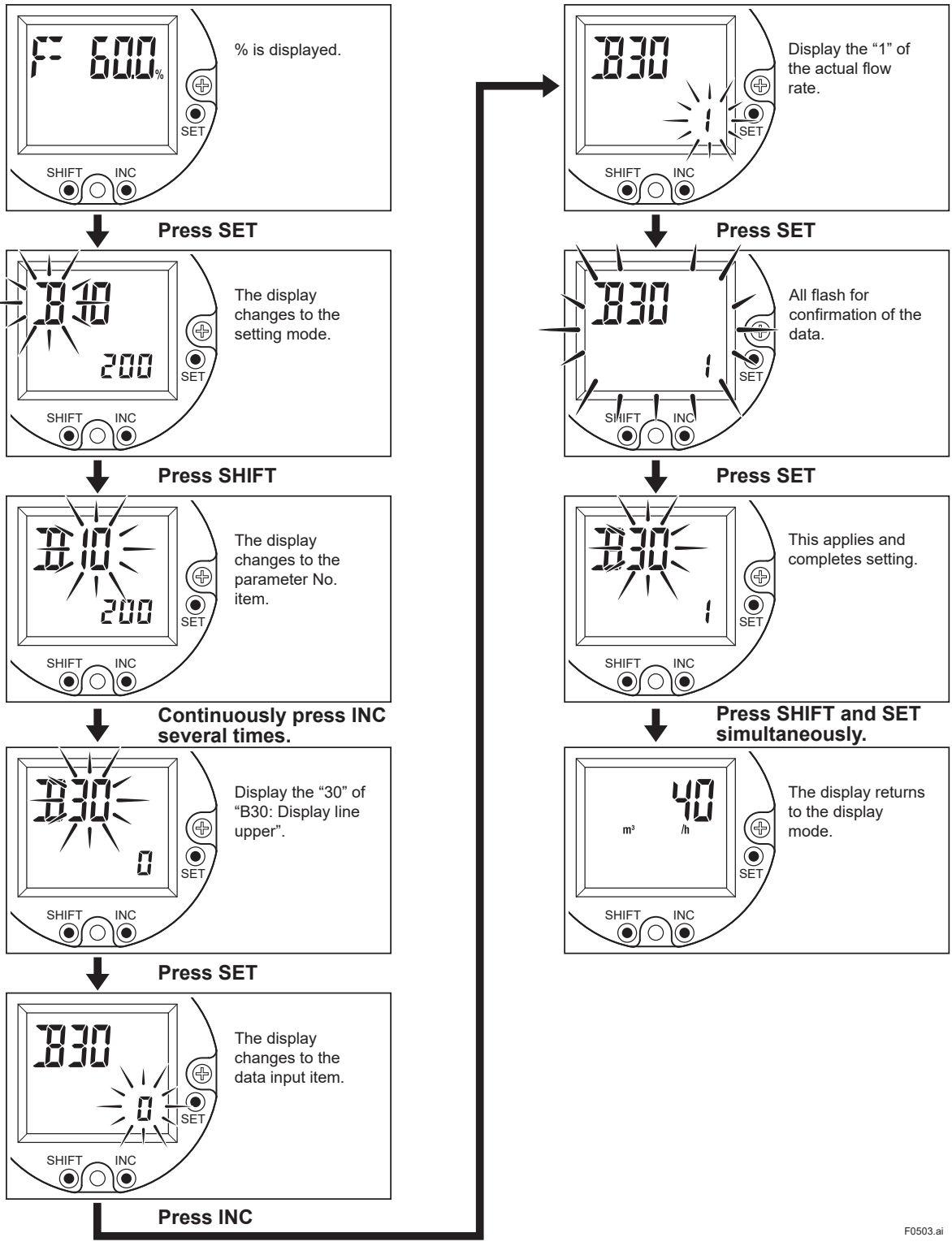
*1: Only when equipped with built-in temperature sensor

F0227.ai

For details, see 4.13.1 Setting Display Items.

2.4.1 Changing from % Display to Actual Flow Rate Display

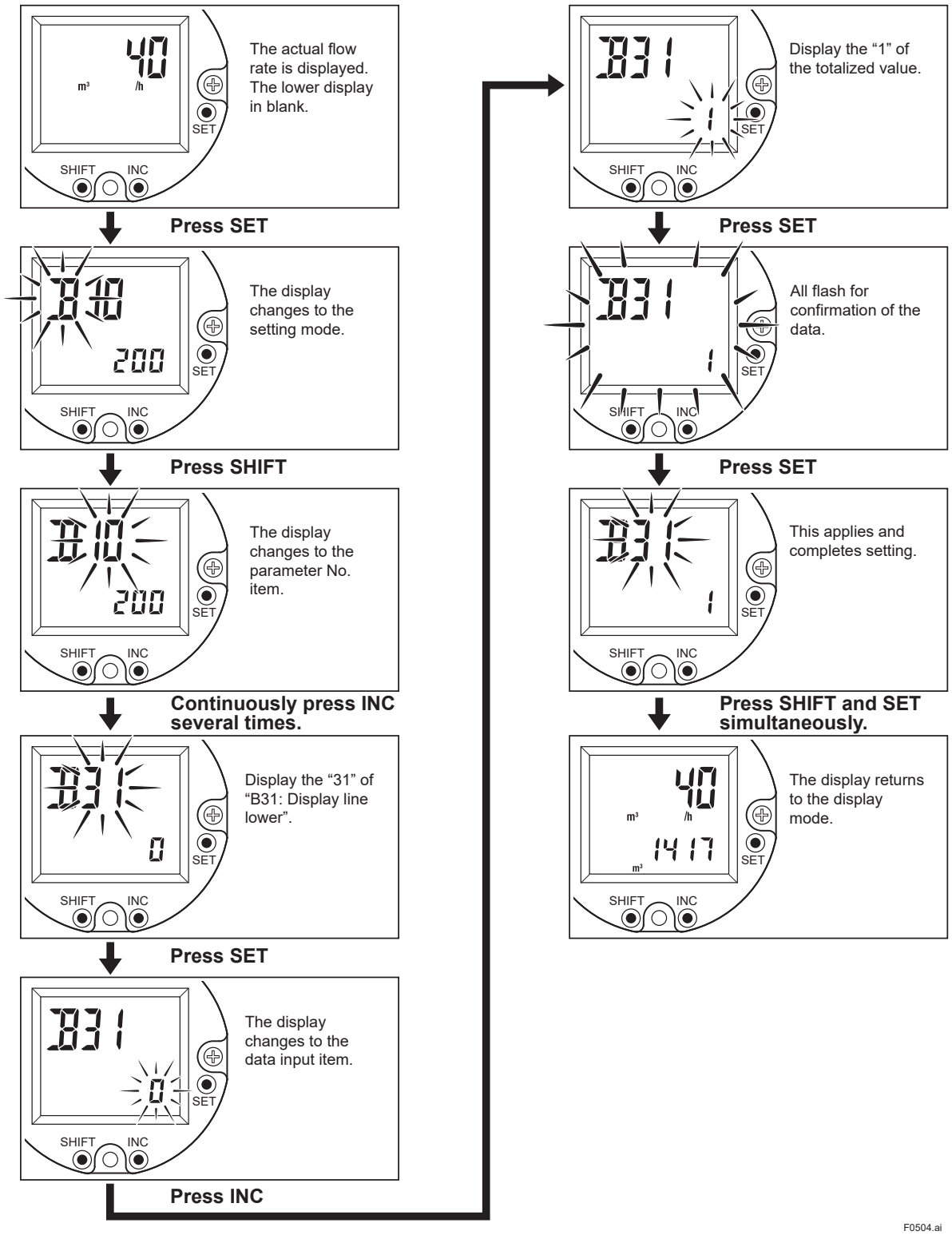
The following describes how to change the display content on the upper display of the select type parameters on the display.



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



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 Setting Mode

This section briefly describes the setting mode.

NOTE

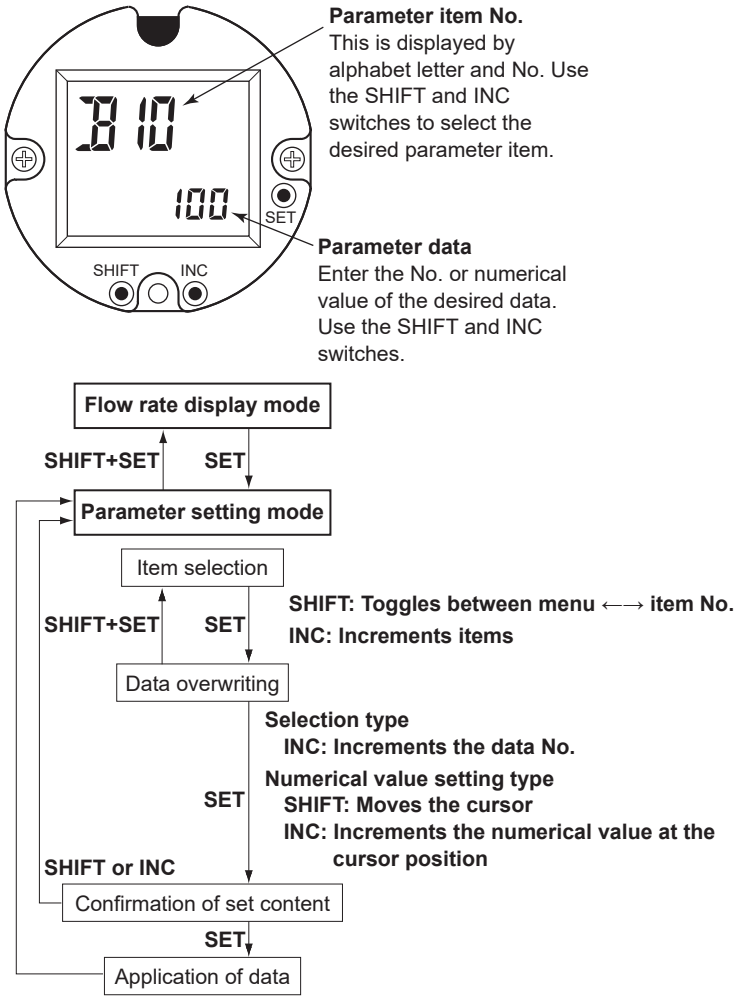
Before changing settings, be sure to check the content of parameters in Chapter 4 “Functions” and Chapter 5 “Parameter Lists.”

2.5.1 Configuration of the Setting Mode Display

Pressing the [SET] switch in the flow rate display mode moves the display to the setting mode as shown below. If operation levels are set at this time, the pass code must be entered. For details about operation levels, see 4.17.2.

NOTE

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. Then, it depends on the setting of display period, and it is about 2 times of the period.
Pay attention for the long period setting.



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.

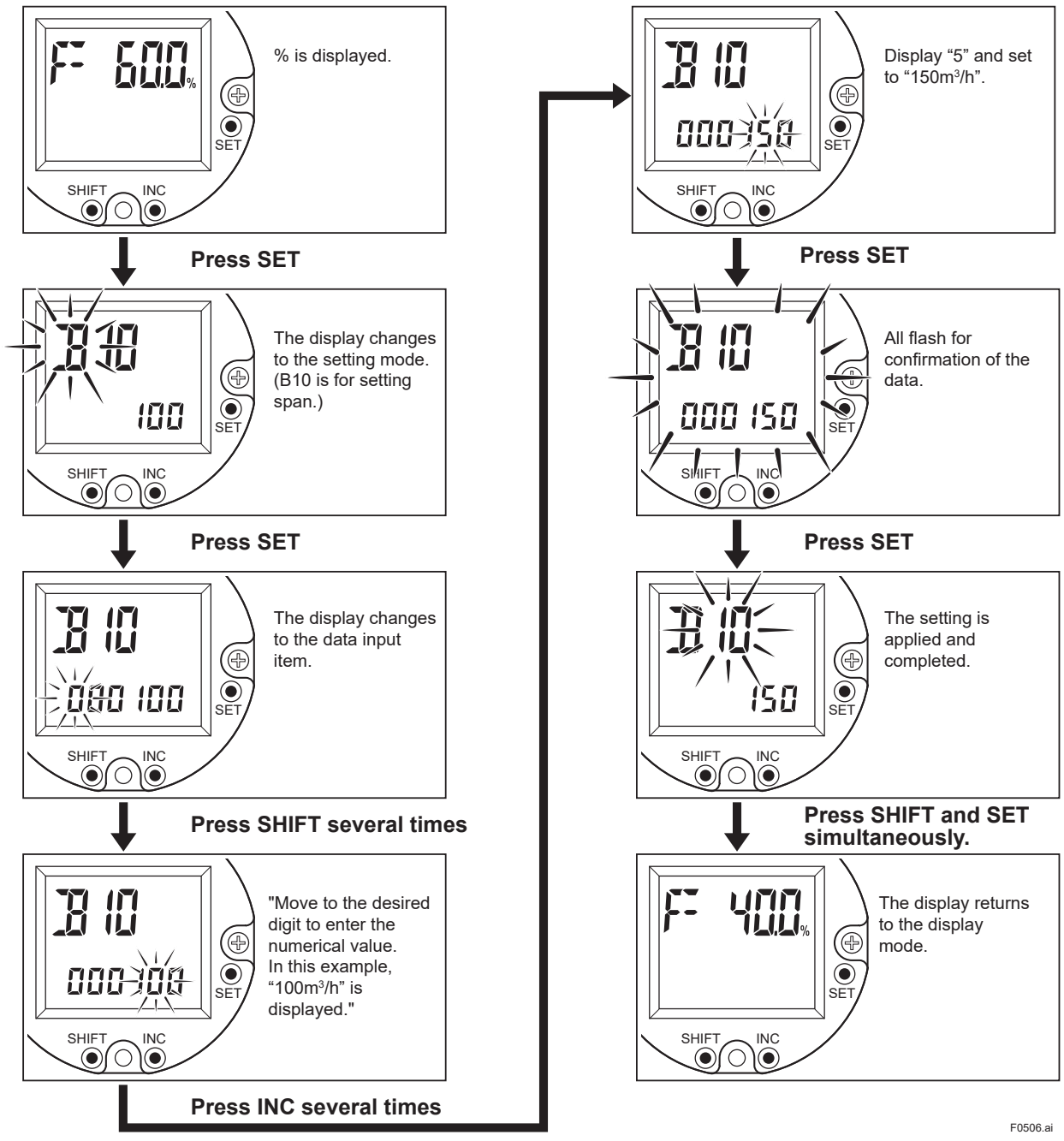
2.5.2 Data Setting Procedure

How to enter numerical values

NOTE

There are 6 digit in lower line of this segment type LCD. However, it is restricted to 5 digit in case of numerical value with sign, even though some parameters can be set to 6 digit by the HART communication access.

Example: Change the span from 100 m³/h to 150 m³/h

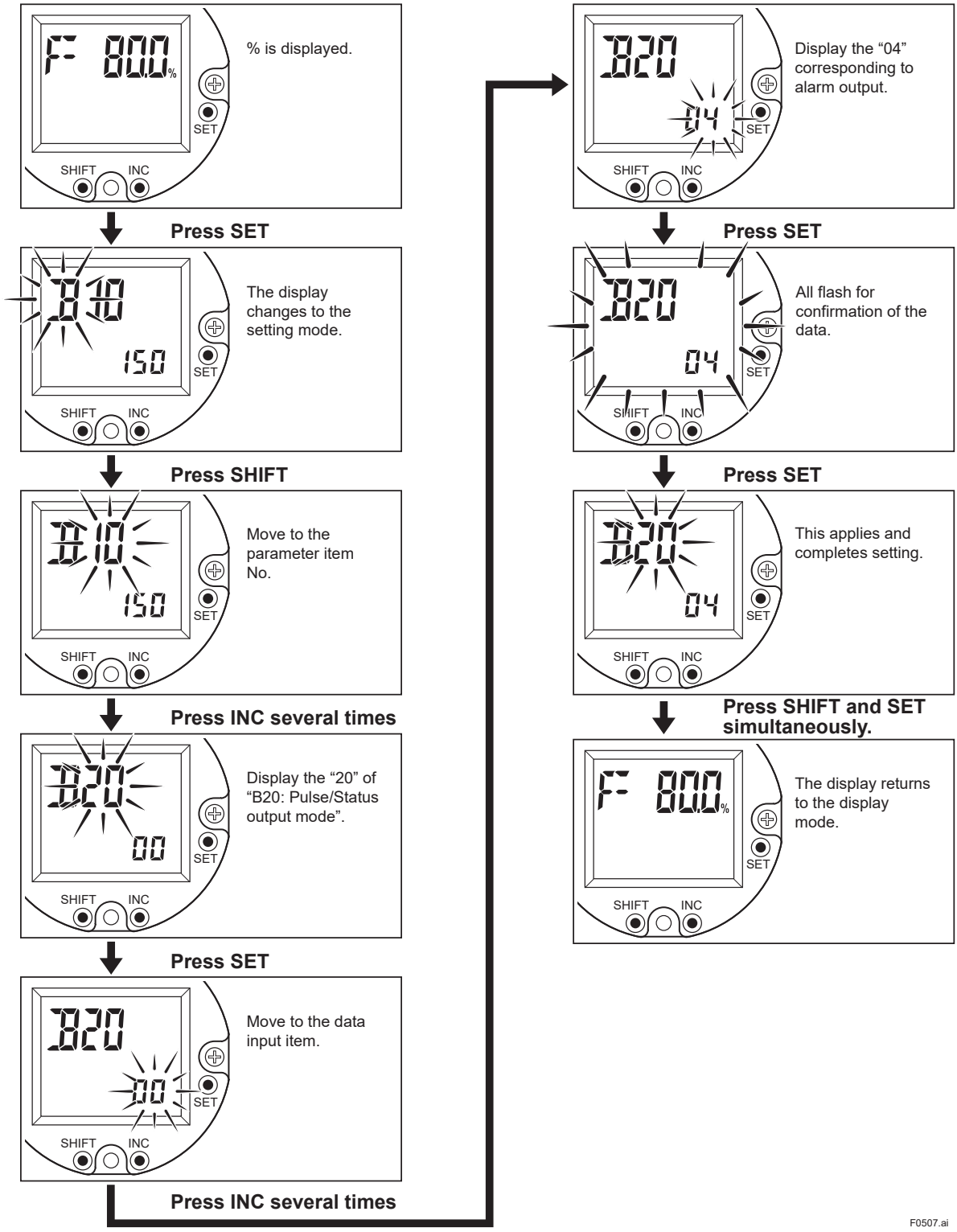


IMPORTANT

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.

How to set selection items

Example: Change contact output to Off (no output) to Alarm switch (alarm contact output)



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.

3. Operation with HART Configuration Tool

This chapter describes the connection of this product and the HART configuration tool (FieldMate (Versatile Device Management Wizard)), and the operations using the HART configuration tool. For details about FieldMate, refer to the User's Manual of FieldMate (IM 01R01A01-01).

NOTE

- For more details regarding operation of the HART configuration tool not given in this manual, refer to the User's Manual of the HART configuration tool.
- When using FieldMate as the HART configuration tool, be sure that the revision is R3.04.20 or later.

3.1 Connecting the HART Configuration Tool

The HART configuration tool can interface with this product from the control room, the device site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 250Ω between the connection and the receiving instrument.
To communicate with the HART configuration tool, the HART configuration tool must be connected in parallel with this product. The connections must be non-polarized.
Figure 3.1 shows a connection example

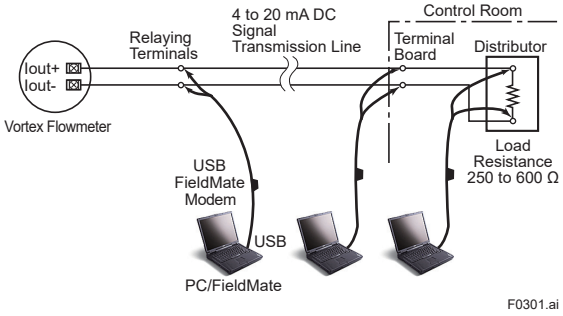


Figure 3.1 Connecting the HART Configuration Tool

IMPORTANT

The communication signal is superimposed on an analog output signal during communication. It is recommended to set a low-pass filter (approximately 0.1 s) to the receiver in order to reduce the output effect from the communication signal. Before online-communication, check that the communication signal does not affect the host system.

3.2 HART Configuration Tool and Product Revision

IMPORTANT

The protocol revision supported by the HART configuration tool must be the same as or later than the protocol revision of the product. If it is not, a communication error will occur.

3.2.1 Device Description (DD) and Device Revision

Before using the HART configuration tool, check that the DD of this product is installed in the configuration tool. If the correct DD is not installed in the configuration tool, download the correct DD from the FieldCommGroup official site and install it, or contact the respective vendor of the configuration tool for its upgrade information.
The device description is as follows.

DD Revision	1 or later
Device Type	VY Series (0x3713)
Device Revision	1 (the software revision is R1.01.01 or R1.01.02) 2 (the software revision is R1.01.03 or more)

• Checking the DD revision

(1) Turn on the power of this product with the configuration tool separated.
(2) Check the device revision from the installed DD file name according to the procedure provided for the configuration tool.

The DD file name is four digits. The upper two digits indicate the device revision and the lower two digits indicate the DD revision.

NOTE

The device revision of the DD file is annotated in hexadecimal.

• Checking the Device revision

Connect the setting tool to this product and confirm the revision by the following parameter.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► fld dev rev*1 / Device Revision*2

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

3.2.2 Device Type Manager (DTM) and Device Revision

When using FieldMate as the HART configuration tool, use the following DTM.

DTM Name	VY Series FDT2.0 HART7 DTM
DTM Revision	5.9.7.0 or later (the software revision is R1.01.01 or R1.01.02)*1 5.9.11.0 or later (the software revision is R1.01.03 or more)*2
Device Type	VY Series (0x3713)
Device Revision	1 (the software revision is R1.01.01 or R1.01.02) 2 (the software revision is R1.01.03 or more)

*1: The DTM is included in Yokogawa DTM Library HART 8.7 or later.

*2: The DTM is included in Yokogawa DTM Library HART 8.12 or later.

NOTE

The DTM revision can be confirmed by “DTM setup”.
Device Files is a medium included in FieldMate.
The user registration site provides Device Files with the latest update programs.
(URL: https://partner.yokogawa.com/japan/fieldmate/)
When updating the DTM, the following operations with “DTM setup” are required.

- Update DTM catalog
- Register DTM to the supported device.

For details, refer to the User’s Manual of FieldMate.

3.3 Basic Setting

If the dedicated parameters are specified at the time of ordering, this product is shipped with the Tag No. or device information configured.
The Tag No. and device information can be checked and set with the following parameters.

■ Tag No. (Tag, Long tag)

Menu path

HART	Device Settings ► Detailed setup ► HART config ► (see table below)

Parameter	Description
Tag	Up to 8 alphanumeric characters *1
Long tag	Up to 32 alphanumeric characters *2

■ Device information (Descriptor, Message)

Menu path

HART	Device Settings ► Detailed setup ► HART config ► (see below)

Parameter	Description
Descriptor	Up to 16 alphanumeric characters *1
Message	Up to 32 alphanumeric characters *1

*1: Symbols, letters and numbers enclosed by the thick line in the following table are available.
*2: All symbols, letters and numbers in the following table are available.

SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

* “SP” indicates a space.

3.4 Parameter Configuration

For details of the HART menu tree and parameters, see Chapters 4 and 5.
Note that some display parameters are different from those of the HART configuration tools.

CAUTION

Note that parameters cannot be set on the display while communicating with the HART configuration tool.

3.5 Data Updating and Upload/Download Function

(1) Updating data

The data is automatically updated at 0.5 to 2-second cycles.

(2) Upload/download function

The upload function is used for copying the parameters of the product to the HART configuration tool. The download function is used for setting the copied parameters in the HART configuration tool into another product. The applicable parameters are included in “Upload variables” as follows.

NOTE

Upload variables can be displayed from [Device] -> [Offline Parameters] from the toolbar of the DTM.
When writing parameters from Upload variables, click [Download to device].

Menu path

HART	Upload variables ► (see table below)

Tag	Reynolds adjust	Air pressure	Display period
Long tag	Viscosity unit	Compensation type	Display startup
Descriptor	Viscosity	Steam type	Display NE107
Message	Adjust reynolds number 1	Density unit	Display format flow
Auto delete time	Re adjust value 1	Fixed density	Display format temperature
Burnout recover	Adjust reynolds number 2	Base density	Display format pressure
Alarm status select	Re adjust value 2	Dryness	Nominal size
Alarm record select	Adjust reynolds number 3	Deviation	Body type
Flow sensor alarm action	Re adjust value 3	Temperature coefficient 1	Sensor type
Fluctuating level	Adjust reynolds number 4	Temperature coefficient 2	Connection type
Transient noise count	Re adjust value 4	Enthalpy unit	K factor unit
High vibration action	Adjust reynolds number 5	Fixed enthalpy	K factor
High vibration time	Re adjust value 5	Heat difference select	Memo 1
Critical vibration action	Expansion factor adjust	Heat difference conv unit	Memo 2
Critical vibration level	Fluid type	Heat difference conv factor	Memo 3
Critical vibration time	Flow select	Totalizer rate	Signal level
Clogging time	Volume unit	Totalizer preset value	Trigger level mode
Sensor circuit threshold	Mass unit	Totalizer reset mode	Trigger level(TLA)
Sensor capacitance threshold	Standard/Normal unit	Analog output low limit	Noise balance mode
Sensor resistance threshold	Energy unit	Analog output high limit	Noise ratio(manual)
Auto release time	Time unit	Pulse/Status output mode	
Flow rate gain	Flow span	Pulse output rate	
Instrument error adjust	Flow damping	Frequency output select	
Adjust vortex frequency 1	Flow lowcut	Frequency output zero	
Adjust value 1	Flow user conversion	Frequency output span	
Adjust vortex frequency 2	Flow user unit	Status output direction	
Adjust value 2	Flow conversion factor	Alarm switch select	
Adjust vortex frequency 3	Temperature unit	Limit switch select	
Adjust value 3	Fixed temperature	Limit switch mode	
Adjust vortex frequency 4	Base temperature	Limit switch level	
Adjust value 4	Pressure unit	Limit switch hysteresis	
Adjust vortex frequency 5	Fixed pressure	Display line upper	
Adjust value 5	Base pressure	Display line lower	

3.6 Specific Functions of HART Configuration Tool

3.6.1 Process Variable Setup (Dynamic Variables)

The device deals with four data (flow rate, temperature, total flow rate and pressure). These four data are allocated to PV (Primary Variable), SV (Secondary Variable), TV (Tertiary Variable) and QV (Quaternary Variable). The variable of PV is 4 to 20mA current output. Therefore, the total flow rate do not allocate to PV. (Except the built-in temperature sensor (B, D, H) and pressure, each dynamic variables are fixed at factory setting.)

Dynamic Variable	Items	Factory Setting
PV	Flow rate, Temperature	Instantaneous Flowrate
SV	Flow rate, Total, Temperature	Total
TV	Flow rate, Total, Temperature, Pressure	Temperature
QV	Flow rate, Total, Temperature, Pressure	Pressure

• Procedure to call up the Dynamic variable assignments.
Check settings : **[Root Menu]** → Detailed Setup → HART config → Dynamic variables → PV is*1 / Primary Variable*2 / SV is*1 / Secondary Variable*2 / TV is*1 / Tertiary Variable*2 / QV is*1 / Quaternary Variable*2
Change settings: **[Root Menu]** → Detailed Setup → HART config → Dynamic variables → Dynamic variables assignments (METHOD)

Update time period of each measurement value is as follows;
• Flow rate: Flow rate Update time period
• Total: Total Update time period
• Temperature: Temperature Update time period
• Pressure: Pressure Update time period

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

3.6.2 Burst Mode

(1) Applicable parameters of the burst mode

When the burst mode is enabled, the product continuously sends up to three data via HART communication. Also, it is possible to continuously send an alarm signal when a change to the product settings or a change by self diagnosis is detected.

NOTE

When changing the Burst Mode setting, set the burst mode to “Off”. When stopping burst mode, please do Stop burst.

Command Parameter	Burst Command	Trigger Mode	Trigger Source	Trigger Units
Primary Variable (PV)	Cmd1:PV*1 / Cmd1:Read Primary Variable*2	Continuous	---	---
		Window	PV	Depends on the assigned variable to PV
		Rising		
		Falling		
		On-change		
Percent Range and Loop Current	Cmd2:% range/ current*1 / Cmd2:Read Percent Range/ Current*2	Continuous	---	---
		Window	Percent Range	%
		Rising		
		Falling		
		On-change		
Dynamic Variables (PV, SV, TV, QV) and Loop Current	Cmd3:Dyn vars/current*1 / Cmd3:Read Dynamic Variables/ Current*2	Continuous	---	---
		Window	PV	Depends on the assigned variable to PV
		Rising		
		Falling		
		On-change		
Device Variables with Status	Cmd9:Device vars w/ status*1 / Cmd9:Read Device Variables with Status*2	Continuous	---	---
		Window	Process variable assigned to the top of Burst Device Variables	Depends on the assigned variable to Burst Device Variables
		Rising		
		Falling		
		On-change		
Device Variables	Cmd33:Device variables*1 / Cmd33:Read Device Variables*2	Continuous	---	---
		Window	Process variable assigned to the top of Burst Device Variables	Depends on the assigned variable to Burst Device Variables
		Rising		
		Falling		
		On-change		
Additional Device Status	Cmd48:Read Additional Device Status	Continuous	---	---
		On-change	All statuses	---

*1: For Device revision 1 and DD revision 1 or 2

*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

(2) Burst Mode setting

The Burst Mode can be set in two modes, Easy Burst Mode or Detailed Burst Mode.

• Setting the Easy Burst Mode

In the Easy Burst Mode, one Burst Command can be sent continuously. Easy Burst Mode (Burst Message #0*1 / Burst Message 1*2) can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Burst setting ► Set easy burst*1 Device Settings ► Detailed setup ► HART config ► Burst setting ► Easy burst setting ► Set easy burst*2

NOTE

When the Easy Burst Mode is used, Event Notification cannot be used.

