azbil

CM2-MTG300-2001

MagneW Neo PLUS / MagneW Two-wire PLUS+ Smart Two-wire Electromagnetic Flowmeter

Model: MTG11A/18A
MTG11B/18B
MTG14C (Converter)

User's Manual

Azbil Corporation

NOTICE

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Preface

Thank you for purchasing our smart two-wire electromagnetic flowmeter.

The MagneW Neo / MagneW Two-wire PLUS is a landmark electromagnetic flowmeter that is operated on 4-20 mA DC. Based on our extensive experience in the field, meticulous care is taken in the detector lining material and waterproofing properties to secure high reliability.

Unpacking and inspection

Unpacking

This flowmeter is a precision instrument. When unpacking, handle it with care to prevent accident or damage. Check that the following items are contained:

MTG main unit, standard accessories and SETTING DATA sheet

Verifying the specifications

The specifications for this device are written on the nameplate of the main unit. Compare these specifications with those listed in the specification sheets, device standard specifications and model number, and verify that all the specifications on the name plate are correct paying special attention to the following:

(Main unit)

- Detector bore diameter
- Electrode material
- Flange rating
- Grounding ring material

Inquiries

If you have any questions regarding the specifications, contact an Azbil Corp. representative. When making an inquiry, be sure to provide the MODEL NO. and PRODUCT NO.

Storage precautions

When storing this instrument before use, observe the following instructions:

- Store the device indoors at room temperature and humidity, in a place safe from vibration or shock.
- Store the device in the same condition as it was shipped.

When storing this instrument after usage, observe the following instructions:

1. Rinse the inside of the detector with water to remove any residual fluids and then allow it to dry.
2. Tighten the display cover and terminal box cover in order to prevent moisture ingression.
3. Return the instrument to its original packing.
4. Store the device indoors at room temperature and humidity in a place safe from vibration and shock.

Usage precautions

The safety precautions explained below aim to prevent injury to you and others, and to prevent property damage.

⚠ **WARNING**	**Warnings are indicated when mishandling this product may result in death or serious injury.**
⚠ **CAUTION**	**Cautions are indicated when mishandling this product may result in minor injury or property damage only.**

In describing the product, this manual uses the icons and conventions listed below.


Indicates that caution is required in handling.


The indicated action is prohibited.


Be sure to follow the indicated instructions.

~Note *Denotes important information and guidelines for safety of personnel and protection of device.*

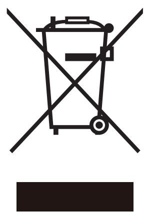
Disposal precaution for Electrical and Electronic Equipment

Disposal of Electrical and Electronic Equipment (for Environmental Protection)

This is an industrial product subject to the WEEE Directive.

Do not dispose of electrical and electronic equipment in the same way as household waste.

Old products contain valuable raw materials and must be returned to an authorized collection point for correct disposal or recycling.



How this Manual is organized and used

Organization and method of use

This manual explains how to use model MTG and related equipment in the following order:

Chapter 1

Explains the configuration of measuring systems using this instrument and describes the names and functions of various parts of the instrument.

Chapter 2

Describes instrument installation. The persons in charge of installation and piping should refer to this chapter.

Chapter 3

Describes the wiring and connections. The persons in charge of wiring work should refer to this chapter.

Chapter 4

Describes the procedure for startup, operation and shut down of this instrument.

Chapter 5

To manipulate the instrument, either its data setting device or a communication line may be used. This chapter describes the operation by using the data setting device.

Read this chapter when starting the instrument after installation or when stopping its operation.

Chapter 6

(To manipulate the instrument, either its data setting device or communication line may be used.) This chapter describes the operation by using the SFC.

Chapter 7

(To manipulate the instrument, either its data setting device or communication line may be used.) This chapter describes the operation by using HART communicator.

Chapter 8

Describes the procedures that are necessary for maintenance, inspection and troubleshooting of the instrument.

Use this chapter when searching for an explanation necessary for maintenance or troubleshooting.