• Setting the Detailed Burst Mode

In the Detailed Burst Mode, up to three Burst Commands can be sent continuously under various conditions. Detailed Burst Mode (Burst Message #1-3*1 / Burst Message 2-4*2) can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Burst setting ► Set detailed burst*1 Device Settings ► Detailed setup ► HART config ► Burst setting ► Detailed burst setting ► Set detailed burst*2

Set as follows according to the method*.
• Burst Command
• Update Period*1 / Update Rate*2 / Max Update Period*1 / Max Update Rate*2
• Trigger Mode
*: A method is a program for simplifying setting of parameters.

(3) Setting Burst Command

Select the data to send by the Burst Mode by a Burst Command.

Burst Command	Command Parameter
Cmd1:PV*1 / Cmd1:Read Primary Variable*2	Primary Variable (PV)
Cmd2:% range/current*1 / Cmd2:Read Percent Range/Current*2	Percent Range and Loop Current
Cmd3:Dyn vars/current*1 / Cmd3:Read Dynamic Variables/Current*2	Dynamic Variables (PV, SV, TV, QV) and Loop Current
Cmd33:Device variables*1 / Cmd33:Read Device Variables*2	Device Variables
Cmd9:Device vars w/ status*1 / Cmd9:Read Device Variables with Status*2	Device Variables with Status
Cmd48:Read Additional Device Status	Additional Device Status

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

(4) Setting Burst Device Variables

When Cmd9:Device vars w/ status*1 / Cmd9:Read Device Variables with Status*2 or Cmd33:Device variables*1 / Cmd33:Read Device Variables*2 is selected as the Burst Command, Burst Device Variables must be set for which up to four values can be set.

Device Variable Code	Burst Device Variables
0	Flowrate
1	Total
2	Temperature
3	Pressure

(5) Setting the Update Period*1 / Update Rate*2 / Max Update Period*1 / Max Update Rate*2

Set the Update Period*1 / Update Rate*2 / Max Update Period*1 / Max Update Rate*2, which is the update interval of the Trigger Mode. The Trigger Source is checked at the Update Period*1 / Update Rate*2 interval. When it fulfills the conditions of the Trigger Mode, the data is updated. When it does not fulfill the conditions of the Trigger Mode at the Update Period*1 / Update Rate*2 interval and reaches the Max Update Period*1 / Max Update Rate*2 interval, the data is forcibly updated.

Select the Update Period*1 / Update Rate*2 / Max Update Period*1 / Max Update Rate*2 from the following.

Update Period*1 / Update Rate*2 / Max Update Period*1 / Max Update Rate*2	
0.5 s	8 s
1 s	16 s
2 s	32 s
4 s	60 s to 3600 s (any value)

NOTE

For the Update Period*1 / Update Rate*2, set a value smaller than the Max Update Period*1 / Max Update Rate*2.

(6) Setting the Trigger Mode

Set the Trigger Mode. When “Window”, “Rising”, or “Falling” is set, the Trigger Level must be set.

Trigger Mode	Description
Continuous	Burst Messages are transmitted continuously.
Window	The Trigger Level is the amount of change. The device variable value detects and transmits the amount of change.
Rising	The setting value of the Trigger Level is the high limit value. When the device variable value exceeds the high limit value, this is detected, and a message is transmitted.
Falling	The setting value of the Trigger Level is the low limit value. When the device variable value exceeds the low limit value, this is detected, and a message is transmitted.
On-change	When the device variable value is changed from the previous output, it is detected, and a message is transmitted.

*1: For Device revision 1 and DD revision 1 or 2

*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

3.6.3 Event Notification

Changes to the device settings and changes in the device status by self diagnosis can be detected as events, and alarm signals are sent continuously as a result. Up to five events can be stored as an event history. When Event Notification is used, the Detailed Burst Message must be set and the Burst Message must be enabled.

NOTE

Note that events stored as the event history are cleared from memory when the power is turned off.

(1) Setting Event Notification

The Event Notification can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Event notification ► (see table below)

Parameter	Description
Set event notification	Sets Event Notification.
Stop event notification	Sets stopping of Event Notification.

Select the Event Notification setting from the table below.

Selection	Description
Event Notification Bit Mask	Sets the device status to trigger detection of an event (mask function). (Cmd48: Read Additional Device Status)
Retry Rate	Sets the interval at which an Event Notification is issued again when an event occurs.
Max Update Rate	Sets the interval at which an Event Notification is issued again when an event has not occurred.
Debounce Interval	Sets the minimum time that an event continues.

(2) Acknowledging events

If an Event is occurring, it must be acknowledged.
Acknowledgment of an event can be set by the following parameter.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Event notification ► Acknowledge event

NOTE

Only the event that occurred first can be acknowledged. When multiple events occur, they must all be acknowledged.

(3) Event Notification flow

When Event Notification is enabled, a change in status caused by self diagnosis of the device will activate the alarm Event1. Event1 is continuously transmitted at the interval of Retry Rate until it is acknowledged.
If Event2 occurs before Event1 is acknowledged, the information on Event2 is stored internally and continuously transmitted until Event1 is acknowledged. When Event1 is acknowledged, Event1 disappears and Event2 is continuously transmitted until it is acknowledged. When Event2 is acknowledged, all Events are acknowledged, and are continuously transmitted at the interval of the Max Update Rate.

3.6.4 Multidrop Mode

When the Multidrop Mode is enabled, the product can reference the connection of multiple HART communication devices on one communication transmission line. This product can connect up to 63 devices. To enable the Multidrop Mode, a number from 1 to 63 must be assigned to the polling address. When the Multidrop Mode is enabled, analog output signal settings of 4 to 20 mA must be changed because all the data is transmitted digitally.
Set the Multidrop Mode by the following procedure.

(1) Setting the polling address

Assign a number from 1 to 63 to the polling address. The polling address is set in method “Loop current mode” and can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Poll addr*1 / Polling Address*2

NOTE

When the same polling address is assigned to two or more products in the Multidrop Mode, communication with these products is disabled.

(2) Setting analog output

Usually, analog output in the Multidrop Mode is fixed at 4 mA on the product side. However, burnout output is no longer possible if analog output is fixed at 4 mA.
In the case of applications that receive and manipulate analog output, only one variable analog output can be set to variable on only one product per loop.
The analog input of the Multidrop Mode is set in method “Loop current mode” in the same method for the polling address, and can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► HART config ► Loop current mode*1 / Loop Current Mode*2

Select the analog output of the Multidrop Mode mode from the table below.

Selection	Description
Disabled*1 / Disable*2	Sets analog output to 4 mA (fixed).
Enabled*1 / Enable*2	Sets analog output to 4 to 20 mA (variable).

NOTE

In the Multidrop Mode, only the current value is fixed. Measured values are displayed for process values.

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

(3) Enabling the Multidrop Mode

Refer to the User's Manual of the HART configuration tool (1R01A01-01) when setting up polling for the receiving instrument.

(4) Communicating in the Multidrop Mode

- When connection between the product and the HART configuration tool starts, the tool searches for the products set to the Multidrop Mode, and the polling address and tag are displayed.
- After the desired product is selected, normal communication with the selected products becomes possible. However, communication in the Multidrop Mode is slower.

(5) Canceling the Multidrop Mode

To cancel the Multidrop Mode, the following parameter needs to be set.

- Set the polling address of (1) to “0”.
- Set the analog output of (2) to “Enabled”.

4. 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), C items (basic setting items), D items (additional setting items), E items (sensor setting items), J items (test items), and K items (maintenance 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, and can be output as analog output after scaling by the preset span from analog output. 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 4.1.

Totalization function

With this function, instantaneous flow rate values can be totaled. 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.
For details about how to check the totalized flow rate and setting procedure, see Section 4.2.

Temperature measurement function

On a type with built-in temperature gauge, temperature can be measured by the built-in temperature gauge. This measured temperature can be displayed on the display, and used for analog output after scaling. On an analog input type, the measured temperature value can be acquired from the temperature transmitter connected to the analog input and displayed on the display.
For details about how to check the temperature measurement function and setting procedure, see Section 4.3.

Pressure measurement function

On an analog input type, the measured pressure value can be acquired from the pressure transmitter connected to the analog 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 4.4.

Density measurement function

On the analog input type, the measured density value can be acquired from the density transmitter connected to the analog 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 4.5.

Analog output function

One analog output is available. Analog output is performed after the instantaneous flow rate is scaled by 4 to 20 mA of the set span setting value. Also, the measured temperature value of the built-in temperature gauge on a type with built-in temperature gauge is output as analog output after scaling. The upper and lower limit if this analog output are restricted.
For details about setting procedures for the analog output, see Section 4.6.

Analog input function

In the case of an analog input type (communication and I/O code JB) is selected, one analog input is available. Measured temperature, pressure or density values can be acquired from the temperature transmitter, pressure transmitter or density transmitter connected to the analog input.
For details about setting procedures for the analog input, see Section 4.7.

Pulse/status output function

One pulse/status output is available. One of pulse output, vortex pulse output, frequency output, alarm switch, and limit switch can be output.
Pulse output is output after the instantaneous flow rate is scaled by the set span setting value. Vortex pulse output is output after conversion of the vortex signal detected by the sensor is converted to pulses. For frequency output, the process value selected from one of the instantaneous flow rate, fluid temperature and fluid pressure is output. For alarm switch output, occurrence of alarms and warnings is notified. For limit switch output, upper and lower limit alarms for targets selected from one of instantaneous flow rate, fluid temperature, fluid pressure, and totalization are notified.
For details about setting procedures for pulse/status output, see Section 4.8.

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 4.9.

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. Analog output operation or 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 4.12.

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 4.13.

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, refer to Section 4.14.

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 4.15.

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 4.15.6.

Frequency analysis function

Product signals can be checked on FieldMate, etc.
For details about the frequency analysis function, see 4.15.8.

Test/simulation function

With this function, the process value and the value output from a connection terminal can be arbitrarily set to test a response from the device.
For details about the test/simulation function, refer to Section 4.16.

Write protect function

Two parameter write protect functions are available and can be changed by using the hardware write protection switch and the parameter settings (software write protection).
For details about the hardware write protection switch, refer to the Startup Manual. For details about the software write protection function, see section 4.17.

NOTE

Only basic 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 HART configuration tool.

4.1 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 HART communication method functions.

4.1.1 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

HART	Device Settings ► Basic setup ► Fluid type
Display	C15

Selection		Description
HART	**Display**	
Liquid	0	Liquid is set as the measured fluid
Gas	1	Gas is set as the measured fluid
Water	2	Water is set as the measured fluid
Steam	3	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 %.

4.1.2 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

HART	Device Settings ► Basic setup ► Flow select
Display	C16

Selection		Description
HART	**Display**	
Volume	0	Volumetric flow rate: This refers to the volume of fluid that flows through the measuring pipe per unit hour.
Mass	1	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	2	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	3	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)	4	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.

4.1.3 Setting the Instantaneous Flow Rate Unit

Set the unit of volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference. The unit of each flow rate can be set as a physical unit and a time unit. Note, however, that the set time unit is common to all flow rates.

Example) When the volumetric flow rate is set to "m^3/h"
Set the volume unit to "m^3" and the time unit to "/h". At this setting, the time unit of mass flow rate, Standard/Normal flow rate, heat, and heat difference also becomes "/h".

This setting can be set by the following parameters.

■ Physical unit

● Volumetric flow rate

Menu path

HART	Device Settings ► Basic setup ► Volume unit
Display	C22

Selection	
HART	**Display**
m^3	0
km^3	1
l	2
mcf	3
cf	4
kcf	5
USgal	6
kUSgal	7
UKgal	8
kUKgal	9
mbbl	10
bbl	11
kbbl	12

NOTE

The unit display will be the same (gal) if either USgal or UKgal is selected for the volumetric flow rate unit, and then the instantaneous flow rate (engineering unit) is displayed on the display.

● Mass flow rate

Menu path

HART	Device Settings ► Basic setup ► Mass unit
Display	C27

Selection	
HART	**Display**
kg	0
t	1
lb	2
klb	3

● Standard/Normal flow rate

Menu path

HART	Device Settings ► Basic setup ► Standard/Normal unit
Display	C37

Selection	
HART	**Display**
(N)m^3	0
k(N)m^3	1
M(N)m^3	2
(N)l	3
(S)m^3	4
k(S)m^3	5
M(S)m^3	6
(S)l	7
(S)cf	8
k(S)cf	9
M(S)cf	10

● Heat/heat difference

Menu path

HART	Device Settings ► Basic setup ► Energy unit
Display	C38

Selection	
HART	**Display**
kJ	0
MJ	1
GJ	2
TJ	3
BTU	4
kBTU	5
MBTU	6

■ Time unit

Menu path

HART	Device Settings ► Basic setup ► Time unit
Display	C40

Selection		Description
HART	**Display**	
/s	0	The time unit is set to s (seconds)
/min	1	The time unit is set to min (minutes)
/h	2	The time unit is set to h (hours)
/d	3	The time unit is set to d (days)

Checking the measurement unit

The preset measurement unit can be checked by the following parameters.

Menu path

HART	Device Settings ► Basic setup ► Flow unit
Display	C41

HART	Display	HART	Display	HART	Display
m^3/s	0	bbl/d	47	M(S)m^3/h	94
m^3/min	1	kbbl/s	48	M(S)m^3/d	95
m^3/h	2	kbbl/min	49	(S)l/s	96
m^3/d	3	kbbl/h	50	(S)l/min	97
km^3/s	4	kbbl/d	51	(S)l/h	98
km^3/min	5	kg/s	52	(S)l/d	99
km^3/h	6	kg/min	53	(S)cf/s	100
km^3/d	7	kg/h	54	(S)cf/min	101
l/s	8	kg/d	55	(S)cf/h	102
l/min	9	t/s	56	(S)cf/d	103
l/h	10	t/min	57	k(S)cf/s	104
l/d	11	t/h	58	k(S)cf/min	105
mcf/s	12	t/d	59	k(S)cf/h	106
mcf/min	13	lb/s	60	k(S)cf/d	107
mcf/h	14	lb/min	61	M(S)cf/s	108
mcf/d	15	lb/h	62	M(S)cf/min	109
cf/s	16	lb/d	63	M(S)cf/h	110
cf/min	17	klb/s	64	M(S)cf/d	111
cf/h	18	klb/min	65	kJ/s	112
cf/d	19	klb/h	66	kJ/min	113
kcf/s	20	klb/d	67	kJ/h	114
kcf/min	21	(N)m^3/s	68	kJ/d	115
kcf/h	22	(N)m^3/min	69	MJ/s	116
kcf/d	23	(N)m^3/h	70	MJ/min	117
USgal/s	24	(N)m^3/d	71	MJ/h	118
USgal/min	25	k(N)m^3/s	72	MJ/d	119
USgal/h	26	k(N)m^3/min	73	GJ/s	120
USgal/d	27	k(N)m^3/h	74	GJ/min	121
kUSgal/s	28	k(N)m^3/d	75	GJ/h	122
kUSgal/min	29	M(N)m^3/s	76	GJ/d	123
kUSgal/h	30	M(N)m^3/min	77	TJ/s	124
kUSgal/d	31	M(N)m^3/h	78	TJ/min	125
UKgal/s	32	M(N)m^3/d	79	TJ/h	126
UKgal/min	33	(N)l/s	80	TJ/d	127
UKgal/h	34	(N)l/min	81	BTU/s	128
UKgal/d	35	(N)l/h	82	BTU/min	129
kUKgal/s	36	(N)l/d	83	BTU/h	130
kUKgal/min	37	(S)m^3/s	84	BTU/d	131
kUKgal/h	38	(S)m^3/min	85	kBTU/s	132
kUKgal/d	39	(S)m^3/h	86	kBTU/min	133
mbbl/s	40	(S)m^3/d	87	kBTU/h	134
mbbl/min	41	k(S)m^3/s	88	kBTU/d	135
mbbl/h	42	k(S)m^3/min	89	MBTU/s	136
mbbl/d	43	k(S)m^3/h	90	MBTU/min	137
bbl/s	44	k(S)m^3/d	91	MBTU/h	138
bbl/min	45	M(S)m^3/s	92	MBTU/d	139
bbl/h	46	M(S)m^3/min	93	SPE.	140

4.1.4 Setting the Span of the Instantaneous Flow Rate

The span of volumetric flow rate, mass flow rate, Standard/Normal flow rate, heat, and heat difference can be set.
Note, however, that the span unit is the unit set in section 4.1.3. 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

HART	Device Settings ► Basic setup ► Flow span
Display	B10 or C45

● Measurable minimum flow velocity

The minimum flow velocity of each size varies according to the density of the fluid. Table 4.1 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 4.1 when the flow rate is heat and heat difference, too.

Table 4.1 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	-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, N, P: General type E, S: Cryogenic type (*1) G, H, U, V: Long Neck Type	C, D, Q, R: High temperature type (*1)	A, B, N, P: General type E, S: Cryogenic type (*1) G, H, U, V: Long Neck Type	C, D, Q, R: High temperature type (*1)
VY015-0	VY025-1 VY025-4	VY040-2	$\sqrt{250/\rho}$	-	$\sqrt{80/\rho}$ or 3	-
VY025-0	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	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	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	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	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	VY200-1	-	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
VY200-0	-	-	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ 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

ρ: Density at operating conditions (kg/m^3) (Unit: m/s)
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 4.2 shows the ranges of the measurable flow velocities.

Table 4.2 Range of Measurable Flow Velocities

Fluid	Model code - Type of body			Minimum flow velocity	Maximum flow velocity
	-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)		
Liquid	VY015-0 to VY400-0 VY015-6 to VY200-6	VY025-1 to VY200-1 VY025-4 to VY150-4	VY040-2 to VY200-2	"Flow velocity obtained from Table 4.1" or "flow velocity at Reynolds number of 5000", whichever is greater.	10 m/s (*1)
Gas Steam	VY015-0 to VY400-0 VY015-6 to VY200-6	VY025-1 to VY200-1 VY025-4 to VY150-4	VY040-2 to VY200-2	"Flow velocity obtained from Table 4.1" or "flow velocity at Reynolds number of 5000", whichever is greater.	80m/s (*2)

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 set.
For gas or steam, a flow rate up to the equivalent of a flow velocity of 120 m/s can be set.

*1: When density ρ > 1000 kg/m^3, maximum flow velocity V = $\sqrt{[(1/\rho) * 10^5]}$
*2: When density ρ > 15.6 kg/m^3, maximum flow velocity V = $\sqrt{[(1/\rho) * 10^5]}$
*3: Formula for calculating flow velocity calculated from Reynolds number

$$u = 5 \times \frac{v}{D} \quad (Re=5000)$$

where

$$Re = \frac{354 \times 10^3 \times Q_f}{v \times D}$$

$$v = \frac{\mu \times 10^3}{\rho_f}$$

Q_f: Volumetric flow rate at operating conditions (m^3/h)
D: Inner diameter of sensor section (mm)
u: Flow velocity (m/s)
Re: Reynolds number (non unit)
ρ_f: Density at operating conditions (kg/m^3)
μ: Viscosity at operating conditions (mPa·s)
v: Kinematic viscosity at operating conditions (10^{-6} m^2/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.

4.1.5 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

HART	Device Settings ► Basic setup ► Flow damping
Display	B15 or C50

NOTE

When using the HART communication in such application that the output varies very quickly, set the damping time constant as 2 sec or greater.

4.1.6 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

HART	Device Settings ► Detailed setup ► Flow rate ► Flow lowcut
Display	D10

Table 4.3 Lowcut setting lower limit flow velocity (m/s)

Model code - Type of body			Liquid	Gas, Steam
-0: 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)	Unit: m/s	Unit: m/s
VY015-0	VY025-1 VY025-4	VY040-2	0.17	1.50
VY025-0	VY040-1 VY040-4	VY050-2	0.12	1.00
VY040-0	VY050-1 VY050-4	VY080-2	0.10	1.00
VY050-0	VY080-1 VY080-4	VY100-2	0.10	1.00
VY080-0	VY100-1 VY100-4	VY150-2	0.10	1.00
VY100-0	VY150-1 VY150-4	VY200-2	0.10	1.00
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 (D10) of the instantaneous flow rate after setting the diameter type (E10).

NOTE

To change the lowcut flow rate and adjust items (H item), change all applicable adjust items (H items), and then set the lowcut value (D10).

NOTE

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

4.1.7 Setting the User Unit Conversion of the Instantaneous Flow Rate

The instantaneous flow rate can be converted to an arbitrary unit for use by using an arbitrary conversion factor. Any character string up to eight characters long can be set for the user unit. Conversion to a user unit is performed by multiplying the instantaneous volumetric flow rate by the conversion factor.
This setting can be set by the following parameters or execute User unit.

■ Selection of whether or not to convert to user units

Menu path

HART	Device Settings ► Detailed setup ► Flow user conversion ► Flow user conversion
Display	D40

Selection		Description
HART	**Display**	
Off	0	Conversion to user units is not performed.
On	1	Conversion to user units is performed.

■ Display the flow rate unit used for the conversion reference

Display the flow rate unit (Flow user base unit) that is used for the conversion reference when Flow user conversion (D40) is “On”.

Menu path

HART	Device Settings ► Detailed setup ► Flow user conversion ► Flow user base unit
Display	D41

Selection									
HART	**Display**	**HART**	**Display**	**HART**	**Display**	**HART**	**Display**	**HART**	**Display**
m^3/s	0	kUSgal/s	28	t/s	56	(S)m^3/s	84	kJ/s	112
m^3/min	1	kUSgal/min	29	t/min	57	(S)m^3/min	85	kJ/min	113
m^3/h	2	kUSgal/h	30	t/h	58	(S)m^3/h	86	kJ/h	114
m^3/d	3	kUSgal/d	31	t/d	59	(S)m^3/d	87	kJ/d	115
km^3/s	4	UKgal/s	32	lb/s	60	k(S)m^3/s	88	MJ/s	116
km^3/min	5	UKgal/min	33	lb/min	61	k(S)m^3/min	89	MJ/min	117
km^3/h	6	UKgal/h	34	lb/h	62	k(S)m^3/h	90	MJ/h	118
km^3/d	7	UKgal/d	35	lb/d	63	k(S)m^3/d	91	MJ/d	119
l/s	8	kUKgal/s	36	klb/s	64	M(S)m^3/s	92	GJ/s	120
l/min	9	kUKgal/min	37	klb/min	65	M(S)m^3/min	93	GJ/min	121
l/h	10	kUKgal/h	38	klb/h	66	M(S)m^3/h	94	GJ/h	122
l/d	11	kUKgal/d	39	klb/d	67	M(S)m^3/d	95	GJ/d	123
mcf/s	12	mbbl/s	40	(N)m^3/s	68	(S)l/s	96	TJ/s	124
mcf/min	13	mbbl/min	41	(N)m^3/min	69	(S)l/min	97	TJ/min	125
mcf/h	14	mbbl/h	42	(N)m^3/h	70	(S)l/h	98	TJ/h	126
mcf/d	15	mbbl/d	43	(N)m^3/d	71	(S)l/d	99	TJ/d	127
cf/s	16	bbl/s	44	k(N)m^3/s	72	(S)cf/s	100	BTU/s	128
cf/min	17	bbl/min	45	k(N)m^3/min	73	(S)cf/min	101	BTU/min	129
cf/h	18	bbl/h	46	k(N)m^3/h	74	(S)cf/h	102	BTU/h	130
cf/d	19	bbl/d	47	k(N)m^3/d	75	(S)cf/d	103	BTU/d	131
kcf/s	20	kbbl/s	48	M(N)m^3/s	76	k(S)cf/s	104	kBTU/s	132
kcf/min	21	kbbl/min	49	M(N)m^3/min	77	k(S)cf/min	105	kBTU/min	133
kcf/h	22	kbbl/h	50	M(N)m^3/h	78	k(S)cf/h	106	kBTU/h	134
kcf/d	23	kbbl/d	51	M(N)m^3/d	79	k(S)cf/d	107	kBTU/d	135
USgal/s	24	kg/s	52	(N)l/s	80	M(S)cf/s	108	MBTU/s	136
USgal/min	25	kg/min	53	(N)l/min	81	M(S)cf/min	109	MBTU/min	137
USgal/h	26	kg/h	54	(N)l/h	82	M(S)cf/h	110	MBTU/h	138
USgal/d	27	kg/d	55	(N)l/d	83	M(S)cf/d	111	MBTU/d	139

Setting the name of the user-specified unit

Set the name of the user-specified unit using eight characters and symbols when Flow user conversion (D40) is “On”.
The same characters and symbols as in Section 3.3 Basic settings can be set.

Menu path

HART	Device Settings ► Detailed setup ► Flow user conversion ► Flow user unit
Display	-

Setting the user conversion factor

Set the conversion factor to user units when Flow user conversion (D40) is “On”.
The conversion factor is calculated/multiplicated to the parameters such as the instantaneous flow rate as follows;
Flow user unit = Flow user base unit × Flow conversion factor

Menu path

HART	Device Settings ► Detailed setup ► Flow user conversion ► Flow conversion factor
Display	D43

Example:
To convert the unit of instantaneous volumetric flow rate from l (liters)/s to dl (deciliters)/s, set the parameters as follows:
Flow user conversion = “On”
Flow user base unit = “l/s”
Flow user unit = “dl/s”
Flow conversion factor = “10”

Applicable parameters for instantaneous flow rate user unit conversion

Applicable parameters for instantaneous flow rate user unit conversion are listed below.

Flow rate	Totalizer preset value
Flow span	Totalizer rate
Flow lowcut	Pulse output rate*1
Lowcut limit	Limit switch level*2
Total	Limit switch hysteresis*2

*1: This parameter will be applicable only when Pulse/Status output mode = “Scaled pulse”.
*2: These parameters will be applicable only when Limit switch select = “Flow rate” or “Total”.

NOTE

If the software revision is R1.01.01, the pulse rate (Pulse output rate) is not multiplied by the user conversion factor, and user unit conversion is not applied.
Example:
With Flow user base unit = “l/s” and Pulse output rate = “5[l/p]”, if Flow user conversion = “On”, Flow user unit = “dl/s”, and Flow conversion factor = “10”, the pulse output rate will not be displayed/operated at 5[l/p] × 10 = 50[SPE./p]. Instead, the pulse output rate will be displayed as 5[SPE./p], and pulse output will operate with a weight of 5[l/p].
The user conversion factor (Flow conversion factor) will not be applied to the pulse output rate, and only the display unit will change. Therefore, replace “SPE.” from the pulse output rate display unit (“SPE./p”) with the unit from the flow user base unit (with the time unit removed).

4.1.8 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

HART	Device Settings ► Detailed setup ► Compensation setup ► Density unit
Display	C25 or F11

Selection	
HART	**Display**
kg/m^3	0
lb/cf	1
lb/USgal	2
lb/UKgal	3

● 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

HART	Device Settings ► Detailed setup ► Compensation setup ► Fixed Density
Display	C26 or F12 or H26

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 normal condition (1 atm, 0°C) or the density value of a standard condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Base density
Display	F13

Temperature basic setting

Temperature unit

Set the temperature unit by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Temperature unit
Display	C30 or F14

Selection	
HART	**Display**
degC	0
degF	1
K	2

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

HART	Device Settings ► Detailed setup ► Compensation setup ► Fixed temperature
Display	C31 or F15

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 normal condition (1 atm, 0°C) or the temperature value of a standard condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Base temperature
Display	C32 or F16

■ Pressure basic setting

● Pressure unit

Set the pressure unit by the following parameters.

Menu path

HART	Device Settings ▶ Detailed setup ▶ Compensation setup ▶ Pressure unit
Display	C33 or F17

Selection		Description
HART	**Display**	
kPa A	0	The unit is set to absolute pressure kPa
MPa A	1	The unit is set to absolute pressure MPa
bar A	2	The unit is set to absolute pressure bar
psi A	3	The unit is set to absolute pressure psi
kPa G	4	The unit is set to gauge pressure kPa
MPa G	5	The unit is set to gauge pressure MPa
bar G	6	The unit is set to gauge pressure bar
psi G	7	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

HART	Device Settings ▶ Detailed setup ▶ Compensation setup ▶ Fixed Pressure
Display	C34 or F18

● 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 normal condition (1 atm, 0°C) or the pressure value of a standard condition (1 atm, 15°C, etc.) according to that selected unit.

Menu path

HART	Device Settings ▶ Detailed setup ▶ Compensation setup ▶ Base Pressure
Display	C35 or F19

NOTE

If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Follow the steps below to set to minus gauge pressure value.

- For Device revision 1 and DD revision 1 or 2

Please set each parameter in the following steps.
(1) Set absolute pressure unit(kPa A, MPa A, bar A, psi A) to Pressure unit
(2) Set the value coverted to absolute pressure to Fixed pressure or Base pressure
(3) Set gauge pressure unit(kPa G, MPa G, bar G, psi G) to Pressure unit

- For Device revision 1 and DD revision 3 or more

Please use Flow rate config method or Pressure detailed config method to set each parameter. The method processing automatically performs the above steps.

Basic settings of specific enthalpy

Specific enthalpy unit

Set the specific enthalpy unit by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Enthalpy unit
Display	F35

Selection	
HART	**Display**
kJ/kg	0
MJ/kg	1
GJ/kg	2
TJ/kg	3
BTU/lb	4

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

HART	Device Settings ► Detailed setup ► Compensation setup ► Fixed enthalpy
Display	F36

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 4.3 and the pressure measurement function in Section 4.4.

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

HART	Device Settings ► Detailed setup ► Compensation setup ► Steam type
Display	F01

Selection		Description
HART	**Display**	
Saturated steam	0	Saturated steam
Superheated steam	1	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 4.3, for the pressure measurement function, see Section 4.4, and for the density measurement function, see Section 4.5.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Compensation type
Display	F03

Selection		Description
HART	**Display**	
Not used	0	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.	1	Temperature correction based on the built-in temperature gauge is performed.
Built-in temp. & A-in press.	2	Temperature correction based on the built-in temperature gauge and pressure correction based on pressure measured by analog input are performed.
A-in temp	4	Temperature correction based on temperature measured by analog input is performed.
A-in press.	5	Pressure correction based on pressure measured by analog input is performed.
A-in density	6	Density correction based on density measured by analog input is performed.

Checking the compensation method of density and specific enthalpy

The compensation method of density and enthalpy can be checked.

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Calculation type
Display	-

Selection		Description
HART	**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.
Analog input	-	The density measured value of analog 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.
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.

Selection		Description
HART	Display	
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 superheated 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

HART	Device Settings ► Detailed setup ► Compensation setup ► Deviation
Display	C36 or F23

■ 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

HART	Device Settings ► Detailed setup ► Compensation setup ► Heat difference select
Display	F37

Selection		Description
HART	Display	
Built-in(H)/Analog input(L)	0	The built-in temperature gauge is used as the fluid temperature value on the high-temperature side and analog input is used as the fluid temperature value on the low-temperature side.
Analog input(H)/Built-in(L)	1	Analog 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.
Analog input(delta T)	2	When the measured fluid is liquid, analog 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

HART	Device Settings ► Detailed setup ► Compensation setup ► Heat difference conv unit
Display	F38

Selection	
HART	**Display**
(kJ/kg)/K	0
(MJ/m^3)/K	1
(BTU/cf)/degF	2
(BTU/USgal)/degF	3
(BTU/UKgal)/degF	4
(BTU/lb)/degF	5

Setting the heat conversion factor

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

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► Heat difference conv factor
Display	F39

4.1.9 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

HART	Process Variables ► Device variable ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Flow rate(%)	A10	The instantaneous flow rate (value converted to %) is displayed
Flow rate	A20	The instantaneous flow rate is displayed at the preset unit
Total	A30	The totalized flow rate is displayed For details on the totalization function, see Section 4.2
Temperature(%)	A40	The temperature (value converted to %) is displayed
Temperature	A41	The temperature is displayed at the preset unit
Loop current	-	The Loop current(mA) is displayed

Menu path

HART	Device Settings ► Detailed setup ► Compensation setup ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Density	F40 or K38	The density is displayed at the preset unit
Density ratio	F41	The density ratio used for Standard/Normal flow rate measurement is displayed
Enthalpy	F42	The specific enthalpy used for heat measurement is displayed at the set unit
Delta temperature	F43	The temperature difference used for heat difference measurement is displayed at the set unit when the measured fluid is liquid
Delta enthalpy	F44	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 %.

4.2 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.

4.2.1 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

HART	Device Settings ► Easy setup ► Totalizer unit
Display	B41

Selection							
HART	**Display**	**HART**	**Display**	**HART**	**Display**	**HART**	**Display**
m^3	0	kUKgal	9	k(N)m^3	18	M(S)cf	27
km^3	1	mbbl	10	M(N)m^3	19	kJ	28
l	2	bbl	11	(N)l	20	MJ	29
mcf	3	kbbl	12	(S)m^3	21	GJ	30
cf	4	kg	13	k(S)m^3	22	TJ	31
kcf	5	t	14	M(S)m^3	23	BTU	32
USgal	6	lb	15	(S)l	24	kBTU	33
kUSgal	7	klb	16	(S)cf	25	MBTU	34
UKgal	8	(N)m^3	17	k(S)cf	26	SPE.	35

4.2.2 Setting Start/Stop of the Totalization Function

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

Menu path

HART	Device Settings ► Easy setup ► Totalizer start/stop
Display	B40

Selection		Description
HART	**Display**	
Stop	0	The totalization function is stopped
Start	1	The totalization function is started

4.2.3 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

HART	Device Settings ▶ Easy setup ▶ Totalizer reset/preset(method)
Display	B47

Selection		Description
HART	**Display**	
Not execute	0	The totalized value reset/preset function is not executed.
Reset	1	The totalized value is reset and “0” is set.
Preset	2	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 (B45) and Totalizer preset value (B48) 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

HART	Device Settings ▶ Easy setup ▶ Totalizer preset value
Display	B48

4.2.4 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

HART	Device Settings ▶ Easy setup ▶ Totalizer rate
Display	B45

NOTE

The totalized value 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.

4.2.5 Setting the Totalization Operation of the Totalization Function

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

Menu path

HART	Device Settings ► Easy setup ► Totalizer reset mode
Display	B49

Selection		Description
HART	**Display**	
Reset	0	Divide the totalized value by 1000000 and use the remainder for the new totalized value.*1 Totalization is continued.
Hold only display	1	Only the totalized value on the display is fixed (held). Totalization of A30: Total is continued.
Hold	2	The totalized value is is fixed (held).

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

4.3 Temperature Measurement Function

4.3.1 Checking the Temperature Measurement Method

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

Menu path

HART	Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature select
Display	F04 or G10

Selection		Description
HART	**Display**	
Fixed	0	The fixed temperature set at Fixed Temperature is used
Built-in	1	The measured value of the built-in temperature gauge on the type with a temperature sensor is used
Analog input	2	The measured temperature value is acquired from the temperature transmitter connected to the analog input on the analog input type

4.3.2 Setting Scaling of Temperature Measurement

■ Setting the lower limit value (0%)

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

Menu path

HART	Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature LRV
Display	B51 or G11

■ Setting the upper limit value (100%)

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

Menu path

HART	Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature URV
Display	B52 or G12

4.3.3 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

HART	Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature damping
Display	G13

NOTE

When using HART communication in a situation where the output signal changes instantly, set the damping time constant to 2 seconds or more.

4.3.4 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 C30 or F14: Temperature unit]

T_n: Measured temperature [unit selected at C30 or F14: 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

HART	Device Settings ► Detailed setup ► T/P setup ► Temperature ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Temperature gain	G15	The compensation factor (gain) is set
Temperature offset	G16	The compensation value (offset) is set

4.4 Pressure Measurement Function

On an analog input type, the measured pressure value can be acquired from the pressure transmitter connected to the analog input. At 4.1.8 Selection of compensation type (F03: Compensation type), select pressure correction based on the pressure measured by analog input, and set the analog input range in 4.7.4.

4.4.1 Checking the Pressure Measurement Method

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

Menu path

HART	Device Settings ► Detailed setup ► T/P setup ► Pressure ► Pressure select
Display	F05 or G20

Selection		Description
HART	**Display**	
Fixed	0	The fixed pressure set at Fixed Pressure is used
Analog input	2	The measured pressure value is acquired from the pressure transmitter connected to the analog input on the analog input type

4.5 Density Measurement Function

On the analog input type, the measured density value can be acquired from the density transmitter connected to the analog input. At 4.1.8 Selection of compensation type (F03: Compensation type), select correction based on the density measured by analog input, and set the analog input range in 4.7.4.

NOTE

When acquiring the density by current input, set the density of 4.1.8 correctly and then set 4.7 as well.

4.6 Analog Output Function

4.6.1 Analog Output Selection

Set the process value to assign to analog output.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog output ► Analog output select
Display	B50

Selection		Description
HART	**Display**	
Flow rate	0	The instantaneous flow rate is set to analog output
Temperature	1	The fluid temperature is set to analog output (When equipped with built-in temperature sensor)

4.6.2 Displaying Analog Output

This current value of the analog output can be checked by the following parameters.

Menu path

HART	Process Variables ► Device variable ► Loop current
Display	-

4.6.3 Upper Limit Value/Lower Limit Value of Analog Output

The upper limit value/lower limit value of analog output can be set.
The upper limit value can be restricted between 4.0 and 21.6 mA, and the lower limit value can be restricted between 3.6 to 20.0 mA.
These settings can be set and checked by the following parameters.
On the HART configuration tool, set this manually according to the interactive Operation Guide called “DD Method”.

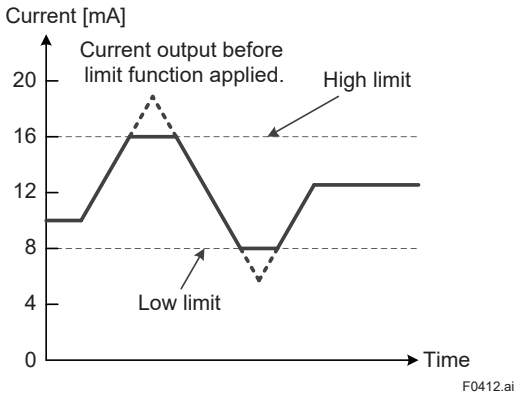
Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog output ► Analog output limit
Display	(See table below)

Parameter		Description
HART	**Display**	
-	D31	The lower limit value of analog output is set
-	D30	The upper limit value of analog output is set
Analog output limit	-	The upper limit value/lower limit value of analog output are set
Analog output low limit	-	The lower limit value of analog output is displayed
Analog output high limit	-	The upper limit value of analog output is displayed

Example:

The result of setting the upper limit value to 16 mA and the lower limit value to 8 mA is as follows.



NOTE

When the NE43 option (Option NE43) is enabled, the Analog output high limit (upper limit value) becomes 20.5 mA and the Analog output low limit (lower limit value) becomes 3.8 mA. For details about how to check the NE43 option, refer to Section 4.14.1.

4.6.4 Adjusting the Analog Output Value

Analog output values can be adjusted by conditions of use. To adjust analog output values, execute adjustment value output (output of 4 mA and 20 mA current) from the product, then connect the ammeter for calibration, and measure the current value.
Set the measured current value to parameters, and adjust the analog output value.
This setting can be set by the following parameters.
On the HART configuration tool, set this manually according to the interactive Operation Guide called “DD Method”.

Menu path

HART	Maintenance ► Adjustment ► Analog output trim ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Analog output trim	H05	Adjustment value output is executed*1
Reference meter(4mA)	H07	The measured value at 4mA adjustment is set
Reference meter(20mA)	H08	The measured value at 20mA adjustment is set
Analog output trim(4mA)	H10	The adjustment value when analog input is 4 mA Value is displayed (Unit:%)
Analog output trim(20mA)	H11	The adjustment value when analog input is 20 mA Value is displayed (Unit:%)
Analog output trim clear	H06	The adjustment value when analog output is used is cleared*2

*1: Select execution of adjustment value output from the table below

Selection		Description
HART	**Display**	
Not execute	0	Not execute
4 mA	1	4 mA is output
20 mA	2	20 mA is output

*2: Select execution of clearing of the adjustment value of analog output from the table below

Selection		Description
HART	**Display**	
Not execute	0	Not execute
Execute	1	Clearing of the adjustment value of analog output is executed

IMPORTANT

When the adjustment function for the current value is used and the indicated output and current value do not match, re-adjust the current value.

NOTE

When the Reference meter (4mA) and Reference meter (20mA) are set, adjustments are made and the initial value (4mA/20mA) is displayed.

4.6.5 Priority of Analog Output

Analog output operates according to the following priority.

Priority	Output Mode
High ↑	Output is fixed at 4 mA in the HART multidrop mode
	Adjustment value output
	HART Loop test
	Test mode, analog output test
↓ Low	Operation when an error occurs*1
	Normal output

*1: See 4.12.2 Operation when an error occurs

4.7 Analog Input Function

This function is an optional function.
The process value of an external device can be loaded to this product as an analog input.
Analog input can be used for the input of external temperature, external pressure, external density, and external temperature difference to perform various correction calculations.
For details on correction calculation, see 4.1.8.

4.7.1 Analog Input Selection

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

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input select
Display	F06

Selection		Description
HART	**Display**	
Off	0	Analog input is unused or cannot be used
Temperature	1	External temperature is currently used as the input
Pressure	2	External pressure is currently used as the input
Density	3	External density is currently used as the input
Delta temperature	4	External temperature difference is currently used as the input

NOTE

- The analog input function can be used when an analog input type (communication and I/O code JB) is selected.
- To assign a process value to analog input, select analog input as the target process value at Compensation Type. (See Section 4.1.8)
- Two or more process values cannot be used as analog inputs at the same time.

4.7.2 Displaying Analog Input

This current value of the analog input can be checked by the following parameters.

Menu path

HART	Maintenance ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Analog input(mA)	K57	The current value of the external input is displayed
Analog input	K58	The process value of the external input is displayed

4.7.3 Setting the Analog Input Unit

Display the unit when analog input is used.
This setting can be checked by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input unit
Display	D52

4.7.4 Setting the Analog Input Range

The range of the process value used for analog input can be set by settings 0% and 100% of the process value used for analog input.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog input ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Analog input LRV	D53	The value when the process value used for analog input is 0% is set
Analog input URV	D54	The value when the process value used for analog input is 100% is set

4.7.5 Upper Limit Value/Lower Limit Value of Analog Input

The upper and lower limit values of current that are input as analog input can be set.
The upper limit value can be set between 4.0 and 21.6 mA, and the lower limit value can be restricted between 3.6 to 20.0 mA.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog input ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Analog input low limit	D55	The lower limit value of the analog input value is set
Analog input high limit	D56	The upper limit value of the analog input value is set

4.7.6 Adjusting the analog input value

Analog input values can be adjusted by conditions of use. To adjust analog input values, input 4 mA and 20 mA currents from external devices, and check the analog input values on the display of this device or by HART communication. Set the checked current value to parameters, and adjust the analog input values.
This setting can be set by the following parameters.
On the HART configuration tool, set this manually according to the interactive Operation Guide called “DD Method”.

Menu path

HART	Maintenance ► Adjustment ► Analog input trim ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
-	H14	The measured value at 4 mA adjustment is displayed
-	H15	The measured value at 8 mA adjustment is displayed
-	H16	The measured value at 12 mA adjustment is displayed
-	H17	The measured value at 16 mA adjustment is displayed
-	H18	The measured value at 20 mA adjustment is displayed
-	H12	Adjustment of analog input is executed*1
-	H13	The adjustment value when analog input is used is cleared*2

Parameter		Description
HART	**Display**	
Analog input trim	-	The measured value at 4 mA, 8 mA, 12 mA, 16 mA, and 20 mA measurement is set, and adjustment is executed
Analog input trim (4mA)	-	The measured value at 4 mA adjustment is displayed
Analog input trim (8mA)	-	The measured value at 8 mA adjustment is displayed
Analog input trim (12mA)	-	The measured value at 12 mA adjustment is displayed
Analog input trim (16mA)	-	The measured value at 16 mA adjustment is displayed
Analog input trim (20mA)	-	The measured value at 20 mA adjustment is displayed
Analog input trim clear	-	The adjustment value when analog input is used is cleared*2

*1: Select execution of adjustment of analog input from the following table

Selection		Description
HART	**Display**	
Not execute	0	Not execute
4 mA	1	Adjustment when analog input is 4 mA is executed
8 mA	2	Adjustment when analog input is 8 mA is executed
12 mA	3	Adjustment when analog input is 12 mA is executed
16 mA	4	Adjustment when analog input is 16 mA is executed
20 mA	5	Adjustment when analog input is 20 mA is executed

*2: Select execution of clearing of the adjustment value of analog input from the table below

Selection		Description
HART	**Display**	
Not execute	0	Not execute
Execute	1	Clearing of the adjustment value of analog input is executed

IMPORTANT

When the adjustment function for the current value is used and the indicated input and current value do not match, re-adjust the current value.

4.7.7 Priority of Analog Input

Analog input operates according to the following priority.

Priority	Output Mode
High ↑	Test Mode
	Operation when an error occurs*1
↓ Low	Normal output

*1: See 4.12.2 Operation when an error occurs

4.8 Pulse Output, Frequency Output, and Status Output

4.8.1 Setting the Pulse/Status Output Mode

Select the pulse/status output mode.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Pulse/Status output mode
Display	B20

Select the output mode from the table below

Selection		Description
HART	**Display**	
Off	0	Not output
Scaled pulse	1	Set the flow rate to pulse output
Unscaled Pulse	2	Vortex pulse output is set
Frequency	3	Frequency output is set
Alarm switch	4	Alarm contact output is set
Limit switch	5	Limit switch output is set

4.8.2 Setting the Pulse Rate

When pulse output or vortex pulse output is used, the pulse rate value (pulse weighting) can be set.
When pulse output is used, set the flow rate per single pulse output. At this time, the pulse rate unit is the unit of instantaneous flow rate set in section 4.1.2.
When vortex pulse output is used, the result obtained by calculation based on the number of vortexes that occurred from the shedder bar is output as the number of pulses. At this time the formula for the number of output pulses is as follows.

Number of output pulses per second = Vortex frequency / pulse rate setting value

This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Pulse output rate
Display	B21

Example: When pulse output is used
If “10” is set as the pulse rate when the flowrate unit is m^3, the pulse rate is expressed as 10 m^3/pulse.

Example: When vortex pulse output is used
If “0.1” is set as the pulse rate, the “Vortex frequency x 10 pulses” are output.

NOTE

The lowcut function will be applied if using pulse output, but will not be applied if using vortex pulse output. For details about the lowcut function, see 4.1.6.

4.8.3 Mapping of Frequency Output

When frequency output is used, the process value to be output must be selected.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Frequency output select
Display	D11

Select the process value to output from the table below

Selection		Description
HART	**Display**	
Flow rate	0	The instantaneous flow rate is set
Temperature	1	The fluid temperature is set (When equipped with built-in temperature sensor)

4.8.4 Setting the Frequency Output Range

When frequency output is used, frequencies at 0% and 100% for the span of the process value can be set. The range of frequency output can be set by setting the frequency.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Frequency output zero	D12	The frequency when the process value at which to output frequency is 0% is set
Frequency output span	B22	The frequency when the process value at which to output frequency is 100% is set

The supported span is determined as follows according to the selection of Frequency output select.

Frequency output select	Process value 100%	Process value 0%
Flow rate	Flow span	0.0
Temperature	Temperature URV	Temperature LRV

4.8.5 Pulse Output/Frequency Output Priority

Pulse output/frequency output operates according to the following priority.

Priority	Output Mode
High ↕ Low	Pulse Test Mode
	Operation when an error occurs*1
	Normal output

*1: See 4.12.2 Operation when an error occurs

4.8.6 Setting Status Output Functions

When a status output (alarm contact output or limit switch output) is used, the product status can be output as a contact output.

■ Alarm contact output

This function turns status output on or off when an alarm or warning occurs. When status output is used as alarm contact output, the alarm to be output can be selected. When the target alarm occurs, status output becomes active.
Target alarms can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Alarm switch select
Display	D15

Select the alarms to output from the table below

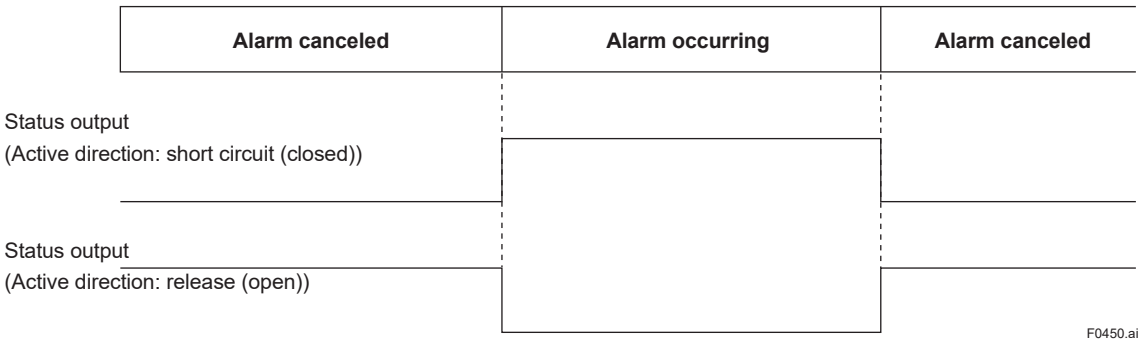
Selection		Description
HART	**Display**	
All alarm/warning	0	All alarms/warnings are set to output
All alarm	1	All alarms are set to output
System/Process alarm	2	System alarms/process warnings are set to output
System alarm	3	System alarms are set to output
Process alarm	4	Process alarms are set to output
Setting alarm	5	Setting alarms are set to output
Warning	6	Warnings are set to output

Alarms targeted with each setting are displayed as follows.

Alarm switch select	Alarm Category			
	System alarm	Process alarm	Setting alarm	Warning
All alarm/warning	✓	✓	✓	✓
All alarm	✓	✓	✓	-
System/Process alarm	✓	✓	-	-
System alarm	✓	-	-	-
Process alarm	-	✓	-	-
Setting alarm	-	-	✓	-
Warning	-	-	-	✓

The following shows an example of operation.

Device alarm states



Limit switch output

This function turns status output 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.
When status output is used as limit switch output, the process value to assign to output can be selected. 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

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Limit switch select	D16	The process value targeted in limit switch output is set*1
Limit switch mode	D17	The H side/L side of limit switch output is set*2
Limit switch level	B23	The threshold value is set
Limit switch hysteresis	D18	The hysteresis width of the limit switch output switching is set*3
Limit switch unit	D19	The unit of the threshold value and hysteresis value are displayed

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

Selection		Description
HART	**Display**	
Flow rate	0	The instantaneous flow rate is set to the limit switch target
Temperature	1	The fluid temperature is set to the limit switch target (When equipped with built-in temperature sensor)
Totalizer	3	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
HART	**Display**	
Low limit	0	The L limit (lower limit value) is set. Limit switch output becomes active when the process value to output falls below the threshold value.
High limit	1	The H limit (upper limit value) is set. Status output becomes active when the process value to output exceeds the threshold value.

NOTE

If the software revision is R1.01.01, the limit switch level and limit switch hysteresis unit (Limit switch unit) will not be displayed properly if the limit switch output target was set to the heat difference instantaneous flow rate, in DTM or another configuration tool.
When Limit switch select = “Flow rate” and Flow select = “Energy (Heat difference)”, the limit switch unit will not be displayed in the heat difference unit (kJ/s, MJ/h, etc.). Instead, it will be displayed in the volumetric flow rate unit (m3/s, l/h, etc.).
The limit switch output will operate normally in the heat difference unit.
When using the conditions described above, read the limit switch level and limit switch hysteresis unit as the energy unit, instead of the limit switch unit.

*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

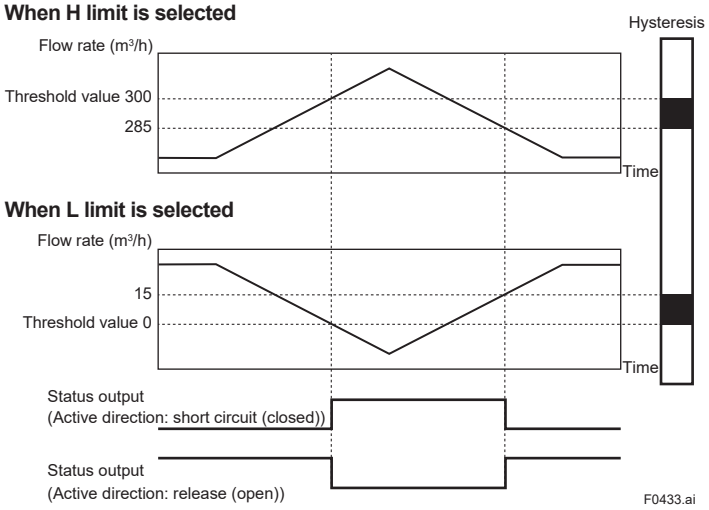
The following shows an example of operation.
Example of H limit:
Limit switch output = instantaneous flow rate
Measured flow rate selection = volumetric flow rate
Span of volumetric flow rate = 300 m^3/h,
H /L selection of limit switch is set = H limit
Limit threshold value = 300 m^3/h
When hysteresis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

When H limit is selected



NOTE

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

4.8.7 Displaying the State of Status Output

Display the state of status output.
This setting can be checked by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Status output condition
Display	D13

Value		Description
HART	**Display**	
Not active	0	Non-actitve state
Active	1	Active state

4.8.8 Setting the Active Direction of Status Output

When status output is used, which of open/close is set to active can be set.
This setting can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Status output direction
Display	D14

Select the active direction of status output from the table below

Selection		Description
HART	**Display**	
On active	0	When status output is short circuit (closed) is set to active
Off active	1	When status output is release (open) is set to active

4.9 Sensor Information

4.9.1 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

HART	Device Settings ► Detailed setup ► Sensor Information ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Nominal size	E10	The nominal size is set*1
Body type	E20	The body type is set*2
Sensor type	E30	The sensor type is set*3
Connection type	E22	The integral/remote sensor is set*4
K factor unit	E40	The K factor unit is set*5
K factor	E41	The K factor 15 degC value is set
Process temperature	E44	The allowable temperature is displayed*6/set*7
Max pressure	E45	The maximum allowable pressure is displayed*6/ set*7
Sensor S/N	-	The sensor serial No. is displayed*6/set*7

*1: Select the nominal size

Selection		Description
HART	**Display**	
15 mm	1	The diameter is set to 15 mm
25 mm	2	The diameter is set to 25 mm
40 mm	3	The diameter is set to 40 mm
50 mm	4	The diameter is set to 50 mm
80 mm	5	The diameter is set to 80 mm
100 mm	6	The diameter is set to 100 mm
150 mm	7	The diameter is set to 150 mm
200 mm	8	The diameter is set to 200 mm
250 mm	9	The diameter is set to 250 mm
300 mm	10	The diameter is set to 300 mm
400 mm	11	The diameter is set to 400 mm

*2: Select the body type

Selection		Description
HART	**Display**	
General	0	General type
One size down	1	Reduced bore type: 1 size reduction
Two size down	2	Reduced bore type: 2 size reduction
High pressure	4	High pressure reduced bore type: 1 size reduction
Dual sensor	6	Dual sensor type

*3: Select the sensor type

Selection		Description
HART	Display	
Standard	0	General type
Standard w/ temp sensor	1	General type with temperature sensor
High temperature	2	High temperature type
High temperature w/ temp sensor	3	High temperature type with temperature sensor
Cryogenic	4	Cryogenic type
Long neck	6	Long neck type
Long neck w/ temp sensor	7	Long neck type with temperature sensor

*4: Select the transmitter connection method

Selection		Description
HART	Display	
Integral	0	The integral sensor is set
Remote	1	The remote sensor is set

*5: The K factor unit is selected

Selection		Description
HART	Display	
p/l	0	P/l is set
p/USgal	1	p/USgal is set
p/UKgal	2	p/UKgal is set

*6: For R1.01.01 or R1.01.02
*7: For R1.01.03 or more

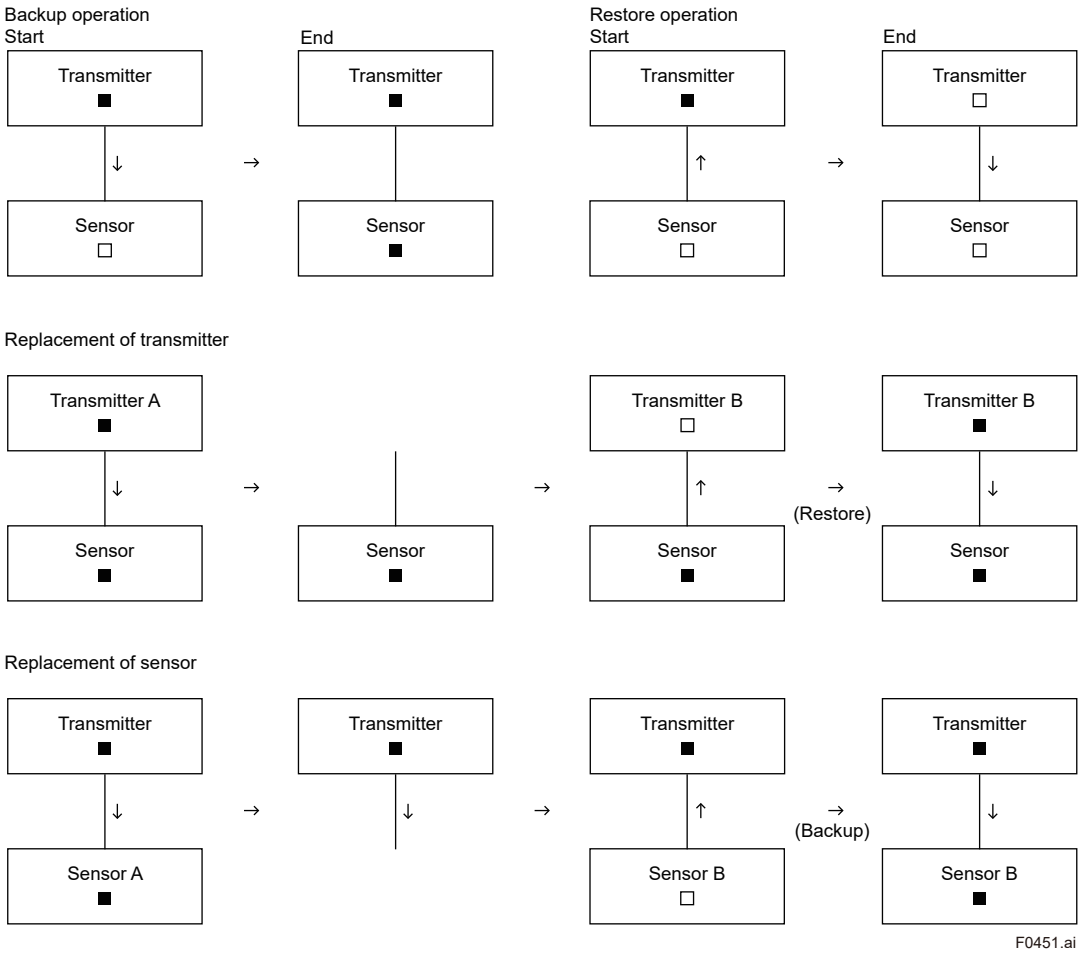
IMPORTANT

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)

4.9.2 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

HART	Device Settings ► Detailed setup ► Sensor Information ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Sensor backup/restore	E46	Backup/restore of sensor information is executed*1
Sensor backup/restore result	E47	The backup/restore result of sensor information is displayed*2

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

Selection		Description
HART	**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
HART	**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.

4.10 Auxiliary Calculation Function

4.10.1 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

HART	Maintenance ► Adjustment ► Flow rate gain
Display	H20

4.10.2 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]) × (Re adjust value [x+1]– Re adjust value [x]) + Re adjust value [x]) / 100

This setting can be set by the following parameters.

NOTE

On the display, you can change the selection of Reynolds number correction, but you cannot change Adjust Reynolds number 1 to 5 and Re adjust value 1 to 5.