Table of Contents

Chapter 1 : Model MTG11A/18A/11B/18B/14C System configuration and structure

Outline of this chapter 1-1

1-1 : System configuration 1-2

Measuring system 1-2
System configuration for analog output 1-3
System configuration for analog output and pulse output 1-5
System configuration for analog output and contact output 1-6
System configuration for digital output (DE output) 1-7

1-2 : Structure of this instrument and functions of its various parts 1-9

Structure of main unit 1-9
Detector 1: Flanged type 1-11
Detector 2: Wafer type 1-12
Indicator/data setting device 1-13
Terminal box 1-14

1-3 : Hazardous area approvals and CE-Mark 1-16

1-3-1 : Model MTG18A 1-16
Combination of FM approval and CSA certification for Division 1 and Division 2 1-16
(1) ATEX Type nA Certification (English) 1-18
(1) Certification ATEX Type nA (Français) 1-20
(1) ATEX Type nA Bescheinigung (Deutsch) 1-22
(1) Certificación ATEX Tipo nA (Español) 1-24
(1) Certificazione ATEX tipo nA (Italiano) 1-26
(1) NEPSI Ex ec and Ex tb Certification 1-28
1-3-2 : MTG18B and MTG14C 1-29
FM approval with remote models MTG18B (detector) and MTG14C (converter) 1-29
CSA certification with remote models MTG18B (detector) and MTG14C (converter) 1-31
1-3-3 : European Pressure Equipment Directive (2014/68/EU) 1-32

Chapter 2 : Instrument installation

Outline of this chapter 2-1

2-1 : Before installation 2-2

Criteria for installation location (1) 2-2
Criteria for installation location (2) 2-4
Method of changing the direction of converter 2-6
Changing the direction of display/data setting device 2-8
Movable range of display/data setting device 2-9
Wiring connection distance of remote-type converter and detector 2-10

2-2 : Installation method 2-11

2-2-1 : Installing a wafer type detector 2-11
Basic installation 2-11
Accessory parts for installation 2-15
Selecting an installation method 2-17
Installation on horizontal pipe 2-18
Installation on vertical pipe 2-19
Installation on metal pipe (1) 2-20
Installation on metal pipe (2) 2-21
Installation on PVC pipe (1) 2-22
Installation on PVC pipe (2) 2-24

Table of Contents

2-2-2 : Installation a flange type detector 2-26
Basic installation method 2-26
Accessory parts for installation 2-29
Selecting an installation method 2-30
Installation on metal pipe (1) 2-31
Installation on metal pipe (2) 2-32
Installation on PVC pipe (1) 2-33
Installation on PVC pipe (2) 2-35
2-2-3 : Installation of remote-type converter 2-37

Chapter 3 : Electrical wiring

Outline of this chapter 3-1

3-1 : Electrical wiring 3-2
Electrical wiring 3-2

Chapter 4 : Operation

Outline of this chapter 4-1

4-1 : Confirmation before start-up 4-2

4-2 : Stopping 4-3

Chapter 5 : Operation using the data setting device

5-1 : Startup 5-2
Display and operation contents of data setting device 5-3

5-2 : Functions of the data setting device 5-5
5-2-1 : Data setting device 5-5

5-3 : Description of MEASURING MODE 5-7
5-3-1 : Display overview 5-7
5-3-2 : Display of write protect level 5-8

5-4 : Overview of operation using the data setting device 5-10

5-5 : Configuration of OPERATOR'S MODE 5-11
5-5-1 : Changing setting of damping time constant 5-14
5-5-2 : Auto zero adjustment 5-15
5-5-3 : Setting of built-in counter reset value 5-16
5-5-4 : Setting of built-in counter reset value 5-17
5-5-5 : Setting auto spike cut 5-18
5-5-6 : Setting moving average processing 5-19
5-5-7 : Setting Electrode Status Diagnostic function 5-21
Electrode status diagnostic troubleshooting 5-30
Selecting the Electrode Status Output Mode 5-31
5-5-8 : Selecting flow rate to be displayed in the main display 5-33
5-5-9 : Selecting a communication system 5-34
5-5-10 : Entering ENGINEERING MODE and MAINTENANCE MODE 5-36

5-6 : Configuration of ENGINEERING MODE 5-38
5-6-1 : Setting ID 5-41
5-6-2 : Selecting Pulse Output, Electrode Status Output or High Low Status Output 5-42
5-6-3 : Setting detector information 5-44

5-6-4 : Setting detector factor 5-45
5-6-5 : Setting flow rate range 5-46
5-6-6 : Setting and changing compensation coefficient 5-47
5-6-7 : Setting specific gravity 5-48
5-6-8 : Setting pulse scale 5-49
5-6-9 : Setting pulse width 5-51
5-6-10 : Setting drop out 5-54
5-6-11 : Setting low flow cutoff 5-56
5-6-12 : Setting upper and lower limit alarm 5-57
5-6-13 : Selecting failsafe mode for analog outputs 5-58
5-6-14 : Selecting failsafe mode for pulse output 5-59
5-6-15 : Setting contact output status 5-60