Menu path

HART	Maintenance ► Adjustment ► Reynolds adjust ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Reynolds adjust	H25	Execution of Reynolds number correction is selected*1
Viscosity unit	H28	Unit of viscosity*2
Viscosity	H27	Viscosity*3
Reynolds number	H24	Reynolds number
Adjust Reynolds number 1	-	Reynolds number of the No.1 break point of Reynolds number correction*4
Re adjust value 1	-	Correction value of the No.1 break point of Reynolds number correction*4
Adjust Reynolds number 2	-	Reynolds number of the No.2 break point of Reynolds number correction*4
Re adjust value 2	-	Correction value of the No.2 break point of Reynolds number correction*4
Adjust Reynolds number 3	-	Reynolds number of the No.3 break point of Reynolds number correction*4
Re adjust value 3	-	Correction value of the No.3 break point of Reynolds number correction*4
Adjust Reynolds number 4	-	Reynolds number of the No.4 break point of Reynolds number correction*4
Re adjust value 4	-	Correction value of the No.4 break point of Reynolds number correction*4
Adjust Reynolds number 5	-	Reynolds number of the No.5 break point of Reynolds number correction*4
Re adjust value 5	-	Correction value of the No.5 break point of Reynolds number correction*4

*1: Execution of Reynolds number correction is selected

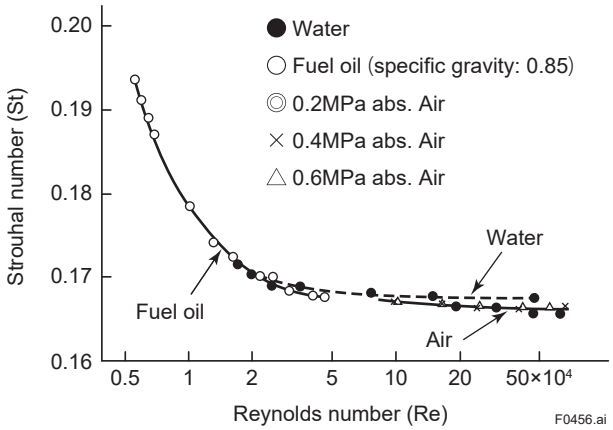
Selection		Description
HART	**Display**	
Off	0	Correction calculation is not performed.
On	1	Correction calculation is performed.

*2: Select the viscosity unit

Selection	
HART	**Display**
mPa·s	0
Pa·s	1
cP	2
P	3
m2/s	4
cSt	5
St	6

*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 H26:Fixed density and H27:Viscosity. Note, however, that when the Viscosity unit is a kinematic viscosity unit (m2/s, cSt, St), H26:Fixed density is not affected.

4.10.3 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 value 1 [x+1]– Adjust value 1 [x]) + Adjust value 1 [x]) / 100

This setting can be set by the following parameters.

Menu path

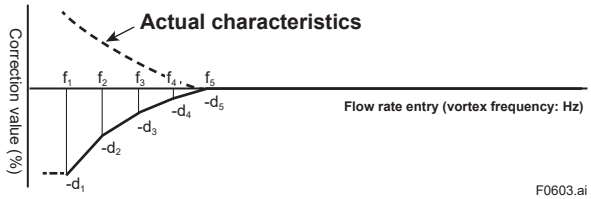
HART	Maintenance ► Adjustment ► Instrument error adjust ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Instrument error adjust	H40	Whether or not to use instrument error correction is selected*1
Adjust vortex frequency 1	H41	Vortex frequency of No.1 break point of instrument error correction*2
Adjust value 1	H42	Correction value of No.1 break point of instrument error correction*2
Adjust vortex frequency 2	H43	Vortex frequency of No.2 break point of instrument error correction*2
Adjust value 2	H44	Correction value of No.2 break point of instrument error correction*2
Adjust vortex frequency 3	H45	Vortex frequency of No.3 break point of instrument error correction*2
Adjust value 3	H46	Correction value of No.3 break point of instrument error correction*2
Adjust vortex frequency 4	H47	Vortex frequency of No.4 break point of instrument error correction*2
Adjust value 4	H48	Correction value of No.4 break point of instrument error correction*2
Adjust vortex frequency 5	H49	Vortex frequency of No.5 break point of instrument error correction*2
Adjust value 5	H50	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
HART	**Display**	
Off	0	Correction calculation is not performed.
On	1	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.

4.10.4 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

HART	Maintenance ► Adjustment ► Expansion factor adjust
Display	H30

Selection		Description
HART	**Display**	
Off	0	Correction calculation is not performed.
On	1	Correction calculation is performed.

4.11 Maintenance/Adjustment Functions

4.11.1 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 Sections 4.11.3 Zero Tuning and 4.1.6 Setting the Lowcut Function of Instantaneous Flow Rate.

Menu path

HART	Maintenance ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Signal band	-	The signal band is displayed.
Signal level	K20	Adjustment scale factor of signal judgment level
Noise balance mode	K25	Selection of noise balance mode
Noise ratio(auto)	K26	Noise balance value when the noise balance mode is Auto
Noise ratio(manual)	K27	Noise balance value when the noise balance mode is Manual

4.11.2 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 Sections 4.11.3 Zero Tuning and 4.1.6 Setting the Lowcut Function of Instantaneous Flow Rate.

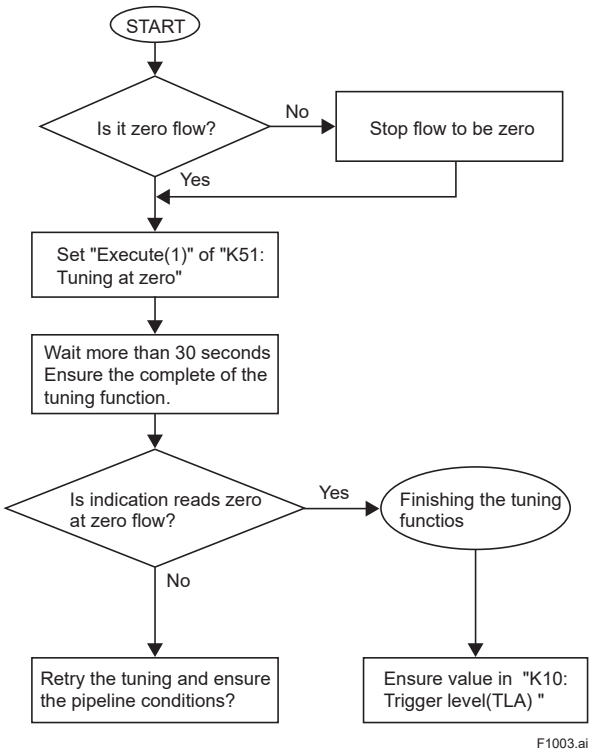
Menu path

HART	Maintenance ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Trigger level mode	-	Selection of TLA mode
Trigger level(TLA)	K10	User setting scale factor of trigger level judgment threshold value

4.11.3 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.



Menu path

HART	Maintenance ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Tuning at zero	K51	Select whether to execute tuning of noise balance is executed
Tuning status	K52	Noise balance tuning state

4.11.4 Other Maintenance Information

The following parameters can be checked.

Menu path

HART	Maintenance ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Velocity span	K32	The flow velocity span value is displayed
Velocity lowcut	K54	The lowcut flow velocity value is displayed
Vortex frequency span	K36	The vortex frequency span is displayed
Vortex frequency lowcut	K55	The lowcut vortex frequency is displayed

4.12 Alarms

4.12.1 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 following table shows possible countermeasures.

■ 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
	HART	Display		
-	-	-	Operation stop of the transmitter CPU is detected	Contact your nearest Yokogawa service center.
F	010:CPU failure	AL-010	A failure in the program memory of the transmitter CPU is detected	Contact your nearest Yokogawa service center.
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.
F	012:Main storage failure	AL-012	Physical/logical failure of the transmitter EEPROM is detected	Contact your nearest Yokogawa service center.
F	013:Sub storage failure	AL-013	Physical/logical failure of the sensor EEPROM is detected	Contact your nearest Yokogawa service center.
F	014:Main ASIC failure	AL-014	Operation stop of the main control IC is detected	Contact your nearest Yokogawa service center.
F	015:Sub ASIC failure	AL-015	Operation stop of the sub control IC is detected	In the case of the remote type, refer to Section 8.7 “Remote Type” in the Vortex Flowmeter VY Series Installation Manual. In the case of the integral flowmeter, contact your nearest Yokogawa service center.
F	016:ADC circuit failure	AL-016	Failure of the sensor ADC circuit is detected	Contact your nearest Yokogawa service center.
F	017:Signal circuit failure	AL-017	Failure of the sensor signal circuit is detected	Contact your nearest Yokogawa service center.
F	018:Power circuit failure	AL-018	Failure of the sensor power circuit is detected	Contact your nearest Yokogawa service center.
F	020:Flow sensor failure	AL-020	Failure of the flow sensors (A or B) is detected	Contact your nearest Yokogawa service center.

NE107 status	Error message		Details of error	Countermeasure
	HART	Display		
F	021:Temperature sensor failure	AL-021	Failure of the temperature sensor is detected	Contact your nearest Yokogawa service center.
F	023:Analog input failure	AL-023	Failure of analog input device is detected	Check the connections to the analog input device

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
	HART	Display		
S	030:Fluctuation	AL-030	Fluctuation of the flow rate signal is detected	Check the process or installation status.
S	031:Transient noise	AL-031	Transient noise on the flow rate signal is detected	Check the process or installation status.
S	032:High vibration	AL-032	Abnormal vibration of the piping is detected	Check the process or installation status.
S	033:Critical vibration	AL-033	Abnormal resonance of the piping is detected	Check the process or installation status.
S	040:Temperature out of range	AL-040	The fluid temperature is out of the specification temperature range	Check the process.
S	042:Analog output out of range	AL-042	Analog output is out of the upper/lower limit value range	Check the parameter settings or the process values assigned to analog output.
S	043:Pulse output out of range	AL-043	Pulse output/frequency output are out of the specification range	Check the parameter settings or the process values assigned to pulse output.
S	044:Analog input out of range	AL-044	Analog input is out of the upper/lower limit value range	Check the device connected to analog input
S	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.

Setting alarm

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

NE107 status	Error message		Details of error	Countermeasure
	HART	Display		
C	050:Flow span set error	AL-050	The flow rate span setting is out of the specification range	Correct the flow rate span value. Or, check the flow rate calculation setting parameter.
C	051:Temperature span set error	AL-051	The temperature span setting is inconsistent or out of the specification range	Correct the temperature span value.

NE107 status	Error message		Details of error	Countermeasure
	HART	Display		
C	053:Flow calculation set error	AL-053	Setting inconsistency in flow rate calculation (including calculation tool)	Check the flow rate setting, flow rate selection and flow rate calculation setting parameter.
C	054:Analog output set error	AL-054	Analog output upper/ lower limit value setting inconsistency	Check the analog output parameter setting.
C	055:Pulse output set error	AL-055	Pulse output setting inconsistency	Check the pulse output rate, frequency of processing values 0% and 100%, and flow rate span value.
C	056:Analog input set error	AL-056	Analog input upper/ lower limit value setting inconsistency	Check the analog input parameter and flow rate calculation settings.
C	060:Sensor backup error	AL-060	Transmitter/sensor backup setting inconsistency	Check the data to be backed up.

■ Warnings

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

NE107 status	Error message		Details of error	Countermeasure
	HART	Display		
M	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.
M	071:Flow sensor error	AL-071	Abnormal sensor sensitivity is detected	Check the state of the flow sensors by using Built-in Verification.
M	072:Clogging	AL-072	Clogging of a flow sensor is detected	Remove foreign matter by following the instructions in the device manual.
M	073:Degradation	AL-073	Degradation of a flow sensor is detected	Consider the timing for removing foreign matter.
S	074:Board temperature out of range	AL-074	A device internal temperature out of the specification range is detected	Review the installation environment.
C	080:Simulation running	AL-080	Test/simulation is running	When restoring to normal operation, cancel simulation or the output test.
C	081:Verification running	AL-081	Verification is currently executing	Wait for diagnostic processing to complete.
-	082:Incorrect PIN	AL-082	Entry of wrong user levels PIN	Enter the correct PIN. If you have forgotten your password, contact your nearest sales office or Service Center.

4.12.2 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

NE 107	Error message	Output			Vortex frequency	Built-in temperature	Analog input	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
		Current	pulse/ frequency	Status						
-	-	Burnout (HW)	Stop	Open (HW)	-		-	-	-	-
F	010:CPU failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	011:CPU failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	012:Main storage failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	013:Sub storage failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	014:Main ASIC failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	015:Sub ASIC failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	016:ADC circuit failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	017:Signal circuit failure	Burnout	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	018:Power circuit failure	Burnout (L)	Stop	Operation	Fixed at 0%		Fixed at 0%	Interlocked to input	Interlocked to input	Stop
F	020:Flow sensor failure	User setting Flow sensor alarm action	Stop	Operation	User setting Flow sensor alarm action	Operation	Operation	Interlocked to input	Interlocked to input	Stop
F	021:Temperature sensor failure	User setting Temp sensor alarm action	Stop	Operation	Operation	User setting Temp sensor alarm action	Operation	Interlocked to input	Interlocked to input	Stop
F	023:Analog input failure	User setting Aux input alarm action	Stop	Operation	Operation		User setting Aux input alarm action	Interlocked to input	Interlocked to input	Stop

Process alarm

NE 107	Error message	Output			Vortex frequency	Built-in temperature	Analog input	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
		Current	pulse/ frequency	Status						
S	030:Fluctuation	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	031:Transient noise	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	032:High vibration	Operation	Operation Stop (*)	Operation	User setting High vibration action	Operation	Operation	Interlocked to input	Interlocked to input	Operation
S	033:Critical vibration	Operation	Operation Stop (*)	Operation	User setting Critical vibration action	Operation	Operation	Interlocked to input	Interlocked to input	Operation
S	040:Temperature out of range	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	042:Analog output out of range	Limit	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	043:Pulse output out of range	Operation	Limit	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	044:Analog input out of range	Operation	Operation	Operation	Operation		Limit	Interlocked to input	Interlocked to input	Operation
S	045:T/P compensation out of range	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation

*: If the software revision is R1.01.01, the pulse/frequency output operation when AL-032:High vibration and AL-033:Critical vibration occur will be “Stop”.

Setting alarm

NE 107	Error message	Output			Vortex frequency	Built-in temperature	Analog input	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
		Current	pulse/ frequency	Status						
C	050:Flow span set error	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	051:Temperature span set error	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	053:Flow calculation set error	Operation	Operation	Operation	Operation		Operation	Hold	Interlocked to input*1	Hold
C	054:Analog output set error	Hold	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	055:Pulse output set error	Operation	Hold	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	056:Analog input set error	Operation	Operation	Operation	Operation		Hold	Interlocked to input	Interlocked to input	Operation
C	060:Sensor backup error	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation

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

Warnings

NE 107	Error message	Output			Vortex frequency	Built-in temperature	Analog input	Instantaneous flow rate	Fluid temperature Fluid pressure Fluid density Fluid density ratio Specific enthalpy	Flow rate total
		Current	pulse/ frequency	Status						
M	070: Sensor Communication error	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
M	071: Flow sensor error	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
M	072: Clogging	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
M	073: Degradation	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
S	074: Board temperature out of range	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	080: Simulation running	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation
C	081: Verification running	Operation	Operation	Operation	Hold		Hold	Interlocked to input	Interlocked to input	Operation
-	082: Incorrect PIN	Operation	Operation	Operation	Operation		Operation	Interlocked to input	Interlocked to input	Operation

4.12.3 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

HART	Device Settings ► Detailed setup ► Display ► Display NE107
Display	D22

Parameter		Description
HART	**Display**	
Off	0	The NAMUR NE107 category is not displayed.
On	1	The NAMUR NE107 category is displayed.

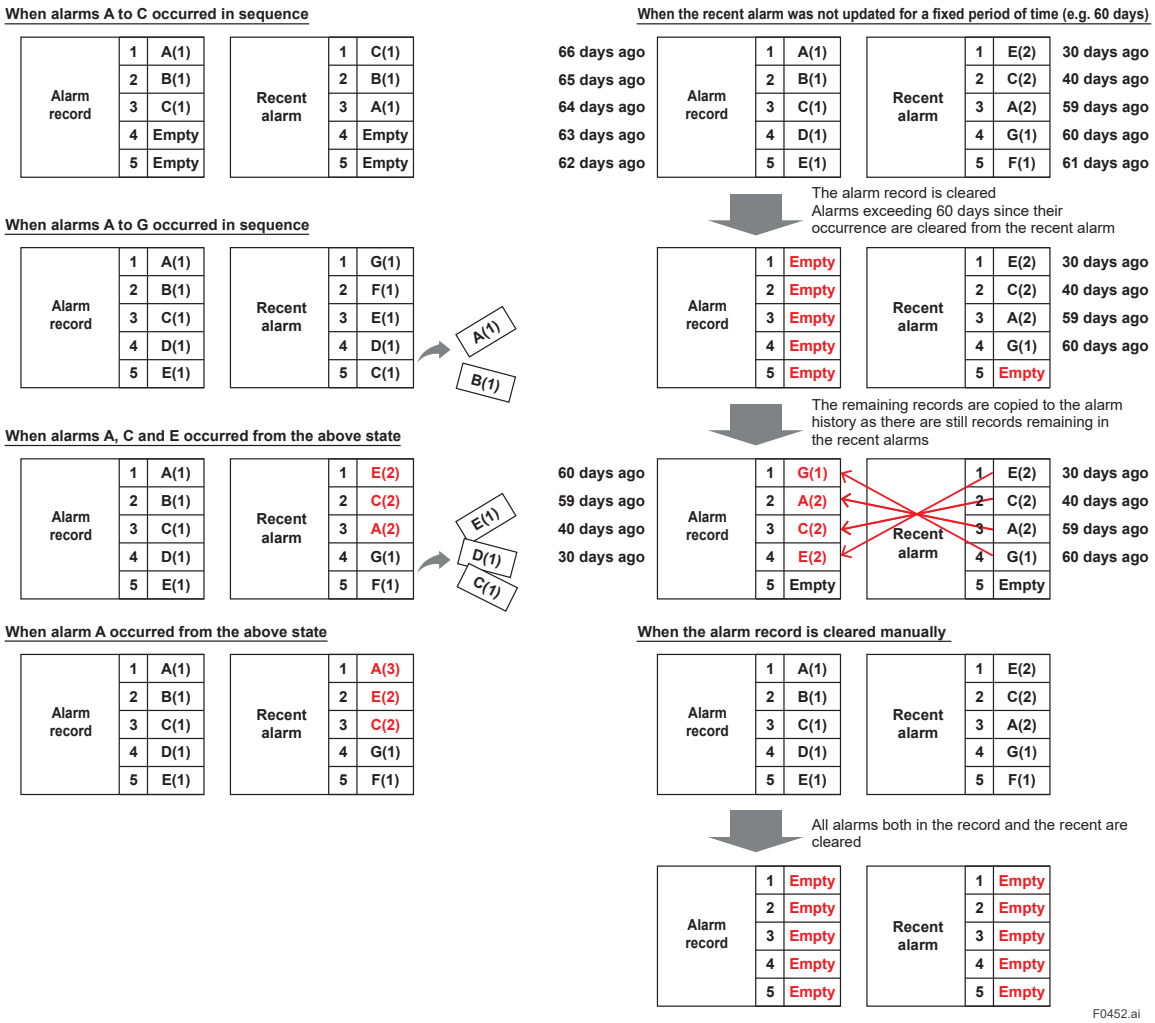
4.12.4 Alarm History Function

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

HART	Diagnostics ► Alarm ► Alarm record ► (see table below)
Display	-

Parameter		Description
HART	**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	-	Alarms recorded in Alarm record are displayed 5: Latest ←→ 1: Oldest
Alarm record date 1-5	-	The date of alarms recorded in Alarm record are displayed (yyyy/mm/dd)
Alarm record time 1-5	-	The time of alarms recorded in Alarm record are displayed (hh:mm:ss)
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	-	Alarms recorded in Recent alarm are displayed 1: Latest ←→ 5: Oldest
Recent alarm date 1-5	-	The date of alarms recorded in Recent alarm are displayed (yyyy/mm/dd)
Recent alarm time 1-5	-	The time of alarms recorded in Recent alarm are displayed (hh:mm:ss)
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.

4.12.5 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

HART	Diagnostics ► Alarm ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Alarm status select	-	Selection of alarm to be notified (HART/display)*1
Alarm record select	-	Selection of alarm to be stored in history*1

*1: Alarm status select / Alarm record select list

Selection		Description
HART	**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)

4.12.6 Output Operation When Alarm Occurs

■ Burnout

For the burnout function, set the direction of analog output when a CPU failure occurs. The direction of analog output when a burnout occurs can be checked by the following parameters.

Menu path

HART	Diagnostics ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Burnout	D35	The direction of analog output when a burnout occurs is displayed
Burnout recover	-	The restore operation when a burnout occurs is set (Normally, this parameter is used set to On)*1

*1: Burnout Recover select list

Selection		Description
HART	**Display**	
Off	-	Restore is not performed when a burnout occurs (To perform a restore, the device must be turned on again)
On	-	Restore is attempted when a burnout occurs (Normally, this parameter is used set to On)

■ Setting output operation when a specific alarm occurs

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

Menu path

HART	Diagnostics ► Signal controls ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
Flow sensor alarm action	-	Output operation when AL-020:Flow sensor failure occurs is set*1
Temperature sensor alarm action	-	Output operation when AL-021: Temperature sensor failure occurs is set*2
Analog input alarm action	-	Output operation when AL-023: Analog input failure occurs is set*2
High vibration action	K45	Output operation when AL-032:High vibration occurs is set*3
Critical vibration action	K46	Output operation when AL-033:Critical vibration occurs is set*3

*1: Select output operation when AL-020 occurs

Selection		Description
HART	**Display**	
Burnout	-	Burnout
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 and AL-023 occurs

Selection		Description
HART	Display	
Burnout	-	Burn out
Hold	-	Output is held at the value immediately before the alarm occurred
Zero	-	Flow rate zero
Fixed value	-	The analog input value is fixed and subsequently normal calculation is performed*2-1

*2-1: The fixed current value can be set by the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input fix value
Display	D57

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

Selection		Description
HART	Display	
Zero	0	Flow rate zero
Hold	1	Output is held at the value immediately before the alarm occurred
Measured value	2	Measurement is continued

4.13 Display

4.13.1 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

HART	Device Settings ► Detailed setup ► Display ► (see table below)
Display	(See table below)

Parameter		Description
HART	**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
HART	**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

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

Selection		Description
HART	**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
Analog input	4	The process value assigned to analog input (engineering unit) is displayed

NOTE

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

4.13.2 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 analog input has been set to a display item in 4.13.1.

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

HART	Device Settings ► Detailed setup ► Display ► (see table below)
Display	(See table below)

Parameter		Description
HART	**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 analog input, included external temperature difference in case of heat difference application
Display format pressure	D25	The decimal point position of external pressure from analog input

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

Selection		Description
HART	**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
HART	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 4.2 Totalization Function.

4.13.3 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

HART	Device Settings ► Detailed setup ► Display ► Display period
Display	D20

Select the update internal from the table below

Selection		Description
HART	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

4.13.4 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

HART	Device Settings ► Detailed setup ► Display ► Display startup
Display	D21

Select the screen display at startup from the table below

Selection		Description
HART	**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.

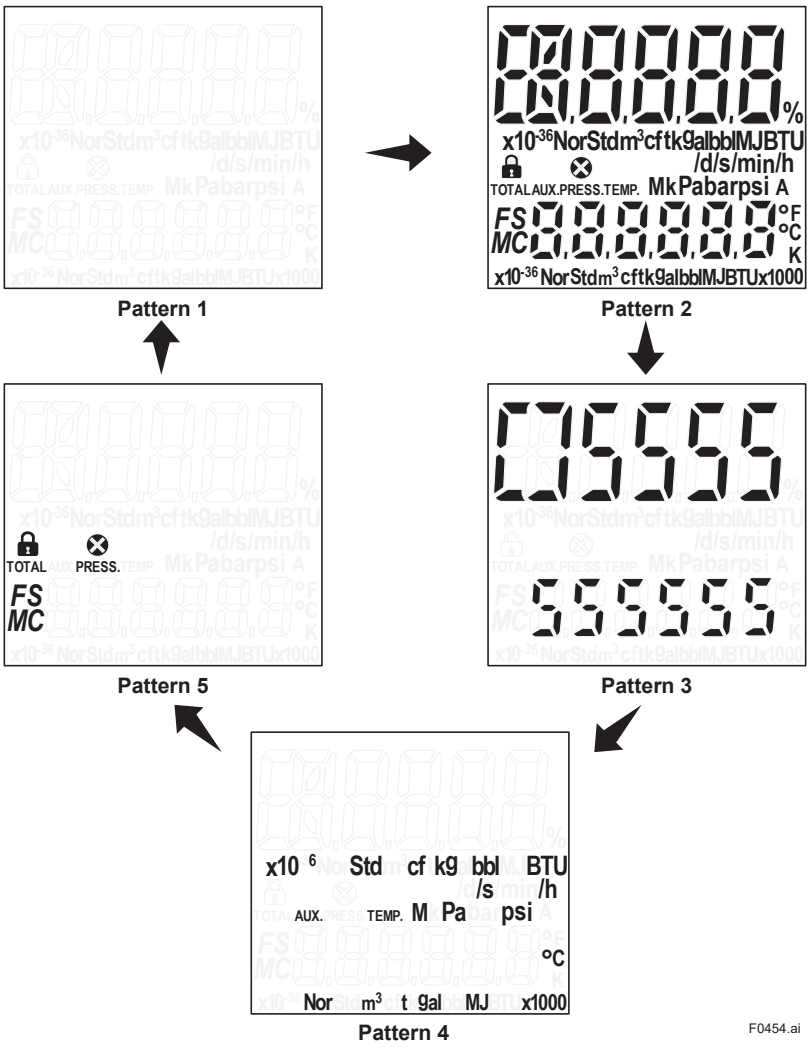
Menu path

HART	Maintenance ► Test/Simulation ► Display test
Display	J45

Select the screen display at startup from the table below

Selection		Description
HART	**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.

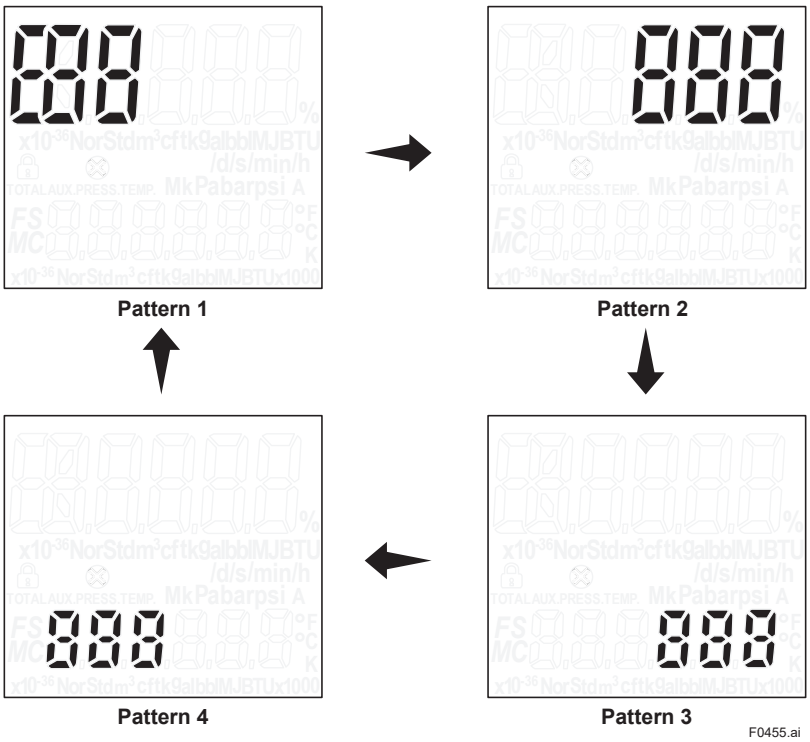
Menu path

HART	Maintenance ▶ Test/Simulation ▶ Squawk
Display	-

Select the squawk function from the table below

Selection		Description
HART	**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



4.14 Device Information

4.14.1 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

HART	Device Settings ► Detailed setup ► Information ► Order info ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Sensor ► Sensor MS code 1 - 6	-	The sensor MS code is displayed*1/set*2
Sensor ► Sensor style code	-	The sensor style code is displayed*1/set*2
Transmitter ► Transmitter MS code 1 - 6	-	The transmitter MS code is displayed*1/set*2
Transmitter ► Transmitter style code	-	The transmitter style code is displayed*1/set*2
Special order ► Special order number 1-2	-	The special order No. is displayed*1/set*2
Other ► Sizing number	-	The sizing No. is displayed*1/set*2
Other ► Name plate tag number	-	The name plate tag No. is displayed*1/set*2
Other ► Instruction manual number	-	The instruction manual No. is displayed*1/set*2
Other ► Communication select	-	The communication option is displayed
Option ► Option analog input	-	The optional analog input is displayed
Option ► Option built-in temperature	-	The optional built-in temperature gauge is displayed
Option ► Option display installation	-	The optional display is displayed
Option ► Option burnout	-	The optional burnout is displayed*1/set*2
Option ► Option NE43	-	The optional NE43 is displayed*1/set*2
Option ► Option wireless adapter	-	The usage status of the wireless adapter is set
Option ► Option dual bolt calibration	-	The optional dual sesnor is displayed*1/set*2
Option ► Option cryogenic	-	The optional cryogenic is displayed
Option ► Prediction function	-	The predictive diagnosis mode is displayed*1/set*2
Option ► Option built-in verification	-	The verification option is displayed*1/set*2
Option ► Option SI unit	-	The optional SI unit is displayed
Option ► Option SIL	-	The optional SIL is displayed

*1: For R1.01.01 or R1.01.02
*2: For R1.01.03 or more

NOTE

When Option wireless adapter is set to “Wireless”, the function to save parameters and totalized values to EEPROM in case of power failure is disabled.

4.14.2 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

HART	Device Settings ► Detailed setup ► Information ► Device info ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Model	-	The device model name is displayed
Dev id*1 / Device Identifier*2	-	The device ID is displayed
Tag	-	The tag number is set
Transmitter S/N	-	The transmitter serial No. is displayed*3/set*4
Software revision	-	The revision No. of the software is displayed
Hardware revision	-	The revision No. of the hardware is displayed
Release date	-	The release date is displayed
Distributor name	-	The distributor name is displayed

4.14.3 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

HART	Device Settings ► Detailed setup ► Information ► Device info ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Memo 1	-	Memo 1 is set
Memo 2	-	Memo 2 is set
Memo 3	-	Memo 3 is set

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more
*3: For R1.01.01 or R1.01.02
*4: For R1.01.03 or more

4.14.4 Date and Time Information

The present date and time can be set.
This setting can be displayed and set with the following parameters.