5-7 : Configuration of MAINTENANCE MODE 5-61

5-7-1 : Configuration of OUTPUT CHECK MODE 5-62
5-7-2 : Performing loop check of analog output by using a calibrator model MGZ/F1X. 5-64
5-7-3 : Performing loop check of analog outputs 5-65
5-7-4 : Performing loop check of pulse outputs 5-66
5-7-5 : Performing loop check of contact outputs 5-67
5-7-6 : Configuration of CALIBRATION MODE 5-68
5-7-7 : Manual zero 5-72
5-7-8 : Configuration of CRITICAL MODE 5-74
5-7-9 : Displaying ROM version and date 5-75
5-7-10 : Returning to settings at shipment 5-76

5-8 : Description of Error Messages 5-77

Chapter 6 : Operation using SFC communicator

6-1 : Structure and functions of SFC 6-1

6-1-1 : Structure of SFC 6-1
Structure of Smart Field Communicator (SFC) 6-1
6-1-2 : Functions of SFC 6-3
SFC keyboard 6-3
Rules of key operations and interaction with screens 6-4
Charging SFC 6-10
6-1-3 : SFC Wiring 6-11
Wiring between two wired magnetic flowmeter converter and SFC 6-11
6-1-4 : SFC unavailable functions 6-11
6-1-5 : Before operating SFC 6-12
Status of two wired magnetic flowmeter SFC at SFC communication 6-12
Confirm write protect mode 6-12
Writing on non-volatile memory 6-13
Changing communication method 6-13

6-2 : Configuration using SFC communicator 6-14

6-2-1 : Before communicating using the SFC 6-15
What can be done using the SFC 6-15
Hierarchical structure of CONFIG functions 6-17
SFC hierarchical structure chart 6-17
Example of a key sequence 6-18
6-2-2 : Setting using SFC communication (1) - setting using key assigned functions 6-19
Starting communication: ID/DE READ key 6-19
Entering TAG No.: ID key 6-21

Table of Contents

Setting/changing damping time constant: DAMP key 6-23
Setting engineering units: UNITS key 6-24
Setting output range and correction coefficient: URV key....6-26
Displaying transmitting output: OUTPUT key....6-27
Loop check of output signal 6-28
Making zero adjustment: CORRECT key....6-29
Displaying flow rate measured value: INPUT key 6-30
Displaying self-diagnostics result: STAT key 6-31
Error messages and remedial action 6-32
Displaying software version: SW VER key....6-35
Data printing....6-36
Printing internal data: PRINT key....6-37
Continuously printing response result: ACT PRINT key 6-39
Switching between digital output and analog output: A ⇔ DE key....6-41
6-2-3 : Setting using SFC communication (2) - setting using CONFIG functions....6-42
Selecting unit system and setting specific gravity [UNIT KEY] function....6-42
Setting or changing low flow cutoff: [CUT-OFF] function 6-44
Changing flow rate display: [DISP] function 6-46
Setting detector constant: [EX(mA)] function 6-48
Setting detector type: [TYPE] function 6-50
Setting diameter of detector: [DIAMETER=] function....6-52
Setting high/low alarm values [ALARM CONFIG] function 6-54
Deciding fail-safe direction: [F/S SET UP] function....6-56
Setting burnout direction of pulse output: [F/S SETUP] function 6-58
Select pulse output / contact output [DIGITAL I/O] function....6-60
Setting contact output status [DIGITAL I/O] function 6-62
Checking output of contact output: [DI/DO CHECK] function 6-64
Adjusting analog current output [CORRECT DAC] function 6-66
Calibrating gain constant [GAIN CAL] function 6-68
Resetting the internal data to factory setting (default) [SHIP DATA RECOV] function 6-70
Displaying totalized value [READ TOTAL] function 6-71
Checking pulse output [PULSE OUTPUT] function 6-72
Setting pulse scale and pulse scale unit [PULSE CONFIGURE] function 6-74
Setting pulse width [PULSE CONFIGURE] function....6-76
Setting dropout [PULSE CONFIGURE] function....6-78
Setting counter reset function [RESET TOTALZE] function....6-80

Chapter 7 : Operation using HART communicator

7-1 : Preparation for communication, verification and cautions on use 7-1
7-1-1 : Wiring between converter and HART Communicator 7-1
7-1-2 : Two wired magflow meter converter setting....7-2
7-1-3 : Verifying communication....7-4
7-1-4 : Cautions....7-4

7-2 : Setting and calibrating devices using the HART Communicator 7-5
7-2-1 : Setting procedures....7-6
Flow units 7-6
Range....7-7
Specific gravity 7-7
Damping time constant 7-8
Zero adjustment 7-9
Selecting display 7-10

Selecting function 7-10
Correction coefficient setting 7-11
Changing communication method 7-12
7-2-2 : Setting converter data 7-13
Detector diameter 7-13
Detector type 7-13
Detector constant 7-14
7-2-3 : Signal processing 7-15
Auto spike cut 7-15
Setting average processing 7-15
Setting the average processing time 7-16
Low flow cutoff 7-16
Drop-out 7-17
Electrode status sensitivity 7-17
Electrode status output mode 7-18
7-2-4 : Pulse setting 7-19
Pulse scale unit 7-19
Pulse scale 7-19
Pulse width 7-20
7-2-5 : Totalized value setting 7-21
Displaying totalized value 7-21
Integrated reset value 7-21
Resetting the totalized value 7-22
7-2-6 : Contact output setting 7-23
High alarm value setting 7-23
Low alarm value setting 7-24
Contact output status setting 7-24
7-2-7 : Burnout setting 7-25
Analog output burnout setting 7-25
Pulse output burnout setting 7-25

7-3 : Calibrating and Inspecting the device by HART Communicator and other functions 7-26

7-3-1 : Device adjustment 7-26
Analog current output adjustment 7-26
Manual Zero 7-28
Gain adjustment 7-30
Pulse output adjustment 7-32
Excitation current adjustment 7-34
7-3-2 : Output check 7-36
Analog output check with a calibrator 7-36
Analog output check 7-37
Pulse output check 7-38
Contact output check 7-39
7-3-3 : Other functions 7-40
Verifying status of converter 7-40
Tag setting 7-41
Shipping data recovery 7-42
Review 7-43

7-4 : Short cut commands and menus for HART communicator 7-44

7-4-1 : Short cut keys 7-44
7-4-2 : Menu tree 7-45

Table of Contents

Chapter 8 : Maintenance and troubleshooting

Outline of this chapter 8-1

8-1 : Maintenance and inspection of parts 8-2

8-1-1 : Replacement of indicator / data setting device 8-2

8-1-2 : Replacement of the electronic unit for the ATEX Ex dmbia or NEPSI Ex dmia model 8-3

8-2 : Troubleshooting 8-6

Types of troubles....................8-6

Troubles at startup 8-7

Troubles during operation 8-8

8-3 : Spare parts 8-9

8-3-1 : Spare parts for integral type....................8-9

8-3-2 : Spare parts for remote type converter 8-11

8-3-3 : Spare parts for remote type detector 8-13

<Figures>

Figure 1-1 Conceptual drawing of measuring system (integral type)...................................... 1-2
Figure 1-2-1 System configuration for analog output 1 (Integral type)................................ 1-3
Figure 1-2-2 System configuration for analog output 1 (Remote type)................................ 1-3
Figure 1-3-1 System configuration for analog output 2 (Integral type)................................ 1-5
Figure 1-3-2 System configuration for analog output (Remote type).................................. 1-5
Figure 1-4-1 System configuration for analog output 1 (Integral type)................................ 1-6
Figure 1-4-2 System configuration for analog output 2 (Remote type)................................ 1-6
Figure 1-5-1 System configuration for digital output 1-7
Figure 1-5-2 System configuration for digital output 1-8
Figure 1-6-1 Overview of integral type 1-9
Figure 1-6-2 Overview of remote type 1-10
Figure 1-7 Detector details (Flanged detector) 1-11
Figure 1-8 Detector details (wafer-type detector)... 1-12
Figure 1-9 Indicator/data setting device details 1-13
Figure 1-10 Display 1-13
Figure 1-11 Terminal box details.. 1-14
Figure 1-12-1 Terminal block (integral type) 1-14
Figure 1-12-2 Terminal block (remote type) 1-14
Figure 1-13 Process fluid temperature and pressure limit for model MTG18A 1-17
Figure 1-14 Process fluid temperature and pressure limit for model MTG18B 1-31
Figure 2-1 Example of installation 2-4
Figure 2-2 Straight pipe section upstream of detector (D: Nominal detector bore diameter) ... 2-4
Figure 2-3 Maintenance space 2-5
Figure 2-4 Change the direction of converter 2-6
Figure 2-5 Changing the display / data setting device direction... 2-8
Figure 2-6 Movable range of display/data setting device 2-9
Figure 2-7 Cable length (m) between converter and detector... 2-10
Figure 2-8 Cable length (m) between converter and detector... 2-10
Figure 2-9 Device installation example 2-11
Figure 2-10 Flange shape.. 2-13
Figure 2-11 Examples of unacceptable installations (1).. 2-14
Figure 2-12 Examples of unacceptable installations (2).. 2-14
Figure 2-13 Horizontal centering of the detector
(Position two centering nuts against each flange) 2-15
Figure 2-14 Vertical centering of the detector
(Position the four centering nuts on the bottom flange).................................... 2-15
Figure 2-15 Installation using SUS material grounding ring and metal pipe 2-20