Menu path

HART	Device Settings ► Detailed setup ► Information ► Date/Time ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Set current date	-	The date is set
Current date*1 / Current Date*2	-	The present date is displayed
Current time*1 / Current Time*2	-	The present time is displayed
Set Clock Date	-	The date set at Set current date is displayed
Set Clock Time	-	The time set at Set current date is displayed

NOTE

When the product is turned off, the date and time at that time are stored in memory. However, the time that elapses while power is turned off is not added to the date and time. Set to the correct time again when the power is turned on.

4.14.5 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

HART	Device Settings ► Detailed setup ► Information ► Date/Time ► 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”.

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

4.15 Self-diagnostics

4.15.1 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.

4.15.2 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

HART	Diagnostics ► Signal controls ► (see table below)
Display	-

Parameter		Description
HART	**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.

4.15.3 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

HART	Diagnostics ► Signal controls ► High vibration time
Display	-

Analog output operation when the High vibration alarm occurs can be set. For details, see 4.12.6.

4.15.4 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

HART	Diagnostics ► Signal controls ► (see table below)
Display	-

Parameter		Description
HART	**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.

Analog output operation when the Critical vibration alarm occurs can be set. For details, see 4.12.6.

4.15.5 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

HART	Diagnostics ► Signal controls ► Clogging time
Display	-

4.15.6 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

HART	Diagnostics ► Predictive diagnosis ► (see table below)
Display	-

Parameter		Description
HART	**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
Prediction data clear*1	-	Clearing of the trend data of predictive diagnosis is executed

*1: For R1.01.03 or more

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.
- Execute Prediction data clear after performing sensor maintenance or changing fluid conditions.
- Trend data cannot be restored if Prediction data clear is executed.

4.15.7 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

HART	Diagnostics ► Verification ► (see table below)
Display	-

Parameter		Description
HART	**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	-	The verification result to be displayed is selected*4
Verification date	-	The date of verification execution selected at Verification select is displayed
Verification time	-	The time of verification execution selected at Verification select is displayed
Verification operation time	-	The operation time of verification execution selected at Verification select is displayed
Verification result	-	The overall result of verification at verification execution selected at Verification select is displayed*5
Sensor circuit result	-	The detection circuit diagnosis result of verification at verification execution selected at Verification select is displayed*5
Signal circuit result	-	The signal circuit diagnosis result of verification at verification execution selected at Verification select is displayed*5
Calculation circuit result	-	The calculation circuit diagnosis result of verification at verification execution selected at Verification select is displayed*5
Alarm status result	-	The alarm state result of verification at verification execution selected at Verification select is displayed*5
Alarm record result	-	The alarm history result of verification at verification execution selected at Verification select is displayed*5

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

Parameter		Description
HART	**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
HART	**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.
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
HART	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
HART	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
HART	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.

4.15.8 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

HART	Diagnostics ► Sensor signal ► (see table below)
Display	-

Parameter		Description
HART	**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 at a signal latch is displayed
Signal latch time	-	The time at a signal latch is 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 A	-	The A signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band B	-	The B signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band C	-	The C signal amplitude at the basic band + (0 to 8) at a signal latch is displayed
Basic+0-8 band NJLS	-	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
HART	**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
HART	**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
HART	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

4.16 Test/Simulation Function

IMPORTANT

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

4.16.1 Setting the Test Mode

If the test mode is executed, the value to be output from a connection terminal can be arbitrarily set, and a response from the device can be tested. Testing of one of analog output, pulse output and status output can be tested.
A warning is displayed to indicate that the test mode is in use while this test mode is used.

NOTE

The test mode is considered about both path of user I/F via display key switch access and via HART communication access.
The test mode gives priority to consider for procedure via HART communication access. So, the test mode is released from the procedure via display key switch access soon if the HART communication detected in that time.

This setting can be set by the following parameters.

Menu path

HART	Maintenance ▶ Test/Simulation ▶ (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
-	J05	Setting of test target*1
-	J10	The test value (%) of analog output is set
-	J20	The test value (Hz) of pulse output is set
-	J30	The test output of status output is set*4

Parameter		Description
HART	**Display**	
Test/Simulation	-	1. Selection of test mode*2 2. Setting of test target*1 3. Setting of test value*3

*1: Select the test target from the table below

Selection		Description
HART	**Display**	
Analog output	1	Testing of analog output is started
Pulse output	2	Testing of pulse output is started
Status output	3	Testing of status output is started
Test mode off	0	The test mode is canceled

*2: Select execution of the test mode from the table below

Selection		Description
HART	Display	
Test mode	-	The test mode is executed
All off	-	The test mode is canceled (simulation also is canceled at the same time when a simulation is currently executing)

*3: Set test values according to the test target

Selection		Description
HART	Display	
Test analog output	-	The test value (%) of analog output is set
Test pulse output	-	The test value (Hz) of pulse output is set
Test status output	-	The test output of status output is set*4

*4: Select the test value of status output from the table below

Selection		Description
HART	Display	
Off(Open)	0	The test value of status output is set to off (open)
On(Close)	1	The test value of status output is set to off (short circuit)

When an analog output test has been performed, the process value currently selected for analog output is interlocked with the current value being output in the test, and also changes.

NOTE

Set pulse/status terminal output in section 4.8.1. If the set output is different from the test starting output, the test mode cannot be used.
For example, if the pulse/status output is set as a frequency output to start the status output test, the test cannot be started.

4.16.2 Setting the Simulation Mode

In the simulation mode, values relating to vortex flowmeter inputs can be simulated.
That is, vortex frequency (Software/Hardware), built-in temperature and analog input 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 4.1.8.
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

HART	Maintenance ► Test/Simulation ► (see table below)
Display	(See table below)

Parameter		Description
HART	**Display**	
-	J31	Setting of simulation target*1
-	J32 or K28	The simulation value (Hz) of the vortex frequency (software) is set
-	J33	The simulation value (Hz) of the vortex frequency (hardware) is set
-	J34	The simulation value of the built-in temperature is set
-	J36	The simulation value (mA) of the analog input is set

Parameter		Description
HART	**Display**	
Test/Simulation	-	1. Selection of simulation mode*2 2. Setting of simulation target*1 3. Setting of simulation value*3

*1: Select the simulation target from the table below

Selection		Description
HART	**Display**	
Vortex frequency	1	Simulation of vortex frequency input (Software) is started
Vortex frequency(HW)	2	Simulation of vortex frequency input (hardware) is started
Built-in temperature	3	Simulation of built-in temperature is started
Analog input	5	Simulation of analog input is started
Simulation mode off	0	The simulation mode is canceled

*2: Select execution of the simulation mode from the table below

Selection		Description
HART	**Display**	
Simulation mode	-	The simulation mode is executed
All off	-	The simulation mode is canceled (the test mode also is canceled at the same time when a test is currently executing)

*3: Set test values according to the simulation target

Selection		Description
HART	Display	
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
Simulation analog input(mA)	-	The simulation value (mA) of the analog input is set

4.16.3 Automatic Cancellation of the Test/Simulation Mode

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

Menu path

HART	Maintenance ► Test/Simulation ► Auto release time
Display	J40

Select the automatic cancellation time from the table below

Selection		Description
HART	Display	
10min	0	The cancellation time is set to ten minutes
30min	1	The cancellation time is set to 30 minutes
60min	2	The cancellation time is set to one hour
3h	3	The cancellation time is set to three hours
6h	4	The cancellation time is set to six hours
12h	5	The cancellation time is set to 12 hours

4.16.4 Loop Test

This function is common to HART communication. A constant current (mA) is output to check the control loop. This function can be executed from the following parameters.

Menu path

HART	Maintenance ► Test/Simulation ► Loop test*1 / Force Loop Current*2
Display	-

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

4.16.5 Device Variable Quantity Simulation Function

This function is common to HART communication. An arbitrary value and status can be set one device variable quantity to check output. The simulation value is also reflected in the output. This function can be executed from the following parameters.

Menu path

HART	Maintenance ► Test/Simulation ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Device variable simulation	-	1. Selection of Device variable*1 2. Setting of Value 3. Setting of Data quality*2 4. Setting of Limit status*3

*1: Select Device variable from the table below

Selection		Description
HART	**Display**	
Flow rate	-	Simulation of the instantaneous flow rate is started
Total	-	Simulation of totalized values is started
Temperature	-	Simulation of fluid temperature is started
Pressure	-	Simulation of fluid pressure is started

*2: Select Data quality from the table below

Selection		Description
HART	**Display**	
Bad	-	The Quality of the status of the selected Device variable is set to Bad
Poor accuracy	-	The Quality of the status of the selected Device variable is set to Poor accuracy
Manual/Fixed	-	The Quality of the status of the selected Device variable is set to Manual/Fixed
Good	-	The Quality of the status of the selected Device variable is set to Good

*3: Select the Limit status from the table below

Selection		Description
HART	**Display**	
Not limited	-	The Limit status of the status of the selected Device variable is set to Not limited
Low limited	-	The Limit status of the status of the selected Device variable is set to Low limited
High limited	-	The Limit status of the status of the selected Device variable is set to High limited
Constant	-	The Limit status of the status of the selected Device variable is set to Constant

4.16.6 Other Test Functions

(1) Restarting devices

Reset the device. When the device is restarted, parameters stored on the device are not initialized.
A restart can be executed by the following parameters.

Menu path

HART	Maintenance ► Test/Simulation ► Device reset
Display	-

Select execution of a restart from the table below

Selection		Description
HART	**Display**	
Exit	-	The device restart is not executed
Execute	-	The device restart is executed

(2) Restarting the sensor circuit

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

Menu path

HART	Maintenance ► Test/Simulation ► Sensor reset
Display	-

Select execution of a restart from the table below

Selection		Description
HART	**Display**	
Exit	-	The sensor circuit restart is not executed
Execute	-	The sensor circuit restart is executed

4.17 Parameter Protection

4.17.1 Write Protect Function

Write protection can be set by two method, the hardware write protection switch and software write protection. Whichever method is used, writing to parameters is no longer possible. For details about the hardware write protection switch, refer to the Installation Manual.
To enable the software write protection function, a password (eight alphanumeric characters, uppercase only) must be set to the parameter “New password”. Write protection can be disabled for only ten minutes by entering the password to parameter “Enable write 10 min”. The write protect function can be completely disabled by entering eight spaces to parameter “New password” with write protect temporarily disabled.
The write protect function can be set by the following parameters.

Menu path

HART	Device Setting ► Detailed setup ► Protect ► Write protect ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Write protect	-	Use of the write protect function is displayed*1
Enable write 10 min	-	The write protect function is disabled for only 10 minutes
New password	-	A new password for the write protect function is set

*1: Use of the write protect function is displayed

Value		Description
HART	**Display**	
No	-	The write protect function is not used (parameters can be changed)
Yes	-	The write protect function is in use (parameters cannot be changed)

NOTE

The use status of the write protect function can be checked in parameters or by the write protect icon displayed on the display.
The following item is displayed.

Icon	Description
	Write protect is in use (parameters cannot be changed)

NOTE

If the write protect switch is set to “Protect” on the amplifier board, it is not possible to overwrite parameters. Furthermore, this state is maintained until the write protect switch is set to “Disable”. To change parameters, disable the write protect function by using the preset password and set a new password.

The user must manage and remember a password that has been set. In the event that the user forgets the password, software write protection can be temporarily disabled by using a joker password.
Use of a joker password can be checked by the following parameters.

Menu path

HART	Device Setting ► Detailed setup ► Protect ► Write protect ► Software seal
Display	-

Check use of the joker password from the following.

Value		Description
HART	**Display**	
Keep	-	Normal
Break	-	The write protect function is disabled by the joker password

NOTE

When use of a joker password is required, inform the nearest Yokogawa Electric Corporation sales office.

4.17.2 Operation Levels (User Role)

On this product, parameters that can be accessed can be restricted by assigning operation levels (user roles) to parameter settings.
The following table summarizes the operation levels that can be assigned on this product.

Operation Rights	Parameter	
	Read	**Write**
Operator	All parameters	Display parameter settings that do not affect processes can be set
Maintenance	All parameters	Parameters that can be set by Operator levels and test- and adjustment-related parameters can be set.
Specialist	All parameters	All parameters that can be written can be set

By default, operation levels are disabled. When operation levels are disabled, the only levels that can be accessed is the Specialist levels.
To enable operation levels, a pass code must be set. Operation levels are enabled by setting a value other than “0” (zero) to the Maintenance or Specialist pass code. Operation levels are changed by this pass code. Different values must be set to the Maintenance and Specialist pass codes.

Operation Rights	Pass Code
Operator	A pass code is not required. From display: When a value other than the pass code set to Maintenance and Specialist is set, Operator levels are enabled. From communication: When “0” (zero) is set, Operator levels are enabled. Entering the incorrect PIN 5 times will cause AL-082: Incorrect PIN.
Maintenance	Maintenance pass code setting conditions • Value other than zero and different from the Specialist pass code • Operation levels are disabled by setting zero
Specialist	Specialist pass code setting conditions • Value other than zero and different from the , Maintenance pass code • Operation levels are disabled by setting zero

HART communication must be used to set and check parameters relating to operation levels. These operations are not possible on the display.
Perform setting and entry of pass codes, and checking of present operation levels by the following parameters.

Menu path

HART	Device Setting ► Detailed setup ► Protect ► User role ► (see table below)
Display	-

Parameter		Description
HART	**Display**	
Set user role PIN	-	The Maintenance/Specialist pass code is set. Set this manually according to the interactive Operation Guide called “DD Method”.
Change user role	-	Enter the pass code to switch operation levels.
Current role	-	The present operation levels are displayed. 0: Operator 1: Maintenance 2: Specialist
Active role	-	The present active operation levels are displayed.
Maintenance PIN	-	The Maintenance PIN is displayed only when Specialist levels are entered.
Specialist PIN	-	The Specialist PIN is displayed only when Specialist levels are entered.

When a pass code is not set to Specialist levels but only to Maintenance levels, the range of parameters that can be written to is the same as for Specialist levels. At this time “Specialist” and not “Maintenance” is displayed for parameter “Current role”.

When 30 minutes elapses from the last writing of a parameter with Current role set to either Maintenance or Specialist, Current role automatically returns to Operator. Current role also returns to Operation when a zero is entered to “Change user role”.

To disable operation levels, set a zero to the Maintenance and Specialist pass codes with Specialist levels enabled.

For details on access levels for each parameter, see Chapter 5 “Parameter Lists.” Operation levels are not applicable to parameters common to HART communication such as Loop Test and Burst Mode.

The user must manage and remember pass codes that have been set. In the event that the user forgets the password, operation levels can be disabled by using a joker password.

NOTE

When use of a joker password is required, inform the nearest Yokogawa Electric Corporation sales office.

5. Parameter Lists

This chapter shows parameter lists used for HART communication and the display.

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

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

The parameter lists are configured by the following items.

Parameter Name	HART: Indicates the parameter name. Display: Indicates the parameter No.
Data Range	When data is select type, the selection is indicated. When data is numeric type, the setting range and number of digits past the decimal point are indicated. When data is alphanumeric type, the number of characters limitation is indicated. The parameter data at setting on the display is indicated in parentheses ( ).
R/W	Indicates parameters that can be displayed and set. When operation levels are enabled, the parameters that can be set vary according to the operation level that is set. R: Display only RW1: Display and setting, settable by all operation levels RW2: Display and setting, setting is limited to Maintenance and Specialist operation levels RW3: Display and setting, setting is limited to Specialist operation levels
Default Value	Indicates the default value that is set before shipment from the factory.
Unit	Indicates the data range unit.
Refer to	Indicates the page to refer to for details on parameter content.

NOTE

The parameter list is listed in the menu order of the display.

5.1 Process Measurement Values

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Process Variables ► Device variable ► Flow rate(%)	A10	-	R	0.0	%	The instantaneous flow rate (%) is displayed	P.57
Process Variables ► Device variable ► Flow rate	A20	-	R	0.0	Flow unit (C41)	The instantaneous flow rate is displayed	P.57
Process Variables ► Device variable ► Temperature(%)	A40	-	R	0.0	%	The measured temperature (%) is displayed	P.57
Process Variables ► Device variable ► Temperature	A41	-	R	0.0	Temperature unit (C30)	The measured temperature is displayed	P.57
Process Variables ► Device variable ► Total	A30	-	R	0.0	Totalizer unit (B41)	The totalized value is displayed	P.57
Process Variables ► Device variable ► Loop current	-	-	R	4.0	mA	The current value of the analog output is displayed	P.63

5.2 Standard Setting Items

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Easy setup ► Flow span	B10 C45	0.0< to 99999.9	RW3	10.0 *1	Flow unit (C41)	The span of the instantaneous flow rate is set	P.44
Device Settings ► Easy setup ► Flow damping	B15 C50	0.0 to 200.0	RW3	4.0	s	The damping time constant of the instantaneous flow rate is set	P.46
Device Settings ► Easy setup ► Pulse/Status output mode	B20	Off (0) Scaled pulse (1) Unscaled pulse (2) Frequency (3) Alarm switch (4) Limit switch (5)	RW3	Off (0) *1	-	The pulse/status output function is selected	P.71
Device Settings ► Easy setup ► Pulse output rate	B21	0.0< to 99999.9	RW3	1.0 *1	-	The pulse rate value is set	P.71
Device Settings ► Easy setup ► Frequency output span	B22	0.0 to 10000.0	RW3	10000.0	Hz	The frequency when the process value is 100% is set	P.72
Device Settings ► Easy setup ► Limit switch level	B23	-99999.9 to 99999.9	RW3	0.0	Limit switch unit (D19)	The threshold value of the limit switch is set	P.74
Device Settings ► Easy setup ► Display line upper	B30	Flow rate(%) (0) Flow rate (1) Temperature(%) (2)	RW1	Flow rate(%) (0) *1	-	The content to display in the upper display is set	P.101
Device Settings ► Easy setup ► Display line lower	B31	Off (0) Totalizer (1) Temperature (2) Analog input (4)	RW1	Off (0) *1	-	The content to display in the lower display is set	P.101
Device Settings ► Easy setup ► Totalizer start/stop	B40	Stop (0) Start (1)	RW3	Stop (0) *1	-	Start/stop of the totalization function is set	P.58
Device Settings ► Easy setup ► Totalizer unit	B41	m^3 (0) km^3 (1) l (2) mcf (3) cf (4) kcf (5) USgal (6) kUSgal (7) UKgal (8) kUKgal (9) mbbl (10) bbl (11) kbbl (12) kg (13) t (14) lb (15) klb (16) (N)m^3 (17) k(N)m^3 (18) M(N)m^3 (19) (N)l (20) (S)m^3 (21) k(S)m^3 (22) M(S)m^3 (23) (S)l (24) (S)cf (25) k(S)cf (26) M(S)cf (27) kJ (28) MJ (29) GJ (30) TJ (31) BTU (32) kBTU (33) MBTU (34) SPE. (35)	R	m^3 (0)	-	The totalized value unit is checked	P.58
Device Settings ► Easy setup ► Totalizer rate	B45	0.00001 to 99999.9	RW3	1.0 *1	-	The total rate is set	P.59
Device Settings ► Easy setup ► Totalizer reset/preset	B47	Not execute (0) Reset (1) Preset (2)	RW3	Not execute (0)	-	Reset/preset of the totalization function is set	P.59
Device Settings ► Easy setup ► Totalizer preset value	B48	0.0 to 99999.9	RW3	0.0	Totalizer unit (B41)	The preset value of the totalization function is set	P.59
Device Settings ► Easy setup ► Totalizer reset mode	B49	Reset (0) Hold only display (1) Hold (2)	RW3	Reset (0)	-	The totalization operation of the totalization function is set	P.60
Device Settings ► Easy setup ► Analog output select	B50	Flow rate (0) Temperature (1)	RW3	Flow rate (0)	-	The process value to assign to analog output is set	P.63
Device Settings ► Easy setup ► Temperature LRV	B51 G11	-999.9 to 999.9	RW3	-40.0	Temperature unit (C30)	The scaling lower limit value (0%) of temperature measurement is set	P.61

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Easy setup ► Temperature URV	B52 G12	-999.9 to 999.9	RW3	250.0	Temperature unit (C30)	The scaling upper limit value (100%) of temperature measurement is set	P.61

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.

5.3 Basic Setting Items

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Basic setup ► Tag	-	-	RW1	All Space *1	-	The tag is set	P.109
Device Settings ► Basic setup ► Fluid type	C15	Liquid (0) Gas (1) Water (2) Steam (3)	RW3	Liquid (0) *1	-	The measured fluid is set	P.39
Device Settings ► Basic setup ► Flow select	C16	Volume (0) Mass (1) Standard/Normal (2) Energy (3) Energy(Heat difference) (4)	RW3	Volume (0) *1	-	The measured flow rate is set	P.40
Device Settings ► Basic setup ► Volume unit	C22	m^3 (0) km^3 (1) l (2) mcf (3) cf (4) kcf (5) USgal (6) kUSgal (7) UKgal (8) kUKgal (9) mbbl (10) bbl (11) kbbl (12)	RW3	m^3 (0) *1	-	The physical unit of the volumetric flow rate is set	P.41
Device Settings ► Basic setup ► Density unit	C25 F11	kg/m^3 (0) lb/cf (1) lb/USgal (2) lb/UKgal (3)	RW3	kg/m^3 (0) *1	-	The density unit is set	P.50
Device Settings ► Basic setup ► Fixed density	C26 F12 H26	0.0< to 99999.9	RW3	1000.0 *1	Density unit (C25)	The fixed density is set	P.50
Device Settings ► Basic setup ► Mass unit	C27	kg (0) t (1) lb (2) klb (3)	RW3	kg (0) *1	-	The physical unit of the mass flow rate is set	P.41
Device Settings ► Basic setup ► Temperature unit	F14 C30	degC (0) degF (1) K (2)	RW3	degC (0) *1	-	The temperature unit is set	P.51
Device Settings ► Basic setup ► Fixed temperature	F15 C31	-999.9 to 999.9	RW3	15.0 *1	Temperature unit (C30)	The fixed temperature is set	P.51
Device Settings ► Basic setup ► Base temperature	F16 C32	-999.9 to 999.9	RW3	15.0 *1	Temperature unit (C30)	The temperature of the normal/ standard condition is set	P.51
Device Settings ► Basic setup ► Pressure unit	F17 C33	kPa A (0) MPa A (1) bar A (2) psi A (3) kPa G (4) MPa G (5) bar G (6) psi G (7)	RW3	MPa A (1) *1	-	The pressure unit is set	P.52
Device Settings ► Basic setup ► Fixed pressure *2	F18 C34	abs:0.0< to 99999.9 guage:-99999.9 *3 to 99999.9	RW3	0.10133 *1	Pressure unit (C33)	The fixed pressure is set	P.52
Device Settings ► Basic setup ► Base pressure *2	F19 C35	abs:0.0< to 99999.9 guage:-99999.9 *3 to 99999.9	RW3	0.10133 *1	Pressure unit (C33)	The pressure of the normal/ standard condition is set	P.52
Device Settings ► Basic setup ► Deviation	F23 C36	0.0< to 99999.9	RW3	1.0 *1	-	The deviation factor (ratio) for the density of the normal/ standard condition is set	P.55
Device Settings ► Basic setup ► Standard/Normal unit	C37	(N)m^3 (0) k(N)m^3 (1) M(N)m^3 (2) (N)l (3) (S)m^3 (4) k(S)m^3 (5) M(S)m^3 (6) (S)l (7) (S)cf (8) k(S)cf (9) M(S)cf (10)	RW3	(N)m^3 (0) *1	-	The physical unit of the Standard/Normal flow rate is set	P.42

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Minus gauge pressure value will be obtained, setting the absolute pressure value in absolute pressure unit and returning to gauge pressure unit.
*3 The lower limit of gauge pressure is the value equivalent to 0 when converted to absolute pressure. This value is equal to the negative value of Air pressure setting.

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Basic setup ► Energy unit	C38	kJ (0) MJ (1) GJ (2) TJ (3) BTU (4) kBTU (5) MBTU (6)	RW3	kJ (0) *1	-	The physical unit of the heat/ heat difference is set	P.42
Device Settings ► Basic setup ► Time unit	C40	/s (0) /min (1) /h (2) /d (3)	RW3	/h (2) *1	-	The time unit is set	P.42

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Minus gauge pressure value will be obtained, setting the absolute pressure value in absolute pressure unit and returning to gauge pressure unit.
*3 The lower limit of gauge pressure is the value equivalent to 0 when converted to absolute pressure. This value is equal to the negative value of Air pressure setting.

Parameter Name		Data Range				R/W	Default Value	Unit	Description	Refer to
HART	Display									
Device Settings ► Basic setup ► Flow unit	C41	m^3/s	(0)	(N)m^3/h	(70)	R	m^3/h (2)	-	The measurement unit is checked	P.43
		m^3/min	(1)	(N)m^3/d	(71)					
		m^3/h	(2)	k(N)m^3/s	(72)					
		m^3/d	(3)	k(N)m^3/min	(73)					
		km^3/s	(4)	k(N)m^3/h	(74)					
		km^3/min	(5)	k(N)m^3/d	(75)					
		km^3/h	(6)	M(N)m^3/s	(76)					
		km^3/d	(7)	M(N)m^3/min	(77)					
		l/s	(8)	M(N)m^3/h	(78)					
		l/min	(9)	M(N)m^3/d	(79)					
		l/h	(10)	(N)l/s	(80)					
		l/d	(11)	(N)l/min	(81)					
		mcf/s	(12)	(N)l/h	(82)					
		mcf/min	(13)	(N)l/d	(83)					
		mcf/h	(14)	(S)m^3/s	(84)					
		mcf/d	(15)	(S)m^3/min	(85)					
		cf/s	(16)	(S)m^3/h	(86)					
		cf/min	(17)	(S)m^3/d	(87)					
		cf/h	(18)	k(S)m^3/s	(88)					
		cf/d	(19)	k(S)m^3/min	(89)					
		kcf/s	(20)	k(S)m^3/h	(90)					
		kcf/min	(21)	k(S)m^3/d	(91)					
		kcf/h	(22)	M(S)m^3/s	(92)					
		kcf/d	(23)	M(S)m^3/min	(93)					
		USgal/s	(24)	M(S)m^3/h	(94)					
		USgal/min	(25)	M(S)m^3/d	(95)					
		USgal/h	(26)	(S)l/s	(96)					
		USgal/d	(27)	(S)l/min	(97)					
		kUSgal/s	(28)	(S)l/h	(98)					
		kUSgal/min	(29)	(S)l/d	(99)					
		kUSgal/h	(30)	(S)cf/s	(100)					
		kUSgal/d	(31)	(S)cf/min	(101)					
		UKgal/s	(32)	(S)cf/h	(102)					
		UKgal/min	(33)	(S)cf/d	(103)					
		UKgal/h	(34)	k(S)cf/s	(104)					
		UKgal/d	(35)	k(S)cf/min	(105)					
		kUKgal/s	(36)	k(S)cf/h	(106)					
		kUKgal/min	(37)	k(S)cf/d	(107)					
		kUKgal/h	(38)	M(S)cf/s	(108)					
		kUKgal/d	(39)	M(S)cf/min	(109)					
		mbbl/s	(40)	M(S)cf/h	(110)					
		mbbl/min	(41)	M(S)cf/d	(111)					
		mbbl/h	(42)	kJ/s	(112)					
		mbbl/d	(43)	kJ/min	(113)					
		bbl/s	(44)	kJ/h	(114)					
		bbl/min	(45)	kJ/d	(115)					
		bbl/h	(46)	MJ/s	(116)					
		bbl/d	(47)	MJ/min	(117)					
		kbbl/s	(48)	MJ/h	(118)					
		kbbl/min	(49)	MJ/d	(119)					
		kbbl/h	(50)	GJ/s	(120)					
		kbbl/d	(51)	GJ/min	(121)					
		kg/s	(52)	GJ/h	(122)					
		kg/min	(53)	GJ/d	(123)					
		kg/h	(54)	TJ/s	(124)					
		kg/d	(55)	TJ/min	(125)					
		t/s	(56)	TJ/h	(126)					
		t/min	(57)	TJ/d	(127)					
		t/h	(58)	BTU/s	(128)					
		t/d	(59)	BTU/min	(129)					
		lb/s	(60)	BTU/h	(130)					
		lb/min	(61)	BTU/d	(131)					
		lb/h	(62)	kBTU/s	(132)					
		lb/d	(63)	kBTU/min	(133)					
		klb/s	(64)	kBTU/h	(134)					
		klb/min	(65)	kBTU/d	(135)					
		klb/h	(66)	MBTU/s	(136)					
		klb/d	(67)	MBTU/min	(137)					
		(N)m^3/s	(68)	MBTU/h	(138)					
		(N)m^3/min	(69)	MBTU/d	(139)					
				SPE.	(140)					
Device Settings ► Basic setup ► Flow span	B10 C45	0.0< to 99999.9				RW3	10.0 *1	Flow unit (C41)	The span of the instantaneous flow rate is set	P.44
Device Settings ► Basic setup ► Flow damping	B15 C50	0.0 to 200.0				RW3	4.0	s	The damping time constant of the instantaneous flow rate is set	P.46

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Minus gauge pressure value will be obtained, setting the absolute pressure value in absolute pressure unit and returning to gauge pressure unit.
*3 The lower limit of gauge pressure is the value equivalent to 0 when converted to absolute pressure. This value is equal to the negative value of Air pressure setting.