List of Figures & Tables

Figure 2-16 Installation using Non-SUS material grounding ring and metal pipe 2-21
Figure 2-17 Example of incorrect installation 2-21
Figure 2-18 Installation using SUS material grounding ring... 2-22
Figure 2-19 Installation using SUS material grounding ring (with protective plate) 2-23
Figure 2-20 Installation using SUS material grounding ring (with rubber gasket) 2-23
Figure 2-21 Installation using Non-SUS material grounding ring....................................... 2-24
Figure 2-22 Installation using Non-SUS grounding ring (with protective plate) 2-25
Figure 2-23 Installation using Non-SUS grounding ring (with rubber gasket) 2-25
Figure 2-24 Installation example 2-26
Figure 2-25 Flange shape.. 2-28
Figure 2-26 Example of incorrect mounting... 2-28
Figure 2-27 Installation using SUS material grounding rings 2-31
Figure 2-28 Installation using Non-SUS material grounding ring....................................... 2-32
Figure 2-29 Example of incorrect installation 2-32
Figure 2-30 Installation using SUS material grounding ring... 2-33
Figure 2-31 Installation using SUS material grounding ring (with protective plate) 2-34
Figure 2-32 Installation using SUS material grounding ring (with rubber gasket) 2-34
Figure 2-33 Installation using Non-SUS material grounding ring....................................... 2-35
Figure 2-34 Installation using Non-SUS material grounding ring (with protective plate)... 2-36
Figure 2-35 Installation using Non-SUS material grounding ring (with rubber gasket)...... 2-36
Figure 2-36 Wall mounting.. 2-37
Figure 2-37 2-inch pipe mounting 2-37
Figure 3-1-1 Supply power voltage-load resistance characteristics 3-3
Figure 3-1-2 Terminal block - Integral type 3-3
Figure 3-1-3 Terminal block - Remote type 3-4
Figure 3-2 Grounding procedure that uses internal grounding terminal................................ 3-6
Figure 3-3 Grounding procedure that uses external grounding terminal 3-6
Figure 3-4 Wire connection diagram 3-7
Figure 3-5 Wire connection diagram (When inputting to the sequence controller etc.)......... 3-7
Figure 3-6 Pulse output wire connection diagram 3-8
Figure 3-7 Contact output wire connection diagram 3-8
Figure 3-8 Wiring for power supply - Integral type 3-10
Figure 3-9 Wiring for power supply - Remote type 3-10
Figure 3-10 Wiring connection between detector and converter... 3-10
Figure 5-1 Damping output characteristics.. 5-14
Figure 5-2 Auto spike cut output characteristics 5-18
Figure 5-3 Output characteristics of moving average processing.. 5-19
Figure 5-4 5-71

Figure 6-1 Details of SFC 6-1
Figure 6-2 SFC keyboard 6-5
Figure 6-3 SFC wiring connection 6-11
Figure 6-4 Data setting screen 6-13
Figure 7-1 HART Communicator wiring 7-1
Figure 7-2 Online menu 7-4
Figure 7-3 Communication not available 7-4
Figure 7-4 Device setup menu 7-6
Figure 7-5 Basic setup menu 7-6
Figure 7-6 Selection of flow rate unit 7-6
Figure 7-7 Transmitting the setting 7-6
Figure 7-9 7-7
Figure 7-10 7-8
Figure 7-11 7-9
Figure 7-12 7-9
Figure 7-13 7-9
Figure 7-14 7-10
Figure 7-15 7-10
Figure 7-16 7-11
Figure 7-17 7-12
Figure 7-18 7-12
Figure 7-19 7-13
Figure 7-20 7-13
Figure 7-21 7-14
Figure 7-22 7-14
Figure 7-23 7-15
Figure 7-24 7-15
Figure 7-25 7-16
Figure 7-26 7-16
Figure 7-27 7-17
Figure 7-28 7-17
Figure 7-29 7-18
Figure 7-30 7-19
Figure 7-31 7-19
Figure 7-32 7-20
Figure 7-33 7-20
Figure 7-34 7-21
Figure 7-35 7-21