5.4 Additional Setup

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Frequency output select	D11	Flow rate (0) Temperature (1)	RW3	Flow rate (0)	-	The process value to assign to frequency output is set	P.72
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Frequency output zero	D12	0.0 to 10000.0	RW3	0.0	Hz	The frequency when the process value is 0% is set	P.72
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Status output condition	D13	Not active (0) Active (1)	R	Not active (0)	-	The state of status output is displayed	P.76
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Status output direction	D14	On active (0) Off active (1)	RW3	On active (0)	-	The active direction of status output is selected	P.76
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Alarm switch select	D15	All alarm/warning (0) All alarm (1) System/Process alarm (2) System alarm (3) Process alarm (4) Setting alarm (5) Warning (6)	RW3	All alarm/ warning (0)	-	The alarm to be output is selected	P.73
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Limit switch select	D16	Flow rate (0) Temperature (1) Totalizer (3)	RW3	Flow rate (0)	-	The process value to assign to limit switch output is set	P.74
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Limit switch mode	D17	Low limit (0) High limit (1)	RW3	Low limit (0)	-	The H side/L side to assign to limit switch output is set	P.74
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Limit switch hysteresis	D18	0.0 to 99999.9	RW3	0.0	Limit switch unit (D19)	The hysteresis width of the limit switch output switching is set	P.74

Parameter Name		Data Range				R/W	Default Value	Unit	Description	Refer to
HART	Display									
Device Settings ► Detailed setup ► I/O ► Pulse/Status output ► Limit switch unit	D19	m^3/s	(0)	M(S)m^3/h	(94)	R	m^3/h (2)	-	The unit of the threshold value and hysteresis value for the limit switch are displayed	P.74
		m^3/min	(1)	M(S)m^3/d	(95)					
		m^3/h	(2)	(S)l/s	(96)					
		m^3/d	(3)	(S)l/min	(97)					
		km^3/s	(4)	(S)l/h	(98)					
		km^3/min	(5)	(S)l/d	(99)					
		km^3/h	(6)	(S)cf/s	(100)					
		km^3/d	(7)	(S)cf/min	(101)					
		l/s	(8)	(S)cf/h	(102)					
		l/min	(9)	(S)cf/d	(103)					
		l/h	(10)	k(S)cf/s	(104)					
		l/d	(11)	k(S)cf/min	(105)					
		mcf/s	(12)	k(S)cf/h	(106)					
		mcf/min	(13)	k(S)cf/d	(107)					
		mcf/h	(14)	M(S)cf/s	(108)					
		mcf/d	(15)	M(S)cf/min	(109)					
		cf/s	(16)	M(S)cf/h	(110)					
		cf/min	(17)	M(S)cf/d	(111)					
		cf/h	(18)	kJ/s	(112)					
		cf/d	(19)	kJ/min	(113)					
		kcf/s	(20)	kJ/h	(114)					
		kcf/min	(21)	kJ/d	(115)					
		kcf/h	(22)	MJ/s	(116)					
		kcf/d	(23)	MJ/min	(117)					
		USgal/s	(24)	MJ/h	(118)					
		USgal/min	(25)	MJ/d	(119)					
		USgal/h	(26)	GJ/s	(120)					
		USgal/d	(27)	GJ/min	(121)					
		kUSgal/s	(28)	GJ/h	(122)					
		kUSgal/min	(29)	GJ/d	(123)					
		kUSgal/h	(30)	TJ/s	(124)					
		kUSgal/d	(31)	TJ/min	(125)					
		UKgal/s	(32)	TJ/h	(126)					
		UKgal/min	(33)	TJ/d	(127)					
		UKgal/h	(34)	BTU/s	(128)					
		UKgal/d	(35)	BTU/min	(129)					
		kUKgal/s	(36)	BTU/h	(130)					
		kUKgal/min	(37)	BTU/d	(131)					
		kUKgal/h	(38)	kBTU/s	(132)					
		kUKgal/d	(39)	kBTU/min	(133)					
		mbbl/s	(40)	kBTU/h	(134)					
		mbbl/min	(41)	kBTU/d	(135)					
		mbbl/h	(42)	MBTU/s	(136)					
		mbbl/d	(43)	MBTU/min	(137)					
		bbl/s	(44)	MBTU/h	(138)					
		bbl/min	(45)	MBTU/d	(139)					
		bbl/h	(46)	SPE.	(140)					
		bbl/d	(47)	degC	(141)					
		kbbl/s	(48)	degF	(142)					
		kbbl/min	(49)	K	(143)					
		kbbl/h	(50)	kPa A	(144)					
		kbbl/d	(51)	MPa A	(145)					
		kg/s	(52)	bar A	(146)					
		kg/min	(53)	psi A	(147)					
		kg/h	(54)	kPa G	(148)					
		kg/d	(55)	MPa G	(149)					
		t/s	(56)	bar G	(150)					
		t/min	(57)	psi G	(151)					
		t/h	(58)	m3	(152)					
		t/d	(59)	km3	(153)					
		lb/s	(60)	l	(154)					
		lb/min	(61)	mcf	(155)					
		lb/h	(62)	cf	(156)					
		lb/d	(63)	kcf	(157)					
		klb/s	(64)	USgal	(158)					
		klb/min	(65)	kUSgal	(159)					
		klb/h	(66)	UKgal	(160)					
		klb/d	(67)	kUKgal	(161)					
		(N)m^3/s	(68)	mbbl	(162)					
		(N)m^3/min	(69)	bbl	(163)					
		(N)m^3/h	(70)	kbbl	(164)					
		(N)m^3/d	(71)	kg	(165)					
		k(N)m^3/s	(72)	t	(166)					
		k(N)m^3/min	(73)	lb	(167)					
		k(N)m^3/h	(74)	klb	(168)					
		k(N)m^3/d	(75)	(N)m^3	(169)					
		M(N)m^3/s	(76)	k(N)m^3	(170)					
		M(N)m^3/min	(77)	M(N)m^3	(171)					
		M(N)m^3/h	(78)	(N)l	(172)					
		M(N)m^3/d	(79)	(S)m^3	(173)					
		(N)l/s	(80)	k(S)m^3	(174)					
		(N)l/min	(81)	M(S)m^3	(175)					
		(N)l/h	(82)	(S)l	(176)					
		(N)l/d	(83)	(S)cf	(177)					
		(S)m^3/s	(84)	k(S)cf	(178)					
		(S)m^3/min	(85)	M(S)cf	(179)					
		(S)m^3/h	(86)	kJ	(180)					
		(S)m^3/d	(87)	MJ	(181)					
		k(S)m^3/s	(88)	GJ	(182)					
		k(S)m^3/min	(89)	TJ	(183)					
		k(S)m^3/h	(90)	BTU	(184)					
		k(S)m^3/d	(91)	kBTU	(185)					
		M(S)m^3/s	(92)	MBTU	(186)					
		M(S)m^3/min	(93)	SPE.	(187)					

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► Display ► Display period	D20	0.25s (0) 0.5s (1) 1s (2) 2s (3) 4s (4) 8s (5)	RW1	0.25s (0)	-	The update interval of the process value for the display is set	P.103
Device Settings ► Detailed setup ► Display ► Display startup	D21	Off (0) On (1)	RW1	Off (0)	-	The screen display at startup is selected	P.104
Device Settings ► Detailed setup ► Display ► Display NE107	D22	Off (0) On (1)	RW1	Off (0)	-	Display/hide of the NAMUR NE107 category is selected	P.95
Device Settings ► Detailed setup ► Display ► Display format flow	D23	Auto (0) 0 digit (1) 1 digit (2) 2 digit (3) 3 digit (4) 4 digit (5)	RW1	Auto (0)	-	The decimal point position of the instantaneous flow rate value is set	P.102
Device Settings ► Detailed setup ► Display ► Display format temperature	D24	0 digit (0) 1 digit (1) 2 digit (2) 3 digit (3) 4 digit (4)	RW1	0digit (0)	-	The decimal point position of the temperature value is set	P.102
Device Settings ► Detailed setup ► Display ► Display format pressure	D25	0 digit (0) 1 digit (1) 2 digit (2) 3 digit (3) 4 digit (4)	RW1	0digit (0)	-	The decimal point position of the pressure value is set	P.102
Device Settings ► Detailed setup ► I/O ► Analog output ► Analog output high limit	D30	4.0 to 21.6	RW3	21.6 *1	mA	The upper limit value of analog output is set Set from Analog output limit(Method)	P.64
Device Settings ► Detailed setup ► I/O ► Analog output ► Analog output low limit	D31	3.6 to 20.0	RW3	3.6 *1	mA	The lower limit value of analog output is set Set from Analog output limit(Method)	P.64
Diagnostics ► Signal controls ► Burnout	D35	High (0) Low (1)	R	High (0)	-	The direction of analog output when a burnout occurs is displayed	P.99
Diagnostics ► Signal controls ► Burnout recover	-	Off (0) On (1)	RW3	Off (0)	-	The restore operation when a burnout occurs is set	P.99
Device Settings ► Detailed setup ► Flow rate ► Flow lowcut	D10	1/2 or equivalent of minimum flow velocity to 99999.9	RW3	0.47 *1	Flow unit (C41)	The lowcut value of the instantaneous flow rate is set	P.46
Device Settings ► Detailed setup ► Flow user conversion ► Flow user conversion	D40	Off (0) On (1)	RW3	Off (0)	-	Whether or not to convert to user units is selected and displayed Set from User unit (Method)	P.48
Device Settings ► Detailed setup ► Flow user conversion ► Flow user unit	-	-	RW3	All Space	-	The name of the user-specified unit is set Set from User unit (Method)	P.49

Parameter Name		Data Range				R/W	Default Value	Unit	Description	Refer to
HART	Display									
Device Settings ► Detailed setup ► Flow user conversion ► Flow user base unit	D41	m^3/s	(0)	(N)m^3/h	(70)	R	m^3/h (2)	-	The flow rate unit used for the conversion reference is displayed	P.48
		m^3/min	(1)	(N)m^3/d	(71)					
		m^3/h	(2)	k(N)m^3/s	(72)					
		m^3/d	(3)	k(N)m^3/min	(73)					
		km^3/s	(4)	k(N)m^3/h	(74)					
		km^3/min	(5)	k(N)m^3/d	(75)					
		km^3/h	(6)	M(N)m^3/s	(76)					
		km^3/d	(7)	M(N)m^3/min	(77)					
		l/s	(8)	M(N)m^3/h	(78)					
		l/min	(9)	M(N)m^3/d	(79)					
		l/h	(10)	(N)l/s	(80)					
		l/d	(11)	(N)l/min	(81)					
		mcf/s	(12)	(N)l/h	(82)					
		mcf/min	(13)	(N)l/d	(83)					
		mcf/h	(14)	(S)m^3/s	(84)					
		mcf/d	(15)	(S)m^3/min	(85)					
		cf/s	(16)	(S)m^3/h	(86)					
		cf/min	(17)	(S)m^3/d	(87)					
		cf/h	(18)	k(S)m^3/s	(88)					
		cf/d	(19)	k(S)m^3/min	(89)					
		kcf/s	(20)	k(S)m^3/h	(90)					
		kcf/min	(21)	k(S)m^3/d	(91)					
		kcf/h	(22)	M(S)m^3/s	(92)					
		kcf/d	(23)	M(S)m^3/min	(93)					
		USgal/s	(24)	M(S)m^3/h	(94)					
		USgal/min	(25)	M(S)m^3/d	(95)					
		USgal/h	(26)	(S)l/s	(96)					
		USgal/d	(27)	(S)l/min	(97)					
		kUSgal/s	(28)	(S)l/h	(98)					
		kUSgal/min	(29)	(S)l/d	(99)					
		kUSgal/h	(30)	(S)cf/s	(100)					
		kUSgal/d	(31)	(S)cf/min	(101)					
		UKgal/s	(32)	(S)cf/h	(102)					
		UKgal/min	(33)	(S)cf/d	(103)					
		UKgal/h	(34)	k(S)cf/s	(104)					
		UKgal/d	(35)	k(S)cf/min	(105)					
		kUKgal/s	(36)	k(S)cf/h	(106)					
		kUKgal/min	(37)	k(S)cf/d	(107)					
		kUKgal/h	(38)	M(S)cf/s	(108)					
		kUKgal/d	(39)	M(S)cf/min	(109)					
		mbbl/s	(40)	M(S)cf/h	(110)					
		mbbl/min	(41)	M(S)cf/d	(111)					
		mbbl/h	(42)	kJ/s	(112)					
		mbbl/d	(43)	kJ/min	(113)					
		bbl/s	(44)	kJ/h	(114)					
		bbl/min	(45)	kJ/d	(115)					
		bbl/h	(46)	MJ/s	(116)					
		bbl/d	(47)	MJ/min	(117)					
		kbbl/s	(48)	MJ/h	(118)					
		kbbl/min	(49)	MJ/d	(119)					
		kbbl/h	(50)	GJ/s	(120)					
		kbbl/d	(51)	GJ/min	(121)					
		kg/s	(52)	GJ/h	(122)					
		kg/min	(53)	GJ/d	(123)					
		kg/h	(54)	TJ/s	(124)					
		kg/d	(55)	TJ/min	(125)					
		t/s	(56)	TJ/h	(126)					
		t/min	(57)	TJ/d	(127)					
		t/h	(58)	BTU/s	(128)					
		t/d	(59)	BTU/min	(129)					
		lb/s	(60)	BTU/h	(130)					
		lb/min	(61)	BTU/d	(131)					
		lb/h	(62)	kBTU/s	(132)					
		lb/d	(63)	kBTU/min	(133)					
		klb/s	(64)	kBTU/h	(134)					
		klb/min	(65)	kBTU/d	(135)					
		klb/h	(66)	MBTU/s	(136)					
		klb/d	(67)	MBTU/min	(137)					
		(N)m^3/s	(68)	MBTU/h	(138)					
		(N)m^3/min	(69)	MBTU/d	(139)					
Device Settings ► Detailed setup ► Flow user conversion ► Flow conversion factor	D43	0.0< to 99999.9				RW3	1.0	-	The conversion factor to user units is set Set from User unit (Method)	P.49

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input unit	D52	degC (0) degF (1) K (2) kPa A (3) MPa A (4) bar A (5) psi A (6) kPa G (7) MPa G (8) bar G (9) psi G (10) kg/m^3 (11) lb/cf (12) lb/USgal (13) lb/UKgal (14)	R	degC (0)	-	The analog input unit is displayed	P.68
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input LRV	D53	-99999.9 to 99999.9	RW3	0.0 *1	Analog input unit (D52)	The value when the process value used for analog input is 0% is set	P.68
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input URV	D54	-99999.9 to 99999.9	RW3	100.0 *1	Analog input unit (D52)	The value when the process value used for analog input is 100% is set	P.68
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input low limit	D55	3.6 to 20.0	RW3	3.6	mA	The lower limit value of analog input is set	P.68
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input high limit	D56	4.0 to 21.6	RW3	21.6	mA	The upper limit value of analog input is set	P.68
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input fix value	D57	3.6 to 21.6	RW3	4.0	mA	The fixed value of analog input is set	P.100

5.5 Detector Setup

Parameter Name		Data Range		R/W	Default Value	Unit	Description	Refer to
HART	Display							
Device Settings ► Detailed setup ► Sensor Information ► Nominal size	E10	15mm 25mm 40mm 50mm 80mm 100mm 150mm 200mm 250mm 300mm 400mm	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)	RW3	25 mm (2) *1	-	The diameter is selected	P.77
Device Settings ► Detailed setup ► Sensor Information ► Body type	E20	General One size down Two size down High pressure Dual sensor	(0) (1) (2) (4) (6)	RW3	General (0) *1	-	The body type is selected	P.77
Device Settings ► Detailed setup ► Sensor Information ► Sensor type	E30	Standard Standard w/ temp sensor High temperature High temperature w/ temp sensor Cryogenic Long neck Long neck w/ temp sensor	(0) (1) (2) (3) (4) (6) (7)	RW3	Standard (0) *1	-	The sensor type is selected	P.77
Device Settings ► Detailed setup ► Sensor Information ► Connection type	E22	Integral Remote	(0) (1)	RW3	Integral (0) *1	-	Integral/remote sensor is selected	P.77
Device Settings ► Detailed setup ► Sensor Information ► K factor unit	E40	p/l p/USgal p/UKgal	(0) (1) (2)	RW3	p/l (0) *1	-	The K factor unit is selected	P.77
Device Settings ► Detailed setup ► Sensor Information ► K factor	E41	0.0< to 99999.9		RW3	68.6 *1	K factor unit (E40)	The K factor is set	P.77
Device Settings ► Detailed setup ► Sensor Information ► Process temperature	E44	-29 to +250 degC -40 to +250 degC -40 to +450 degC -40 to +400 degC -196 to +250 degC	(0) (1) *2*5 (2) *2*6 (3) *2*6 (4)	R *3/ RW3 *4	0.0 *1	degC	The allowable temperature is displayed *3/set *4	P.77
Device Settings ► Detailed setup ► Sensor Information ► Max pressure	E45	0.0 to 99999.9		R *3/ RW3 *4	0.0 *1	MPa at 38 degC	The maximum allowable pressure is displayed *3/set *4	P.77
Device Settings ► Detailed setup ► Sensor Information ► Sensor backup/restore	E46	Not execute Backup parameter Restore parameter Restore parameter(factory)	(0) (1) (3) (4)	RW3	Not execute (0)	-	Backup/restore of sensor information	P.79
Device Settings ► Detailed setup ► Sensor Information ► Sensor backup/restore result	E47	Unknown Pass Failure Running	(0) (1) (2) (3)	R	Unknown (0)	-	The backup/restore result of sensor information is displayed	P.79
Device Settings ► Detailed setup ► Sensor Information ► Sensor S/N	-	-		R *3/ RW3 *4	All Space *1	-	Sensor serial No. displayed *3/ set *4	P.77

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For option code/LAT, the measured lower limit temperature will be -50 degC instead of -40 degC.
*3: For R1.01.01 or R1.01.02
*4: For R1.01.03 or more
*5: For Body & shedder bar material code W□, the measured temperature range will be -29 to +250 degC.
*6: For Body & shedder bar material code W□, the measured temperature range will be -29 to +400 degC.

5.6 Adjust

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► Compensation setup ► Calculation type	-	Fixed Analog input Compensation T Compensation T/P Saturated steam T Saturated steam P Superheated steam T/P	R	Fixed *1	-	The compensation method of density and specific enthalpy is confirmed	P.54
Device Settings ► Detailed setup ► Compensation setup ► Steam type	F01	Saturated steam (0) Superheated steam (1)	RW3	Saturated steam (0) *1	-	The steam type is selected	P.53
Device Settings ► Detailed setup ► Compensation setup ► Compensation type	F03	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)	RW3	Not used (0) *1	-	The compensation type is selected	P.54
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature select	F04 G10	Fixed (0) Built-in (1) Analog input (2)	R	Fixed (0)	-	The temperature measurement method is checked	P.61
Device Settings ► Detailed setup ► T/P setup ► Pressure ► Pressure select	F05 G20	Fixed (0) Analog input (2)	R	Fixed (0)	-	The pressure measurement method is checked	P.62
Device Settings ► Detailed setup ► I/O ► Analog input ► Analog input select	F06	Off (0) Temperature (1) Presseure (2) Density (3) Delta temperature (4)	R	Off (0) *1	-	The process value assigned to analog output is displayed	P.67
Device Settings ► Detailed setup ► Compensation setup ► Density unit	C25 F11	kg/m³ (0) lb/cf (1) lb/USgal (2) lb/UKgal (3)	RW3	kg/m³ (0)	-	The density unit is set	P.50
Device Settings ► Detailed setup ► Compensation setup ► Fixed density	C26 F12 H26	0.0< to 99999.9	RW3	1000.0 *1	Density unit (C25)	The fixed density is set	P.50
Device Settings ► Detailed setup ► Compensation setup ► Base density	F13	0.0< to 99999.9	RW3	1000.0 *1	Density unit (C25)	The density of the normal condition is set	P.51
Device Settings ► Detailed setup ► Compensation setup ► Temperature unit	F14 C30	degC (0) degF (1) K (2)	RW3	degC (0) *1	-	The temperature unit is set	P.51
Device Settings ► Detailed setup ► Compensation setup ► Fixed temperature	F15 C31	-999.9 to 999.9	RW3	15.0 *1	Temperature unit (C30)	The fixed temperature is set	P.51
Device Settings ► Detailed setup ► Compensation setup ► Base temperature	F16 C32	-999.9 to 999.9	RW3	15.0 *1	Temperature unit (C30)	The temperature of the normal/ standard condition is set	P.51
Device Settings ► Detailed setup ► Compensation setup ► Pressure unit	F17 C33	kPa A (0) MPa A (1) bar A (2) psi A (3) kPa G (4) MPa G (5) bar G (6) psi G (7)	RW3	MPa A (1) *1	-	The pressure unit is set	P.52
Device Settings ► Detailed setup ► Compensation setup ► Fixed pressure *2*3	F18 C34	abs:0.0< to 99999.9 guage:-99999.9 *4 to 99999.9	RW3	0.10133 *1	Pressure unit (C33)	The fixed pressure is set	P.52
Device Settings ► Detailed setup ► Compensation setup ► Base pressure *2*3	F19 C35	abs:0.0< to 99999.9 guage:-99999.9 *4 to 99999.9	RW3	0.10133 *1	Pressure unit (C33)	The pressure of the normal/ standard condition is set	P.52
Device Settings ► Detailed setup ► Compensation setup ► Air pressure unit	-	kPa A (0) MPa A (1) bar A (2) psi A (3)	R	MPa A (1)	-	The air pressure unit is displayed	-
Device Settings ► Detailed setup ► Compensation setup ► Air pressure *3	F20	0.0< to 99999.9	RW3	0.10133 *1	Air pressure unit	Pressure is added to the gauge pressure and air pressure is set at calculation of absolute pressure	-
Device Settings ► Detailed setup ► Compensation setup ► Deviation	F23 C36	0.0< to 99999.9	RW3	1.0 *1	-	The deviation factor (ratio) for the density of the normal/ standard condition is set	P.55

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Minus gauge pressure value will be obtained, setting the absolute pressure value in absolute pressure unit and returning to gauge pressure unit.
*3 Fixed pressure and Base Pressure settings will change to maintain the value converted to absolute pressure in changing Air pressure setting, when Pressure unit is set to gauge pressure unit.
*4 The lower limit of gauge pressure is the value equivalent to 0 when converted to absolute pressure. This value is equal to the negative value of Air pressure setting.

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► Compensation setup ► Dryness	F24	90.0 to 100.0	RW3	100.0 *1	%	The dryness level is set	-
Device Settings ► Detailed setup ► Compensation setup ► Temperature coefficient 1	F30	-99999.9 to 99999.9	RW3	0.0	1 / Temperature unit (1/C30)	The primary temperature factor of density calculation is set	-
Device Settings ► Detailed setup ► Compensation setup ► Temperature coefficient 2	F31	-99999.9 to 99999.9	RW3	0.0	1 / Temperature unit^2 (1/C30^2)	The secondary temperature factor of density calculation is set	-
Device Settings ► Detailed setup ► Compensation setup ► Enthalpy unit	F35	kJ/kg (0) MJ/kg (1) GJ/kg (2) TJ/kg (3) BTU/lb (4)	RW3	kJ/kg (0) *1	-	The specific enthalpy unit is set	P.53
Device Settings ► Detailed setup ► Compensation setup ► Fixed enthalpy	F36	0.0< to 99999.9	RW3	1000.0 *1	Enthalpy unit (F35)	The fixed specific enthalpy is set	P.53
Device Settings ► Detailed setup ► Compensation setup ► Heat difference select	F37	Built-in(H)/Analog input(L) (0) Analog input(H)/Built-in(L) (1) Analog input(delta T) (2)	RW3	Built-in(H)/ Analog input(L) (0)	-	The method of use of the fluid temperature is selected	P.55
Device Settings ► Detailed setup ► Compensation setup ► Heat difference conv unit	F38	(kJ/kg)/K (0) (MJ/m^3)/K (1) (BTU/cf)/degF (2) (BTU/USgal)/degF (3) (BTU/UKgal)/degF (4) (BTU/lb)/degF (5)	RW3	(kJ/kg)/K (0)	-	The unit of heat conversion factor is selected	P.56
Device Settings ► Detailed setup ► Compensation setup ► Heat difference conv factor	F39	0.0< to 99999.9	RW3	1.0	Heat difference conv unit (F38)	The heat conversion factor is set	P.56
Device Settings ► Detailed setup ► Compensation setup ► Density	F40 K38	-99999.9 to 99999.9	R	0.0	Density unit (C25)	The density is displayed	P.57
Device Settings ► Detailed setup ► Compensation setup ► Density ratio	F41	-99999.9 to 99999.9	R	0.0	-	The density ratio used for Standard/Normal flow rate measurement is displayed	P.57
Device Settings ► Detailed setup ► Compensation setup ► Enthalpy	F42	-99999.9 to 99999.9	R	0.0	Enthalpy unit (F35)	The specific enthalpy used for heat measurement is displayed at the set unit	P.57
Device Settings ► Detailed setup ► Compensation setup ► Delta temperature	F43	-99999.9 to 99999.9	R	0.0	Temperature unit (C30)	The temperature difference used for heat difference measurement is displayed	P.57
Device Settings ► Detailed setup ► Compensation setup ► Delta enthalpy	F44	-99999.9 to 99999.9	R	0.0	Enthalpy unit (F35)	The specific enthalpy used for heat measurement is displayed	P.57

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 If the software revision is R1.01.01 or R1.01.02, Fixed pressure and Base Pressure cannot be set to minus gauge pressure value, when Pressure unit is set to gauge pressure unit. Minus gauge pressure value will be obtained, setting the absolute pressure value in absolute pressure unit and returning to gauge pressure unit.
*3 Fixed pressure and Base Pressure settings will change to maintain the value converted to absolute pressure in changing Air pressure setting, when Pressure unit is set to gauge pressure unit.
*4 The lower limit of gauge pressure is the value equivalent to 0 when converted to absolute pressure. This value is equal to the negative value of Air pressure setting.

5.7 Temperature/Pressure Measurement Setup

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature select	F04 G10	Fixed (0) Built-in (1) Analog input (2)	R	Fixed (0)	-	The temperature measurement method is checked	P.61
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature LRV	B51 G11	-999.9 to 999.9	RW3	-40.0	Temperature unit (C30)	The scaling lower limit value (0%) of temperature measurement is set	P.61
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature URV	B52 G12	-999.9 to 999.9	RW3	250.0	Temperature unit (C30)	The scaling upper limit value (100%) of temperature measurement is set	P.61
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature damping	G13	0.0 to 200.0	RW3	4.0	s	The damping time constant of the temperature measurement is set	P.61
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature gain	G15	0.0< to 99999.9	RW3	1.0	-	The compensation factor (gain) of temperature measurement is set	P.62
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Temperature offset	G16	-999.9 to 999.9	RW3	0.0	Temperature unit (C30)	The compensation value (offset) of temperature measurement is set	P.62
Device Settings ► Detailed setup ► T/P setup ► Temperature ► Selected temperature	-	-9999.9 to 9999.9	R	0.0	Temperature unit (C30)	The fluid temperature is displayed	-
Device Settings ► Detailed setup ► T/P setup ► Pressure ► Selected pressure	-	-9999.9 to 9999.9	R	0.0	Pressure unit (C33)	The fluid pressure is displayed	-

5.8 Adjustment Functions

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Maintenance ► Adjustment ► Analog output trim ► Analog output trim mode	H05	Not execute (0) 4mA (1) 20mA (2)	RW2	Not execute (0)	-	Adjustment of analog output is executed, executed from Analog output trim(Method)	P.65
Maintenance ► Adjustment ► Analog output trim ► Analog output trim clear	H06	Not execute (0) Execute (1)	RW2	Not execute (0)	-	The adjustment value of analog output is cleared	P.65
Maintenance ► Adjustment ► Analog output trim ► Reference meter(4mA)	H07	3.6 to 20.0	RW2	4.0	mA	The measured value at 4 mA adjustment is set, set from Analog output trim(Method)	P.65
Maintenance ► Adjustment ► Analog output trim ► Reference meter(20mA)	H08	4.0 to 21.6	RW2	20.0	mA	The measured value at 20 mA adjustment is set, set from Analog output trim(Method)	P.65
Maintenance ► Adjustment ► Analog output trim ► Analog output trim(4mA)	H10	-1.0 to 1.0	R	0.0	%	The 4 mA adjustment value is displayed	P.65
Maintenance ► Adjustment ► Analog output trim ► Analog output trim(20mA)	H11	-1.0 to 1.0	R	0.0	%	The 20 mA adjustment value is displayed	P.65
Maintenance ► Adjustment ► Analog input trim ► Analog input trim mode	H12	Not execute (0) 4mA (1) 8mA (2) 12mA (3) 16mA (4) 20mA (5)	RW2	Not execute (0)	-	Adjustment of analog input is executed, Execute from Analog input trim(Method)	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim clear	H13	Not execute (0) Execute (1)	RW2	Not execute (0)	-	The adjustment value of analog output is cleared	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim(4mA)	H14	-10.0 to 10.0	R	0.0	%	The 4 mA adjustment value is displayed	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim(8mA)	H15	-10.0 to 10.0	R	0.0	%	The 8 mA adjustment value is displayed	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim(12mA)	H16	-10.0 to 10.0	R	0.0	%	The 12 mA adjustment value is displayed	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim(16mA)	H17	-10.0 to 10.0	R	0.0	%	The 16 mA adjustment value is displayed	P.69
Maintenance ► Adjustment ► Analog input trim ► Analog input trim(20mA)	H18	-10.0 to 10.0	R	0.0	%	The 20 mA adjustment value is displayed	P.69
Maintenance ► Adjustment ► Flow rate gain	H20	0.0< to 99999.9	RW2	1.0	-	An arbitrary compensation factor (gain) is set	P.81
Maintenance ► Adjustment ► Instrument error adjust ► Instrument error adjust	H40	Off (0) On (1)	RW2	Off (0)	-	Whether or not to use instrument error correction is selected	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust vortex frequency 1	-	0.0 to 10000.0	RW2	0.0	Hz	Vortex frequency (f1) of No.1 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust value 1	-	-50.0 to 50.0	RW2	0.0	%	Compensation value (d1) of No.1 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust vortex frequency 2	-	0.0 to 10000.0	RW2	0.0	Hz	Vortex frequency (f2) of No.2 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust value 2	-	-50.0 to 50.0	RW2	0.0	%	Compensation value (d2) of No.2 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust vortex frequency 3	-	0.0 to 10000.0	RW2	0.0	Hz	Vortex frequency (f3) of No.3 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust value 3	-	-50.0 to 50.0	RW2	0.0	%	Compensation value (d3) of No.3 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust vortex frequency 4	-	0.0 to 10000.0	RW2	0.0	Hz	Vortex frequency (f4) of No.4 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust value 4	-	-50.0 to 50.0	RW2	0.0	%	Compensation value (d4) of No.4 break point	P.84

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Maintenance ► Adjustment ► Instrument error adjust ► Adjust vortex frequency 5	-	0.0 to 10000.0	RW2	0.0	Hz	Vortex frequency (f5) of No.5 break point	P.84
Maintenance ► Adjustment ► Instrument error adjust ► Adjust value 5	-	-50.0 to 50.0	RW2	0.0	%	Compensation value (d5) of No.5 break point	P.84
Maintenance ► Adjustment ► Reynolds adjust ► Reynolds adjust	H25	Off (0) On (1)	RW2	Off (0)	-	Execution of Reynolds number correction is selected	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Viscosity unit	H28	mPa·s (0) Pa·s (1) cP (2) P (3) m2/s (4) cSt (5) St (6)	RW2	mPa·s (0) *1	-	The viscosity factor unit is selected	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Viscosity	H27	0.0< to 99999.9	RW2	1.0 *1	Viscosity unit (H28)	The viscosity factor is set	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Reynolds number	H24	-99999.9 to 99999.9	R	0.0	-	The Reynolds number is displayed	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Adjust Reynolds number 1	-	0.0 to 99999.9	RW2	5500.0	-	Reynolds number of No.1 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Re adjust value 1	-	-50.0 to 50.0	RW2	-11.4	%	Compensation value of No.1 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Adjust Reynolds number 2	-	0.0 to 99999.9	RW2	8000.0	-	Reynolds number of No.2 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Re adjust value 2	-	-50.0 to 50.0	RW2	-6.5	%	Compensation value of No.2 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Adjust Reynolds number 3	-	0.0 to 99999.9	RW2	12000.0	-	Reynolds number of No.3 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Re adjust value 3	-	-50.0 to 50.0	RW2	-3.6	%	Compensation value of No.3 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Adjust Reynolds number 4	-	0.0 to 99999.9	RW2	20000.0	-	Reynolds number of No.4 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Re adjust value 4	-	-50.0 to 50.0	RW2	-1.0	%	Compensation value of No.4 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Adjust Reynolds number 5	-	0.0 to 99999.9	RW2	40000.0	-	Reynolds number of No.5 break point	P.81
Maintenance ► Adjustment ► Reynolds adjust ► Re adjust value 5	-	-50.0 to 50.0	RW2	0.0	%	Compensation value of No.5 break point	P.81
Maintenance ► Adjustment ► Expansion factor adjust	H30	Off (0) On (1)	RW2	Off (0)	-	Whether or not to use expansion factor is selected	P.85

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.

5.9 Test/Simulation

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Maintenance ► Test/Simulation ► Test/Simulation ► Test mode	J05	Off (0) Analog output (1) Pulse output (2) Status output (3)	RW2	Off (0)	-	Test mode and target are selected	P.118
Maintenance ► Test/Simulation ► Test/Simulation ► Test mode ► Test analog output	J10	-2.5 to 110.0	RW2	0.0	%	The test value (%) of analog output is set, Set from Test/Simulation(method)	P.118
Maintenance ► Test/Simulation ► Test/Simulation ► Test mode ► Test pulse output	J20	0.0 to 10000.0	RW2	0.0	Hz	The test value (Hz) of pulse output is set, Set from Test/Simulation(method)	P.118
Maintenance ► Test/Simulation ► Test/Simulation ► Test mode ► Test status output	J30	Off(Open) (0) On(Close) (1)	RW2	Off(Open) (0)	-	Test output of status output is set, Set from Test/Simulation(method)	P.118
Maintenance ► Test/Simulation ► Test/Simulation ► Simulation mode	J31	All Off (0) Vortex frequency (1) Vortex frequency(HW) (2) Built-in temperature (3) Analog input (5)	RW2	All Off (0)	-	Simulation mode and target are selected	P.120
Maintenance ► Test/Simulation ► Test/Simulation ► Simulation mode ► Simulation vortex frequency	J32 K28	0.0 to 10000.0	RW2	0.0	Hz	The simulation value (Hz) of the vortex frequency is set, Set from Test/Simulation(method)	P.120
Maintenance ► Test/Simulation ► Test/Simulation ► Simulation mode ► Simulation vortex frequency(HW)	J33	0.0 to 10000.0	RW2	0.0	Hz	The simulation value (Hz) of the vortex frequency (hardware) is set, Set from Test/Simulation(method)	P.120
Maintenance ► Test/Simulation ► Test/Simulation ► Simulation mode ► Simulation built-in temperature	J34	-999.9 to 999.9	RW2	0.0	Temperature unit (C30)	The simulation value of the built-in temperature is set, Set from Test/Simulation(method)	P.120
Maintenance ► Test/Simulation ► Test/Simulation ► Simulation mode ► Simulation analog input(mA)	J36	3.6 to 21.6	RW2	4.0	mA	The simulation value (mA) of the analog input is set, Set from Verification Exe(method)	P.120
Maintenance ► Test/Simulation ► Auto release time	J40	10min (0) 30min (1) 60min (2) 3h (3) 6h (4) 12h (5)	RW2	30min (1)	-	The time up to automatic cancellation of the test mode and simulation mode is set	P.121
Maintenance ► Test/Simulation ► Display test	J45	Not execute (0) Execute (1) All on (2) All off (3) Only numeric (4) Only unit (5) Only icon (6)	RW1	Not execute (0)	-	The test pattern and whether or not to execute the display test are selected	P.105
Maintenance ► Test/Simulation ► Squawk	-	Off On Once	RW1	Off	-	Whether or not to execute the display's squawk function is selected	P.106
Maintenance ► Test/Simulation ► Device reset	-	Not execute Execute	RW2	Not execute	-	Whether or not to execute a device restart is selected	P.123
Maintenance ► Test/Simulation ► Sensor reset	-	Not execute Execute	RW2	Not execute	-	Whether or not to execute a sensor circuit restart is selected	P.123

5.10 Maintenance

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Maintenance ► Signal controls ► Signal band	-	Up to 19200 Hz Up to 9600 Hz Up to 4800 Hz Up to 2400 Hz Up to 1200 Hz Up to 600 Hz Up to 300 Hz Up to 150 Hz Up to 75.0 Hz Up to 37.5 Hz Up to 18.8 Hz Up to 9.38 Hz Up to 4.69 Hz Up to 2.34 Hz Up to 1.17 Hz Up to 0.59 Hz Up to 0.29 Hz Up to 0.15 Hz Up to 0.07 Hz	R	Up to 19200 Hz	-	The signal band is displayed.	P.86
Maintenance ► Signal controls ► Trigger level(TLA)	K10	0.1 to 20.0	RW3	1.0	-	The trigger level is set	P.86
Maintenance ► Signal controls ► Signal level	K20	0.1 to 20.0	RW3	1.0	-	The signal level is set	P.86
Maintenance ► Signal controls ► Trigger level mode	-	Fix Tracking	RW3	Tracking	-	The trigger level mode is selected	P.86
Maintenance ► Signal controls ► Noise balance mode	K25	Auto (0) Manual (1)	RW3	Auto (0)	-	The noise balance mode is selected	P.86
Maintenance ► Signal controls ► Noise ratio(auto)	K26	0.0 to 2.0	R	0.0	-	The noise balance value when the noise balance mode is Auto is displayed	P.86
Maintenance ► Signal controls ► Noise ratio(manual)	K27	-2.0 to 2.0	RW3	0.0	-	The noise balance value when the noise balance mode is Manual is set	P.86
Maintenance ► Signal controls ► Velocity	K30	-99999.9 to 99999.9	R	0.0	m/s	The flow velocity is displayed	-
Maintenance ► Signal controls ► Velocity span	K32	-99999.9 to 99999.9	R	0.0	m/s	The flow velocity span is displayed	P.88
Maintenance ► Signal controls ► Vortex frequency	K34	-99999.9 to 99999.9	R	0.0	Hz	The vortex frequency is displayed	-
Maintenance ► Signal controls ► Vortex frequency span	K36	-99999.9 to 99999.9	R	0.0	Hz	The vortex frequency span is displayed	P.88
Device Settings ► Detailed setup ► Lowcut limit	-	0 to 99999.0	R	0.0	Flow unit (C41)	The input lower limit value of lowcut is displayed	P.88
Diagnostics ► Alarm ► Alarm status select	-	All alarm/warning All alarm System/Process alarm	RW3	All alarm/ warning	-	The alarm to be notified is selected	P.98
Diagnostics ► Alarm ► Alarm record select	-	All alarm/warning All alarm System/Process alarm	RW3	All alarm/ warning	-	The alarm to be stored in history is selected	P.98
Diagnostics ► Signal controls ► Flow sensor alarm action	-	Burnout Hold Zero Measured value	RW3	Burnout	-	Output operation when alarm 020:Flow sensor failure occurs is set	P.99
Diagnostics ► Signal controls ► Temperature sensor alarm action	-	Burnout Hold Zero Fixed value	RW3	Burnout	-	Output operation when alarm 021: Temperature sensor failure occurs is set	P.99
Diagnostics ► Signal controls ► Analog input alarm action	-	Burnout Hold Zero Fixed value	RW3	Fixed value	-	Output operation when alarm 023: Analog input failure occurs is set	P.99
Diagnostics ► Signal controls ► Fluctuating level	-	0.0 to 100.0	RW3	10.0	%	The judgment value for the fluctuation alarm is set	P.111
Diagnostics ► Signal controls ► Transient noise count	-	0 to 99	RW3	12	-	The judgment count for noise diagnosis is set	P.111
Diagnostics ► Signal controls ► High vibration action	K45	Zero (0) Hold (1) Measured value (2)	RW3	Measured value (2)	-	Output operation when alarm 032: High vibration occurs is set	P.99
Diagnostics ► Signal controls ► High vibration time	-	0 to 99	RW3	10	s	The judgment time for vibration diagnosis is set	P.112
Diagnostics ► Signal controls ► Critical vibration action	K46	Zero (0) Hold (1) Measured value (2)	RW3	Hold (1)	-	Output operation when alarm 033: Critical vibration occurs is set	P.99
Diagnostics ► Signal controls ► Critical vibration level	-	0.0 to 100.0	RW3	5.0	%	The judgment value for the resonant diagnosis alarm is set	P.112

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Diagnostics ► Signal controls ► Critical vibration time	-	0 to 99	RW3	5	s	The judgment time for resonant diagnosis is set	P.112
Diagnostics ► Signal controls ► Clogging time	-	0 to 99	RW3	30	s	The judgment time for clogging diagnosis is set	P.112
Diagnostics ► Signal controls ► Sensor circuit threshold	-	0 to 65535	RW3	0 *1	-	The judgment value for the input circuit alarm is set	P.111
Diagnostics ► Signal controls ► Sensor capacitance threshold	-	0.0 to 99999.9	RW3	0 *1	pF	The abnormality judgment value of the static capacitance for the piezoelectric element sensor is set	P.111
Diagnostics ► Signal controls ► Sensor resistance threshold	-	0.0 to 99999.9	RW3	0 *1	kohm	The abnormality judgment value of the insulation resistance for the piezoelectric element sensor is set	P.111
Device Settings ► Detailed setup ► Information ► Device info ► Software revision	K50	-	R	"R1.01.01 "	-	The revision No. of the software is displayed	P.109
Maintenance ► Signal controls ► Tuning at zero	K51	Not execute (0) Execute (1)	RW3	Not execute (0)	-	Whether or not to execute tuning of noise balance is selected	P.87
Maintenance ► Signal controls ► Tuning status	K52	Unknown (0) Pass (1) Failure (2) Running (3)	R	Unknown (0)	-	The tuning state of noise balance is displayed	P.87
Maintenance ► Signal controls ► Vortex frequency lowcut	K55	-99999.9 to 99999.9	R	0.0	Hz	The lowcut vortex frequency is displayed	P.88
Maintenance ► Signal controls ► Velocity lowcut	K54	-99999.9 to 99999.9	R	0.0	m/s	The lowcut flow velocity value is displayed	P.88
Maintenance ► Signal controls ► Board temperature	K56	-99999.9 to 99999.9	R	0.0	Temperature unit (C30)	The device internal temperature is displayed	-
Maintenance ► Signal controls ► Analog input(mA)	K57	-99999.9 to 99999.9	R	0.0	mA	The current value of the external input is displayed	P.67
Maintenance ► Signal controls ► Analog input	K58	-99999.9 to 99999.9	R	0.0	Analog input unit (D52)	The process value of the external input is displayed	P.67
Maintenance ► Signal controls ► Built-in temperature	-	-9999.9 to 9999.9	R	0.0	Temperature unit (C30)	The measured value of the internal temperature gauge is displayed	-

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.

5.11 Alarm Setting Items

Menu path

HART	Diagnostics ► Alarm ► Alarm record ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Alarm record clear	-	Not execute Execute	RW2	Not execute	-	Clearing of the alarm history is executed	P.97
Auto delete time	-	0 to 9999	RW2	60	day	The auto-clear time of the alarm history is set	P.97
Alarm record 1	-	000:None 010:CPU failure 011:CPU failure 012:Main storage failure 013:Sub storage failure 014:Main ASIC failure 015:Sub ASIC failure 016:ADC circuit failure 017:Signal circuit failure 018:Power circuit failure 020:Flow sensor failure 021:Temperature sensor failure 023:Analog input failure 030:Fluctuation 031:Transient noise 032:High vibration 033:Critical vibration 040:Temperature out of range 041:Pressure out of range 042:Analog output out of range 044:Analog input out of range 045:T/P compensation out of range 050:Flow span set error 051:Temperature span set error 053:Flow calculation set error 054:Analog output set error 055:Pulse output set error 056:Analog input set error 060:Sensor backup error 070:Sensor communication error 071:Flow sensor error 072:Clogging 073:Degradation 074:Board temperature out of range 080:Simulation running 081:Verification running 082:Incorrect PIN	R	000:None	-	Alarms recorded to the alarm history (Alarm record 1 - 5) are displayed	P.97
Alarm record 2	-						
Alarm record 3	-						
Alarm record 4							
Alarm record 5	-						
Alarm record date 1	-	1900/01/01 to 2155/12/31	R	2021/01/01	-	The date that alarms are recorded to the alarm history (Alarm record 1 - 5) is displayed	P.97
Alarm record date 2	-						
Alarm record date 3	-						
Alarm record date 4	-						
Alarm record date 5	-						
Alarm record time 1	-	00:00:00 to 23:59:59	R	00:00:00	-	The time that alarms are recorded to the alarm history (Alarm record 1 - 5) is displayed	P.97
Alarm record time 2	-						
Alarm record time 3	-						
Alarm record time 4	-						
Alarm record time 5	-						
Alarm record operation time 1	-	0000D 00:00 to 9999D 23:59	R	0000D 00:00	-	The operation time of devices up to when alarms are recorded to the alarm history (Alarm record 1 - 5) is displayed	P.97
Alarm record operation time 2	-						
Alarm record operation time 3	-						
Alarm record operation time 4	-						
Alarm record operation time 5	-						

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Recent alarm 1	-	000:None 010:CPU failure 011:CPU failure 012:Main storage failure 013:Sub storage failure 014:Main ASIC failure 015:Sub ASIC failure 016:ADC circuit failure 017:Signal circuit failure 018:Power circuit failure 020:Flow sensor failure 021:Temperature sensor failure 023:Analog input failure 030:Fluctuation 031:Transient noise 032:High vibration 033:Critical vibration 040:Temperature out of range 041:Pressure out of range 042:Analog output out of range 044:Analog input out of range 045:T/P compensation out of range 050:Flow span set error 051:Temperature span set error 052:Pressure span set error 053:Flow calculation set error 054:Analog output set error 056:Analog input set error 060:Sensor backup error 070:Sensor communication error 071:Flow sensor error 072:Clogging 073:Degradation 074:Board temperature out of range 080:Simulation running 081:Verification running 082:Incorrect PIN	R	000:None	-	Alarms recorded to the alarm history (Recent alarm 1 - 5) are displayed	P.97
Recent alarm 2	-						
Recent alarm 3	-						
Recent alarm 4	-						
Recent alarm 5	-						
Recent alarm date 1	-	1900/01/01 to 2155/12/31	R	2021/01/01	-	The date that alarms are recorded to the alarm history (Recent alarm 1 - 5) is displayed	P.97
Recent alarm date 2	-						
Recent alarm date 3	-						
Recent alarm date 4	-						
Recent alarm date 5	-						
Recent alarm time 1	-	00:00:00 to 23:59:59	R	00:00:00	-	The time that alarms are recorded to the alarm history (Recent alarm 1 - 5) is displayed	P.97
Recent alarm time 2	-						
Recent alarm time 3	-						
Recent alarm time 4	-						
Recent alarm time 5	-						
Recent alarm operation time 1	-	0000D 00:00 to 9999D 23:59	R	0000D 00:00	-	The operation time of devices up to when alarms are recorded to the alarm history (Recent alarm 1 - 5) is displayed	P.97
Recent alarm operation time 2	-						
Recent alarm operation time 3	-						
Recent alarm operation time 4	-						
Recent alarm operation time 5	-						

5.12 Diagnostic Functions (Verification) Setting Items

Menu path

HART	Diagnostics ► Verification ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Verification mode	-	Not execute Execute	RW3	Not execute	-	Execution/cancellation of verification is selected, Set from Test/Simulation(method)	P.114
Verification target	-	Sensor circuit Signal processing circuit Calculation circuit Alarm status Alarm record	RW3	All off	-	The verification target is selected	P.114
Verification status	-	Not execute Execute(1/10) Execute(2/10) Execute(3/10) Execute(4/10) Execute(5/10) Execute(6/10) Execute(7/10) Execute(8/10) Execute(9/10) Execute(10/10) Finish Cancel	R	Not execute	-	The progress of verification is displayed	P.114
Verification select	-	Latest Previous Factory	RW3	Latest	-	The verification result to be displayed is selected	P.114
Verification date	-	1900/01/01 to 2155/12/31	R	2021/01/01	-	The date of verification execution is displayed	P.114
Verification time	-	00:00:00 to 23:59:59	R	00:00:00	-	The time at verification execution is displayed	P.114
Verification operation time	-	0000D 00:00 to 9999D 23:59	R	0000D 00:00	-	The operation time of the device up to verification execution is displayed	P.114
Verification result	-	Unknown Pass Failure Cancel	R	Unknown	-	The overall result of verification is displayed	P.114
Sensor circuit result	-	Unknown Pass Failure Cancel Skip	R	Unknown	-	The diagnosis result of the sensor circuit is displayed	P.114
Signal circuit result	-	Unknown Pass Failure Cancel Skip	R	Unknown	-	The diagnosis result of the signal circuit is displayed	P.114
Calculation circuit result	-	Unknown Pass Failure Cancel Skip	R	Unknown	-	The diagnosis result of the calculation circuit is displayed	P.114
Alarm status result	-	Unknown Pass Failure Cancel Skip	R	Unknown	-	The diagnosis result of the alarm is displayed	P.114
Alarm record result	-	Unknown Pass Failure Cancel Skip	R	Unknown	-	The diagnosis result of the alarm history is displayed	P.114

5.13 Predictive Diagnosis Setting Items

Menu path

HART	Diagnostics ► Predictive diagnosis ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Prediction execution	-	Not execute Execute	RW3	Not execute	-	Execution/cancellation of predictive diagnosis is selected	P.113
Prediction select	-	A/B ratio Sensor sensitivity Signal A Signal B Signal C	RW3	A/B ratio	-	The target of predictive diagnosis is selected	P.113
Prediction period	-	0 to 65535	RW3	60	min	The storage interval of predictive diagnosis is set	P.113
Prediction start date	-	1900/01/01 to 2155/12/31	R:	2021/01/01	-	The start date of predictive diagnosis is displayed	P.113
Prediction stop date	-	1900/01/01 to 2155/12/31	R	2021/01/01	-	The stop date of predictive diagnosis is displayed	P.113
Prediction level	-	0.0 to 99999.9	RW3	0.0	-	The judgment value of the prediction time is set	P.113
Prediction alarm time	-	0 to 65535	RW3	0	h	The specified time of predictive diagnosis is set	P.113
Prediction estimate time	-	0 to 65535	R	0	h	The prediction time of predictive diagnosis is displayed	P.113
Prediction result	-	Unknown Pass Failure	R	Unknown	-	The result of predictive diagnosis is displayed	P.113
Prediction type	-	Type 1 Type 2 Type 3	RW3	Type 1	-	The type of predictive diagnosis is set	P.113
Prediction data clear*1	-	Not execute Execute	RW3	Not execute	-	Clearing of the trend data of predictive diagnosis is executed	P.113

*1 For R1.01.03 or more

5.14 Signal Latch Setting Items

Menu path

HART	Diagnostics ► Sensor signal ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Signal latch execution	-	Not execute Execute	RW3	Not execute	-	Signal latch is executed	P.113
Signal latch target	-	Latest Sensor alarm record 1 Sensor alarm record 2 Sensor alarm record 3 Sensor alarm record 4 Sensor alarm record 5	RW3	Latest	-	The signal latch to display is selected	P.116
Signal latch alarm	-	None Fluctuating Transient noise High vibration Critical vibration Flow sensor error Clogging Degradation	R	None	-	The alarm when a signal latch is executed is displayed	P.116
Signal latch date	-	1900/01/01 to 2155/12/31	R	2021/01/01	-	The date when a signal latch is executed is displayed	P.116
Signal latch time	-	00:00:00 to 23:59:59	R	00:00:00	-	The time when a signal latch is executed is displayed	P.116
Signal latch operation time	-	0000D 00:00 to 9999D 23:59	R	0000D 00:00	-	The operation time of the device up to signal latch execution is displayed	P.116

Menu path

HART	Diagnostics ► Sensor signal ► Band data ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Signal latch vortex frequency	-	-99999.9 to 99999.9	R	0.0	Hz	The vortex frequency when a signal latch is executed is displayed	P.116
Signal latch velocity	-	-99999.9 to 99999.9	R	0.0	m/s	The flow velocity when a signal latch is executed is displayed	P.116
Signal latch max band	-	0 to 99	R	0	-	The maximum band when a signal latch is executed is displayed	P.116
Signal latch noise ratio	-	-99999.9 to 99999.9	R	0.0	-	The noise ratio when a signal latch is executed is displayed	P.116
Signal latch noise band 1	-	0 to 99	R	0	-	Noise band 1 when a signal latch is executed is displayed	P.116
Signal latch noise band 2	-	0 to 99	R	0	-	Noise band 2 when a signal latch is executed is displayed	P.116
Signal latch TLA	-	-99999.9 to 99999.9	R	0.0	-	The trigger level when a signal latch is executed is displayed	P.116
Signal latch basic band	-	0 to 99	R	0	-	The basic band when a signal latch is executed is displayed	P.116
Basic+0 band A	-	0 to 65535	R	0	-	The A signal amplitude at the basic band + (0 to 8) when a signal latch is executed is displayed	P.116
Basic+1 band A	-						
Basic+2 band A	-						
Basic+3 band A	-						
Basic+4 band A	-						
Basic+5 band A	-						
Basic+6 band A	-						
Basic+7 band A	-						
Basic+8 band A	-						

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Basic+0 band B	-	0 to 65535	R	0	-	The B signal amplitude at the basic band + (0 to 8) when a signal latch is executed is displayed	P.116
Basic+1 band B	-						
Basic+2 band B	-						
Basic+3 band B	-						
Basic+4 band B	-						
Basic+5 band B	-						
Basic+6 band B	-						
Basic+7 band B	-						
Basic+8 band B	-						
Basic+0 band C	-	0 to 65535	R	0	-	The C signal amplitude at the basic band + (0 to 8) when a signal latch is executed is displayed	P.116
Basic+1 band C	-						
Basic+2 band C	-						
Basic+3 band C	-						
Basic+4 band C	-						
Basic+5 band C	-						
Basic+6 band C	-						
Basic+7 band C	-						
Basic+8 band C	-						
Basic+0 band NJLS	-	0 to 65535	R	0	-	The noise judgment level at the basic band + (0 to 8) when a signal latch is executed is displayed	P.116
Basic+1 band NJLS	-						
Basic+2 band NJLS	-						
Basic+3 band NJLS	-						
Basic+4 band NJLS	-						
Basic+5 band NJLS	-						
Basic+6 band NJLS	-						
Basic+7 band NJLS	-						
Basic+8 band NJLS	-						

5.15 Date/Time Setting Items

Menu path

HART	Device Settings ► Detailed setup ► Information ► Date/Time ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Operation time	-	0000D 00:00 to 9999D 23:59	R	0000D 00:00	-	The operation time of the device is displayed	P.110
Current date*1 / Current Date*2	-	1900/01/01 to 2155/12/31	R	1900/01/01	-	The present date is displayed	P.110
Current time*1 / Current Time*2	-	00:00:00 to 23:59:59	R	00:00:00	-	The present time is displayed	P.110
Set Clock Date	-	1900/01/01 to 2155/12/31	RW3	1900/01/01	-	The date is set	P.110
Set Clock Time	-	00:00:00 to 23:59:59	RW3	00:00:00	-	The time is set	P.110

*1: For Device revision 1 and DD revision 1 or 2
*2: For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

5.16 Parameter Protection/Operation Rights Setting Items

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Device Settings ► Detailed setup ► Protect ► Write protect ► Write protect	-	Off On	-	Off	-	Use of the write protect function is displayed	P.124
Device Settings ► Detailed setup ► Protect ► Write protect ► Software seal	-	Break Keep	-	Break	-	Use of a joker password is checked	P.125
Device Settings ► Detailed setup ► Protect ► Write protect ► New password	-	-	RW3	All Space	-	A new password for the write protect function is set	P.124
Device Settings ► Detailed setup ► Protect ► Write protect ► Enable write 10min	-	-	RW3	All Space	-	The write protect function is canceled for only 10 minutes	P.124
Device Settings ► Detailed setup ► Protect ► User role ► Current role	-	PL1:Operator PL2:Maintenance PL3:Specialist	-	Specialist	-	The present operation levels are displayed.	P.125
Device Settings ► Detailed setup ► Protect ► User role ► Active role	-	0x01:PL1:Operator 0x02:PL2:Maintenance 0x04:PL3:Specialist	-	All off	-	The present active operation levels are displayed	P.125
Device Settings ► Detailed setup ► Protect ► User role ► Set user role PIN	-	-	RW3	0	-	The Maintenance/Specialist pass code is set	P.125
Device Settings ► Detailed setup ► Protect ► User role ► Change user role	-	-	RW1	0	-	Changing of operation levels is implemented	P.125
Device Settings ► Detailed setup ► Protect ► User role ► Maintenance PIN	-	0 to 9999	RW3	0	-	The Maintenance PIN is displayed only when Specialist levels are entered	P.125
Device Settings ► Detailed setup ► Protect ► User role ► Specialist PIN	-	0 to 9999	RW3	0	-	The Specialist PIN is displayed only when Specialist levels are entered	P.125

5.17 Order Information

Menu path

HART	Device Settings ► Detailed setup ► Information ► Order info ► Sensor ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Sensor MS code 1	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor MS code 2	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor MS code 3	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor MS code 4	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor MS code 5	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor MS code 6	-	16 characters	R *2/RW3 *3	All Space *1	-	The sensor model and code are displayed *2/set *3	P.108
Sensor style code	-	16 characters	R *2/RW3 *3	All Space	-	The sensor style code is displayed *2/set *3	P.108

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For R1.01.01 or R1.01.02
*3 For R1.01.03 or more

Menu path

HART	Device Settings ► Detailed setup ► Information ► Order info ► Transmitter ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Transmitter MS code 1	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter MS code 2	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter MS code 3	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter MS code 4	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter MS code 5	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter MS code 6	-	16 characters	R *2/RW3 *3	All Space *1	-	The transmitter model and code are displayed *2/set *3	P.108
Transmitter style code	-	16 characters	R *2/RW3 *3	All Space	-	The transmitter style code is displayed *2/set *3	P.108

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For R1.01.01 or R1.01.02
*3 For R1.01.03 or more

Menu path

HART	Device Settings ► Detailed setup ► Information ► Order info ► Special order ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Special order number 1	-	16 characters	R *1/RW3 *2	All Space	-	The special order No. is displayed *1/set *2	P.108
Special order number 2	-	16 characters	R *1/RW3 *2	All Space	-	The special order No. is displayed *1/set *2	P.108

*1 For R1.01.01 or R1.01.02
*2 For R1.01.03 or more

Menu path

HART	Device Settings ► Detailed setup ► Information ► Order info ► Other ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Sizing number	-	16 characters	R *2/RW3 *3	All Space *1	-	The sizing No. is displayed *2/set *3	P.108
Name plate tag number	-	16 characters	R *2/RW3 *3	All Space *1	-	The name plate tag No. is displayed *2/set *3	P.108
Instruction manual number	-	16 characters	R *2/RW3 *3	All Space *1	-	The instruction manual No. is displayed *2/set *3	P.108
Communication select	-	HART	R	HART	-	The communication type is displayed.	P.108

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For R1.01.01 or R1.01.02
*3 For R1.01.03 or more

Menu path

HART	Device Settings ► Detailed setup ► Information ► Order info ► Option ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Option analog input	-	Off On	R	Off *1	-	The optional analog input is displayed	P.108
Option built-in temperature	-	Off On	R	Off *1	-	The optional built-in temperature gauge is displayed	P.108
Option display installation	-	Off On	R	Off *1	-	The optional display is displayed	P.108
Option burnout	-	High Low	R *2/RW3 *3	High *1	-	The optional burnout is displayed *2/set *3	P.108
Option NE43	-	Normal NE43	R *2/RW3 *3	Normal *1	-	The optional NE43 is displayed *2/set *3	P.108
Option wireless adapter	-	Normal Wireless	RW3	Normal	-	The usage status of the wireless adapter is set	P.108
Option dual bolt calibration	-	Off Upstream Downstream	R *2/RW3 *3	Off *1	-	The optional dual sesnor is displayed *2/set *3	P.108
Option cryogenic	-	Off On	R	Off *1	-	The optional cryogenic is displayed	P.108
Option built-in verification	-	Off On	R *2/RW3 *3	On	-	The verification option (/VF) is displayed *2/set *3	P.108
Prediction function	-	Off On	R *2/RW3 *3	On	-	The predictive diagnosis mode is displayed *2/set *3	P.108
Option SI unit	-	All JP only	R	All *1	-	The optional SI unit is displayed	P.108
Option SIL	-	Off On	R	Off *1	-	The optional SIL is displayed	P.108

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For R1.01.01 or R1.01.02
*3 For R1.01.03 or more

NOTE

When Option wireless adapter is set to “Wireless”, the function to save parameters and totalized values to EEPROM in case of power failure is disabled.

5.18 Device Information

Menu path

HART	Device Settings ► Detailed setup ► Information ► Device info ► (see table below)

Parameter Name		Data Range	R/W	Default Value	Unit	Description	Refer to
HART	Display						
Model	-	-	R	VY Series	-	The device model name is displayed	P.109
Dev id*2 / Device Identifier*3	-	0 to 16777215	R	0 *1	-	The device ID is displayed	P.109
Memo 1	-	-	RW1	All Space	-	Memo 1 is set	P.109
Memo 2	-	-	RW1	All Space	-	Memo 2 is set	P.109
Memo 3	-	-	RW1	All Space	-	Memo 3 is set	P.109
Transmitter S/N	-	-	R *4/RW3 *5	All Space *1	-	The transmitter serial No. is displayed *4/set *5	P.109
Hardware revision	-	-	R	S1.01	-	The hardware software is displayed	P.109
Release date	-	1900/01/01 to 2155/12/31	R	2021/01/01 *1	-	The release date is displayed	P.109
Distributor name	-	-	R	YOKOGAWA	-	The distributor name is displayed	P.109

*1 Values are determined according to ordering information, sizing sheet or information about the combination of sensors.
*2 For Device revision 1 and DD revision 1 or 2
*3 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more
*4 For R1.01.01 or R1.01.02
*5 For R1.01.03 or more

6. Menu Tree (HART communication)

The following shows the hierarchy of the HART 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.

(M) Method

- **Online**
  - Device Settings →Page 160
    - Easy setup
    - Basic setup
    - Detailed setup
  - Diagnostics →Page 170
    - Alarm
    - Signal controls
    - Condensed status map
    - Verification
    - Predictive diagnosis
    - Sensor signal
  - Process Variables →Page 174
    - Device variable
    - Device variable status
  - Maintenance →Page 175
    - Test/Simulation
    - Adjustment
    - Signal controls

Device Settings

- **Device Settings**
  - Easy setup
    - Flow span
    - Flow damping
    - Pulse/Status output (M)
    - Pulse/Status output mode
    - Pulse output rate
    - Frequency output span
    - Limit switch level
    - Display line upper
    - Display line lower
    - Totalizer start/stop
    - Totalizer unit
    - Totalizer rate
    - Totalizer reset/preset (M)
    - Totalizer preset value
    - Totalizer reset mode
    - Analog output select (M)
    - Analog output select
    - Temperature LRV
    - Temperature URV
  - Basic setup
    - Tag
    - Flow rate config (M)
    - Fluid type
    - Flow select
    - Volume unit
    - Density unit
    - Fixed density
    - Mass unit
    - Temperature unit
    - Fixed temperature
    - Base temperature
    - Pressure unit
    - Fixed pressure
    - Base pressure
    - Deviation
    - Standard/Normal unit
    - Energy unit
    - Time unit
    - Flow unit
    - Flow span
    - Flow damping
  - Detailed setup →Page 161
    - Flow rate config (M)
    - Flow rate
    - I/O
    - Display
    - Flow user conversion
    - Sensor Information
    - Compensation setup
    - T/P setup
    - Information
    - HART config
    - Protect

Detailed setup

- **Detailed setup**
  - Flow rate config (M)
  - Flow rate
    - Flow lowcut
    - Lowcut limit
  - I/O →Page 162
  - Display
    - Display line upper
    - Display line lower
    - Display period
    - Display startup
    - Display NE107
    - Display format flow
    - Display format temperature
    - Display format pressure
  - Flow user conversion
    - User unit (M)
    - Flow user conversion
    - Flow user base unit
    - Flow user unit
    - Flow conversion factor
  - Sensor Information
    - Nominal size
    - Body type
    - Sensor type
    - Connection type
    - K factor unit
    - K factor
    - Process temperature
    - Max pressure
    - Sensor backup/restore (M)
    - Sensor backup/restore
    - Sensor backup/restore result
    - Sensor S/N
  - Compensation setup →Page 163
  - T/P setup →Page 164
  - Information →Page 165
  - HART config →Page 166
  - Protect →Page 169

I/O

- **I/O**
  - Analog output
    - Analog output select (M)
    - Analog output limit (M)
    - Analog output select
    - Analog output low limit
    - Analog output high limit
  - Analog input
    - Analog input select
    - Analog input unit
    - Analog input LRV
    - Analog input URV
    - Analog input low limit
    - Analog input high limit
    - Analog input fix value
  - Pulse/Status output
    - Pulse/Status output (M)
    - Pulse/Status output mode
    - Pulse output rate
    - Frequency output select
    - Frequency output zero
    - Frequency output span
    - Status output condition
    - Status output direction
    - Alarm switch select
    - Limit switch select
    - Limit switch mode
    - Limit switch level
    - Limit switch hysteresis
    - Limit switch unit

Compensation setup

Compensation setup		
	Steam type	
	Heat difference select	
	Compensation type	
	Calculation type	
	Temperature select	
	Pressure select	
	Analog input select	
	Density unit	
	Fixed density	
	Base density	
	Temperature unit	
	Fixed temperature	
	Base temperature	
	Pressure detailed config*1	(M)
	Pressure unit	
	Fixed pressure	
	Base pressure	
	Air pressure unit	
	Air pressure	
	Deviation	
	Dryness	
	Temperature coefficient 1	
	Temperature coefficient 2	
	Enthalpy unit	
	Fixed enthalpy	
	Heat difference conv unit	
	Heat difference conv factor	
	Density	
	Density ratio	
	Enthalpy	
	Delta temperature	
	Delta enthalpy	
	Variable status	
		Density data quality
		Density limit status
		Density ratio data quality
		Density ratio limit status
		Enthalpy data quality
		Enthalpy limit status
		Delta temperature data quality
		Delta temperature limit status
		Delta enthalpy data quality
		Delta enthalpy limit status

*1 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

T/P setup

- **T/P setup**
  - Temperature
    - Temperature select
    - Temperature unit
    - Selected temperature
    - Temperature
    - Temperature(%)
    - Temperature LRV
    - Temperature URV
    - Temperature damping
    - Temperature gain
    - Temperature offset
  - Pressure
    - Pressure select
    - Pressure unit
    - Selected pressure

Information

- Information
  - Date/Time
    - Set current date (M)
    - Operation time
    - Current date*1 / Current Date*2
    - Current time*1 / Current Time*2
    - Set Clock Date
    - Set Clock Time
  - Device info
    - Model
    - Dev id*1 / Device Identifier*2
    - Tag
    - Memo 1
    - Memo 2
    - Memo 3
    - Transmitter S/N
    - Software revision
    - Hardware revision
    - Release date
    - Distributor name
  - Order info
    - Sensor
      - 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
      - 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
      - Special order number 1
      - Special order number 2
    - Other
      - Sizing number
      - Name plate tag number
      - Instruction manual number
      - Communication select
    - Option
      - Option analog input
      - Option built-in temperature
      - Option display installation
      - Option burnout
      - Option NE43
      - Option wireless adapter
      - Option dual bolt calibration
      - Option cryogenic
      - Prediction function
      - Option built-in verification
      - Option SI unit
      - Option SIL

*1 For Device revision 1 and DD revision 1 or 2
*2 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

HART config

HART config			
	Loop current mode		(M)
	Poll addr*1 / Polling Address*2		
	Loop current mode*1 / Loop Current Mode*2		
	Num req preams*1 / Number Request Preambles*2		
	Num resp preams*1 / Number Response Preambles*2		
	Manufacturer		
	Model*1 / Device Type*2		
	Tag		
	Long tag		
	Descriptor		
	Message		
	Final asmbly num*1 / Final Assembly Number*2		
	Max dev vars*1 / Last Device Variable*2		
	Device Profile		
	Universal rev*1 / HART Protocol Revision*2		
	Fld dev rev*1 / Device Revision*2		
	Software rev*1 / Software Revision*2		
	Hardware rev*1 / Hardware Revision*2		
	Cfg chng count*1 / Configuration Change Counter*2		
	Reset cfg chng flag*1 / Reset configuration change flag*2		(M)
	Dynamic variables		
		Dynamic variables assignment	(M)
		PV is*1 / Primary Variable*2	
		SV is*1 / Secondary Variable*2	
		TV is*1 / Tertiary Variable*2	
		QV is*1 / Quaternary Variable*2	
		PV	
		PV Data quality*1 / PV Process Data Quality*2	
		PV Limit Status	
		SV	
		SV Data quality*1 / SV Process Data Quality*2	
		SV Limit Status	
		TV	
		TV Data quality*1 / TV Process Data Quality*2	
		TV Limit Status	
		QV	
		QV Data quality*1 / QV Process Data Quality*2	
		QV Limit Status	
	Burst setting		→Page 167*1 / Page 168*2
	Event notification		
		Set event notification	(M)
		Acknowledge event	(M)
		Stop event notification	(M)
		Mode*1 / Event Mode*2	
		Retry Rate*1 / Event Retry Rate*2	
		Max Update Rate*1 / Event Max Update Rate*2	
		Debounce Interval*1 / Event Debounce Interval*2	
		Status*1 / Event Status*2	
		Time Stamp*1 / Event Time Stamp*2	
		Device Status Mask*1 / Event Device Status Mask*2	
		Device Specific Status 1 Mask*1 / Event Device Specific Status 1 Mask*2	
		Device Specific Status 2 Mask*1 / Event Device Specific Status 2 Mask*2	
		Device Specific Status 3 Mask*1 / Event Device Specific Status 3 Mask*2	
		Device Specific Status 4 Mask*1 / Event Device Specific Status 4 Mask*2	
		Device Specific Status 5 Mask*1 / Event Device Specific Status 5 Mask*2	
		Device Specific Status 6 Mask*1 / Event Device Specific Status 6 Mask*2	
		Extended Device Status Mask*1 / Event Extended Device Status Mask*2	
		Standardized Status 0 Mask*1 / Event Standardized Status 0 Mask*2	
		Standardized Status 1 Mask*1 / Event Standardized Status 1 Mask*2	
		Analog Channel Saturated Mask*1 / Event Analog Channel Saturated Mask*2	
		Standardized Status 2 Mask*1 / Event Standardized Status 2 Mask*2	
		Standardized Status 3 Mask*1 / Event Standardized Status 3 Mask*2	
		Analog Channel Fixed Mask*1 / Event Analog Channel Fixed Mask*2	
		Device Specific Status 15 Mask*1 / Event Device Specific Status 15 Mask*2	
		Device Specific Status 16 Mask*1 / Event Device Specific Status 16 Mask*2	

*1 For Device revision 1 and DD revision 1 or 2
*2 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

Burst setting

- **Burst setting***
  - Set easy burst (M)
  - Set detailed burst (M)
  - Stop burst (M)
  - Stop easy burst (M)
  - Stop detailed burst (M)
  - Burst Message #0
    - Mode
    - slot0
    - slot1
    - slot2
    - slot3
    - Command
    - Update Period
    - Max Update Period
    - Trigger Mode
    - Classification
    - Trigger Units
    - Trigger Level
  - Burst Message #1
    - Mode
    - slot0
    - slot1
    - slot2
    - slot3
    - slot4
    - slot5
    - slot6
    - slot7
    - Command
    - Update Period
    - Max Update Period
    - Trigger Mode
    - Classification
    - Trigger Units
    - Trigger Level
  - Burst Message #2
    - Mode
    - slot0
    - slot1
    - slot2
    - slot3
    - slot4
    - slot5
    - slot6
    - slot7
    - Command
    - Update Period
    - Max Update Period
    - Trigger Mode
    - Classification
    - Trigger Units
    - Trigger Level
  - Burst Message #3
    - Mode
    - slot0
    - slot1
    - slot2
    - slot3
    - slot4
    - slot5
    - slot6
    - slot7
    - Command
    - Update Period
    - Max Update Period
    - Trigger Mode
    - Classification
    - Trigger Units
    - Trigger Level

* For Device revision 1 and DD revision 1 or 2

- **Burst setting***
  - Stop burst (M)
  - Easy burst setting
    - Set easy burst (M)
    - Stop easy burst (M)
    - Busrt Message 1 Mode
    - Busrt Message 1 Command
    - Busrt Message 1 Burst Variable 1
    - Busrt Message 1 Burst Variable 2
    - Busrt Message 1 Burst Variable 3
    - Busrt Message 1 Burst Variable 4
  - Detailed burst setting
    - Set detailed burst (M)
    - Stop detailed burst (M)
    - Burst Message 2
      - Busrt Message 2 Mode
      - Busrt Message 2 Command
      - Burst Message 2 Burst Variable 1
      - Burst Message 2 Burst Variable 2
      - Burst Message 2 Burst Variable 3
      - Burst Message 2 Burst Variable 4
      - Burst Message 2 Burst Variable 5
      - Burst Message 2 Burst Variable 6
      - Burst Message 2 Burst Variable 7
      - Burst Message 2 Burst Variable 8
      - Burst Message 2 Update Rate
      - Burst Message 2 Max Update Rate
      - Burst Message 2 Trigger Mode
      - Burst Message 2 Trigger Class
      - Burst Message 2 Trigger Units
      - Burst Message 2 Trigger Level
    - Burst Message 3
      - Busrt Message 3 Mode
      - Busrt Message 3 Command
      - Burst Message 3 Burst Variable 1
      - Burst Message 3 Burst Variable 2
      - Burst Message 3 Burst Variable 3
      - Burst Message 3 Burst Variable 4
      - Burst Message 3 Burst Variable 5
      - Burst Message 3 Burst Variable 6
      - Burst Message 3 Burst Variable 7
      - Burst Message 3 Burst Variable 8
      - Burst Message 3 Update Rate
      - Burst Message 3 Max Update Rate
      - Burst Message 3 Trigger Mode
      - Burst Message 3 Trigger Class
      - Burst Message 3 Trigger Units
      - Burst Message 3 Trigger Level
    - Burst Message 4
      - Busrt Message 4 Mode
      - Busrt Message 4 Command
      - Burst Message 4 Burst Variable 1
      - Burst Message 4 Burst Variable 2
      - Burst Message 4 Burst Variable 3
      - Burst Message 4 Burst Variable 4
      - Burst Message 4 Burst Variable 5
      - Burst Message 4 Burst Variable 6
      - Burst Message 4 Burst Variable 7
      - Burst Message 4 Burst Variable 8
      - Burst Message 4 Update Rate
      - Burst Message 4 Max Update Rate
      - Burst Message 4 Trigger Mode
      - Burst Message 4 Trigger Class
      - Burst Message 4 Trigger Units
      - Burst Message 4 Trigger Level

* For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

Protect

Protect			
	Write protect		
		New password	(M)
		Enable write 10min	(M)
		Write protect	
		Software seal	
	User role		
		Set user role PIN	(M)
		Change user role	(M)
		Current role	
		Active role	
		Maintenance PIN	
		Specialist PIN	
		Reset PIN code	

Diagnostics

- **Diagnostics**
  - Alarm → Page 171
  - Signal controls
    - Burnout
    - Burnout recover
    - Flow sensor alarm action
    - Temperature sensor alarm action
    - Analog input alarm action
    - 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
  - Condensed status map → Page 172
  - Verification
    - Verification Exe (M)
    - Verification target
    - Verification status
    - Verification select
    - Verification date
    - Verification time
    - Verification operation time
    - Verification result
    - Sensor circuit result
    - Signal circuit result
    - Calculation circuit result
    - Alarm status result
    - Alarm record result
  - Predictive diagnosis
    - Prediction execution
    - Prediction select
    - Prediction period
    - Prediction start date
    - Prediction stop date
    - Prediction level
    - Prediction estimate time
    - Prediction alarm time
    - Prediction result
    - Prediction type
    - Prediction data clear*1 (M)
  - Sensor signal → Page 173

*1 For Device revision 2 and DD revision 1 or more

Alarm

- Alarm
  - Alarm status select
  - Alarm record select
  - Alarm status
    - System alarm 1
    - System alarm 2
    - Process alarm 1
    - Process alarm 2
    - Setting alarm 1
    - Setting alarm 2
    - Warning 1
    - Warning 2
  - Alarm record
    - Alarm record clear (M)
    - Auto delete time
    - Alarm record 1
    - Alarm record date 1
    - Alarm record time 1
    - Alarm record operation time 1
    - Alarm record 2
    - Alarm record date 2
    - Alarm record time 2
    - Alarm record operation time 2
    - Alarm record 3
    - Alarm record date 3
    - Alarm record time 3
    - Alarm record operation time 3
    - Alarm record 4
    - Alarm record date 4
    - Alarm record time 4
    - Alarm record operation time 4
    - Alarm record 5
    - Alarm record date 5
    - Alarm record time 5
    - Alarm record operation time 5
    - Recent alarm 1
    - Recent alarm date 1
    - Recent alarm time 1
    - Recent alarm operation time 1
    - Recent alarm 2
    - Recent alarm date 2
    - Recent alarm time 2
    - Recent alarm operation time 2
    - Recent alarm 3
    - Recent alarm date 3
    - Recent alarm time 3
    - Recent alarm operation time 3
    - Recent alarm 4
    - Recent alarm date 4
    - Recent alarm time 4
    - Recent alarm operation time 4
    - Recent alarm 5
    - Recent alarm date 5
    - Recent alarm time 5
    - Recent alarm operation time 5
  - Additional device status
    - Device status*1 / Device Status*2
    - Status group 0*1 / Device Specific Status 1*2
    - Status group 1*1 / Device Specific Status 2*2
    - Status group 2*1 / Device Specific Status 3*2
    - Status group 3*1 / Device Specific Status 4*2
    - Status group 4*1 / Device Specific Status 5*2
    - Status group 5*1 / Device Specific Status 6*2
    - Ext dev status*1 / Extended Device Status*2
    - Device Diagnostic Status 0*1 / Standardized Status 0*2
    - Device Diagnostic Status 1*1 / Standardized Status 1*2
    - AO saturated*1 / Analog Channel Saturated*2
    - I/O and Subdevice Status*1 / Standardized Status 2*2
    - WirelessHART Status*1 / Standardized Status 3*2
    - AO fixed*1 / Analog Channel Fixed*2
    - Status group 14*1 / Device Specific Status 15*2
    - Status group 15*1 / Device Specific Status 16*2

*1 For Device revision 1 and DD revision 1 or 2
*2 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

Condensed status map

Condensed status map	
	Reset condensed status map (M)
	Device status*1 / Device Status*2
	Status group 0*1 / Device Specific Status 1*2
	Status group 1*1 / Device Specific Status 2*2
	Status group 2*1 / Device Specific Status 3*2
	Status group 3*1 / Device Specific Status 4*2
	Status group 4*1 / Device Specific Status 5*2
	Status group 5*1 / Device Specific Status 6*2
	Ext dev status*1 / Extended Device Status*2
	Device Diagnostic Status 0*1 / Standardized Status 0*2
	Device Diagnostic Status 1*1 / Standardized Status 1*2
	AO saturated*1 / Analog Channel Saturated*2
	I/O and Subdevice Status*1 / Standardized Status 2*2
	WirelessHART Status*1 / Standardized Status 3*2
	AO fixed*1 / Analog Channel Fixed*2
	Status group 14*1 / Device Specific Status 15*2
	Status group 15*1 / Device Specific Status 16*2

Device status*1 / Device Status*2
Primary Variable Out of Limits Map
Non-Primary Variable Out of Limits Map
Loop Current Saturated Map
Loop Current Fixed Map
More Status Available Map
Cold Start Map
Configuration Changed Map
Device Malfunction Map

Status group 0*1 / Device Specific Status 1*2
010:CPU failure
011:CPU failure
012:Main storage failure
013:Sub storage failure
014:Main ASIC failure
015:Sub ASIC failure

Status group 1*1 / Device Specific Status 2*2
016:ADC circuit failure
017:Signal circuit failure
018:Power circuit failure
020:Flow sensor failure
021:Temperature sensor failure
023:Analog input failure

Status group 2*1 / Device Specific Status 3*2
030:Fluctuation
031:Transient noise
032:High vibration
033:Critical vibration

Status group 3*1 / Device Specific Status 4*2
040:Temperature out of range
042:Analog output out of range
043:Pulse output out of range
044:Analog input out of range
045:T/P compensation out of range

Status group 4*1 / Device Specific Status 5*2
050:Flow span set error
051:Temperature span set error
053:Flow calculation set error
054:Analog output set error
055:Pulse output set error
056:Analog input set error

Status group 5*1 / Device Specific Status 6*2
060:Sensor backup error

Ext dev status*1 / Extended Device Status*2
Maintenance Required Map
Device Variable Alert Map
Critical Power Failure Map
Failure Map
Out of Specification Map
Function Check Map

Device Diagnostic Status 0*1 / Standardized Status 0*2
Device Variable Simulation Active Map
Non-Volatile Memory Defect Map
Volatile Memory Defect Map
Watchdog Reset Executed Map
Power Supply Conditions Out of Range Map
Environmental Conditions Out of Range Map
Electronic Defect Map
Device Configuration Locked Map

Device Diagnostic Status 1*1 / Standardized Status 1*2
Status Simulation Active Map
Discrete Variable Simulation Active Map
Event Notification Overflow Map
Battery or Power Supply needs Maintenance*1 / Undefined*2

AO saturated*1 / Analog Channel Saturated*2
Secondary Analog Channel Saturated Map
Tertiary Analog Channel Saturated Map
Quaternary Analog Channel Saturated Map
Quinary Analog Channel Saturated Map

I/O and Subdevice Status*1 / Standardized Status 2*2
Sub-Device List Changed Map
Duplicate Master Detected Map
Sub-Device Mismatch Map
Sub-Devices with Duplicate IDs Found Map
Stale Data Notice Map

WirelessHART Status*1 / Standardized Status 3*2
Capacity Denied Map
Bandwidth Allocation Pending Map
Block Transfer Pending Map
Radio Failure Map

AO fixed*1 / Analog Channel Fixed*2
Secondary Analog Channel Fixed Map
Tertiary Analog Channel Fixed Map
Quaternary Analog Channel Fixed Map
Quinary Analog Channel Fixed Map

Status group 14*1 / Device Specific Status 15*2
070:Sensor communication error
071:Flow sensor error
072:Clogging
073:Degradation
074:Board temperature out of range

Status group 15*1 / Device Specific Status 16*2
080:Simulation running
081:Verification running
082:Incorrect PIN
083:Device ID not entered

*1 For Device revision 1 and DD revision 1 or 2
*2 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

Sensor signal

Sensor signal		
	Signal latch execution	(M)
	Signal latch target	
	Signal latch alarm	
	Signal latch date	
	Signal latch time	
	Signal latch operation time	
	Band data	
		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
		Basic+0 band A
		Basic+0 band B
		Basic+0 band C
		Basic+0 band NJLS
		Basic+1 band A
		Basic+1 band B
		Basic+1 band C
		Basic+1 band NJLS
		Basic+2 band A
		Basic+2 band B
		Basic+2 band C
		Basic+2 band NJLS
		Basic+3 band A
		Basic+3 band B
		Basic+3 band C
		Basic+3 band NJLS
		Basic+4 band A
		Basic+4 band B
		Basic+4 band C
		Basic+4 band NJLS
		Basic+5 band A
		Basic+5 band B
		Basic+5 band C
		Basic+5 band NJLS
		Basic+6 band A
		Basic+6 band B
		Basic+6 band C
		Basic+6 band NJLS
		Basic+7 band A
		Basic+7 band B
		Basic+7 band C
		Basic+7 band NJLS
		Basic+8 band A
		Basic+8 band B
		Basic+8 band C
		Basic+8 band NJLS

Process Variables

- **Process Variables**
  - Device variable
    - Flow rate(%)
    - Flow rate
    - Temperature(%)
    - Temperature
    - Total
    - Loop current
  - Device variable status
    - Flow rate(%) data quality
    - Flow rate(%) limit status
    - Flow rate data quality
    - Flow rate limit status
    - Temperature(%) data quality
    - Temperature(%) limit status
    - Temperature data quality
    - Temperature limit status
    - Totalizer data quality
    - Totalizer limit status
    - Loop current data quality
    - Loop current limit status

Maintenance

- **Maintenance**
  - Test/Simulation
    - Auto release time
    - Test/Simulation (M)
    - Display test (M)
    - Squawk (M)
    - Device reset (M)
    - Sensor reset (M)
    - Self test (M)
    - Loop test*1 / Force Loop Current*2 (M)
    - Device variable simulation (M)
    - Device status bit simulation (M)
  - Adjustment →Page 176
  - Signal controls
    - Signal band
    - Signal level
    - Trigger level mode
    - Trigger level(TLA)
    - Noise balance mode
    - Noise ratio(auto)
    - Noise ratio(manual)
    - Tuning at zero (M)
    - Tuning status
    - Velocity
    - Velocity span
    - Velocity lowcut
    - Vortex frequency
    - Vortex frequency span
    - Vortex frequency lowcut
    - Board temperature
    - Built-in temperature
    - Analog input(mA)
    - Analog input
    - Variable status
      - Vortex frequency data quality
      - Vortex frequency limit status
      - Built-in temperature data quality
      - Built-in temperature limit status
      - Analog input data quality
      - Analog input limit status

*1 For Device revision 1 and DD revision 1 or 2
*2 For Device revision 1 and DD revision 3 or more, Device revision 2 and DD revision 1 or more

Adjustment

- **Adjustment**
  - Analog output trim
    - Analog output trim (M)
    - Analog output trim clear (M)
    - Reference meter(4mA)
    - Reference meter(20mA)
    - Analog output trim(4mA)
    - Analog output trim(20mA)
  - Analog input trim
    - Analog input trim (M)
    - Analog input trim clear (M)
    - Analog input trim(4mA)
    - Analog input trim(8mA)
    - Analog input trim(12mA)
    - Analog input trim(16mA)
    - Analog input trim(20mA)
  - Flow rate gain
  - Instrument error adjust
    - Instrument error adjust (M)
    - Instrument error adjust
    - Adjust vortex frequency 1
    - Adjust value 1
    - Adjust vortex frequency 2
    - Adjust value 2
    - Adjust vortex frequency 3
    - Adjust value 3
    - Adjust vortex frequency 4
    - Adjust value 4
    - Adjust vortex frequency 5
    - Adjust value 5
  - Reynolds adjust
    - Reynolds adjust (M)
    - Reynolds adjust
    - Reynolds number
    - Viscosity unit
    - Viscosity
    - Adjust reynolds number 1
    - Re adjust value 1
    - Adjust reynolds number 2
    - Re adjust value 2
    - Adjust reynolds number 3
    - Re adjust value 3
    - Adjust reynolds number 4
    - Re adjust value 4
    - Adjust reynolds number 5
    - Re adjust value 5
  - Expansion factor adjust

Revision Information

- Title : Vortex Flowmeter VY Series HART Communication Type
- Manual No. : IM 01F07A02-01EN

Edition	Date	Page	Revised Item
1st	Feb. 2022	-	New issue
2nd	Aug. 2022		Revised as a whole.
3rd	May 2023	15	Revised number of display digits.
		37	Corrections. (Waveform monitoring->Frequency analysis)
		48	Added explanations and a note.
		50, 51	Minor fix.
		53, 54	Minor fix.
		59	Corrections. (A30)
		73	Added a note to ■Limit switch output.
		90, 93	Minor fix. (Warning->Warnings)
		91	Corrections. (■System alarm)
		92	Corrections. (■Process alarm)
		105	Correction to (3) Squawk function.
		112	Added a note to 4.15.6 Predictive Diagnosis.
		124	Correction to 4.17.2 Operation Levels (User Role).
		130	Corrections to 5.3 Basic Setting Items.
		134	Corrections to the parameter list. (D19, 155, 156)
		135	Minor fix.
		168	Minor fix. (Diagnostic->Diagnostics)
4th	Oct. 2023	12	2.2.2 Minor fix.
		13	2.3 Corrections and add note *1, a table
		41	4.1.3 Add a note
		71	4.8.2 Add a note
		77	4.9.1, 4.9.2 Add a parameter item
		90	4.12.1 Minor fix.
		105, 106	4.13.4 Corrections
		108	4.14.1 Corrections
		113	4.15.6 Add an item of NOTE
		124	4.17.1 Corrections of NOTE
		139	5.5 Minor fix.
5th	Aug. 2024	24 - 34	3. Revisions for DD rev.up
		44	4.1.4 Add Long Neck Type
		52	■Pressure basic setting add a NOTE
		89	4.12.1 ■System alarm add a note for remote type
		109 - 121	4. Revisions for DD rev.up
		131-133	5.3 Corrections, add notes
		140, 141	5.6 Corrections for DD rev.up
		154	5.15 Revisions for DD rev.up
		158	5.18 Corrections for DD rev.up
		163 - 175	6. Add Method(M), add note for DD rev.up

Edition	Date	Page	Revised Item
6th	Oct. 2024	24	3.2.1 Device revision update
		25	3.2.2 Device revision update
		28 - 31	3.6.1, 3.6.2 Device revision update
		34	3.6.4 Device revision update
		52	■Pressure basic setting add notes
		77 - 78	4.9.1 Add notes to parameter list
		79	4.9.2 Add notes to parameter list
		108 - 109	4.14.1, 4.14.2, 4.14.3 Add notes to parameter list
		110	4.14.5 Add notes
		113	4.15.6 Add notes to parameter list and NOTE
		121	4.16.4 Add notes
		139	5.5 Add notes to parameter list
		151	5.13 Add notes to parameter list
		154	5.15 Add notes to parameter list
		156 - 157	5.17 Add notes to parameter list
		158	5.18 Add notes to parameter list
		163	Add notes to Menu Tree
		165 - 168	Add notes to Menu Tree
		170 - 172	Add notes to Menu Tree
		175	Add notes to Menu Tree