Figure 7-36 7-22
Figure 7-37 7-22
Figure 7-38 7-23
Figure 7-39 7-24
Figure 7-40 7-24
Figure 7-41 7-25
Figure 7-42 7-25
Figure 7-43 7-26
Figure 7-44 7-26
Figure 7-45 7-26
Figure 7-46 7-27
Figure 7-47 7-27
Figure 7-48 7-27
Figure 7-49 7-28
Figure 7-50 7-28
Figure 7-51 7-28
Figure 7-52 7-28
Figure 7-53 7-29
Figure 7-54 7-29
Figure 7-55 7-30
Figure 7-56 7-30
Figure 7-57 7-30
Figure 7-58 7-30
Figure 7-59 7-31
Figure 7-60 7-31
Figure 7-61 7-31
Figure 7-62 7-32
Figure 7-63 7-32
Figure 7-64 7-32
Figure 7-65 7-32
Figure 7-66 7-33
Figure 7-67 7-34
Figure 7-68 7-34
Figure 7-69 7-34
Figure 7-70 7-34
Figure 7-71 7-35
Figure 7-72 7-35
Figure 7-73 7-36

Figure 7-74 7-36
Figure 7-75 7-36
Figure 7-76 7-36
Figure 7-77 7-37
Figure 7-78 7-37
Figure 7-79 7-37
Figure 7-80 7-37
Figure 7-81 7-37
Figure 7-82 7-38
Figure 7-83 7-38
Figure 7-84 7-38
Figure 7-85 7-38
Figure 7-86 7-39
Figure 7-87 7-39
Figure 7-88 7-39
Figure 7-89 7-39
Figure 7-90 7-40
Figure 7-91 7-40
Figure 7-92 7-41
Figure 7-93 7-42
Figure 8-1 Replacement of indicator/data setting device (with the cover removed) 8-2
Figure 8-2 8-3
Figure 8-3 8-3
Figure 8-4 8-4
Figure 8-5 8-4
Figure 8-6 8-5
Figure 8-7 8-5
Figure 8-8 Spare parts for integral type 8-9
Figure 8-9 Spare parts for remote type converter 8-11
Figure 8-10 Spare parts for remote type detector 8-13

List of Figures & Tables

<Table>

Table 1-1 Maximum allowable pressure for SEP products 1-33
Table 2-1 Fastening torque 2-12
Table 2-2 Recommended internal diameters of gaskets 2-16
Table 2-3 Internal and external diameters of rubber gaskets (0.5 to 1 mm thick)................ 2-16
Table 2-4 Internal and external diameter of rubber gaskets (3 to 4 mm thick) 2-16
Table 2-5 Fastening torque 2-27
Table 2-6 Recommended internal diameters of gaskets 2-29
Table 5-1 Set Levels for Electrode Status Diagnostic Function 5-23
Table 7-1 Items in each group 7-40
Table 8-1 Spare parts for integral type 8-10
Table 8-2 Spare parts for remote-type converter (Model MTG11B) 8-12
Table 8-3 Spare parts for remote-type detector 8-13
Table 8-5 Flange type grounding ring assembly.. 8-15
Table 8-6 Through bolt and nut (required 1 set per detector)
Parts number: 80380810-ITEM... 8-17
Table 8-7 Centering tool for wafer type detector (required 4 pcs. per detector)
Part number: 80380811-ITEM 8-19

Chapter 1 : Model MTG11A/18A/11B/18B/14C System configuration and structure

Outline of this chapter

This chapter presents the equipment configuration of a measuring system using this instrument.

It also describes the structure and the names and functions of various parts of the main unit.

1-1 : System configuration

Measuring system

Introduction

This instrument is a two-wire electromagnetic flowmeter which operates on the 4-20 mA DC. It measures the flow rate of the conductive fluid flowing in the detector and outputs a signal that is suitable for the measuring range.

Concept of flow rate measurement by this instrument

The concept of a flow rate measuring system using this instrument is shown.

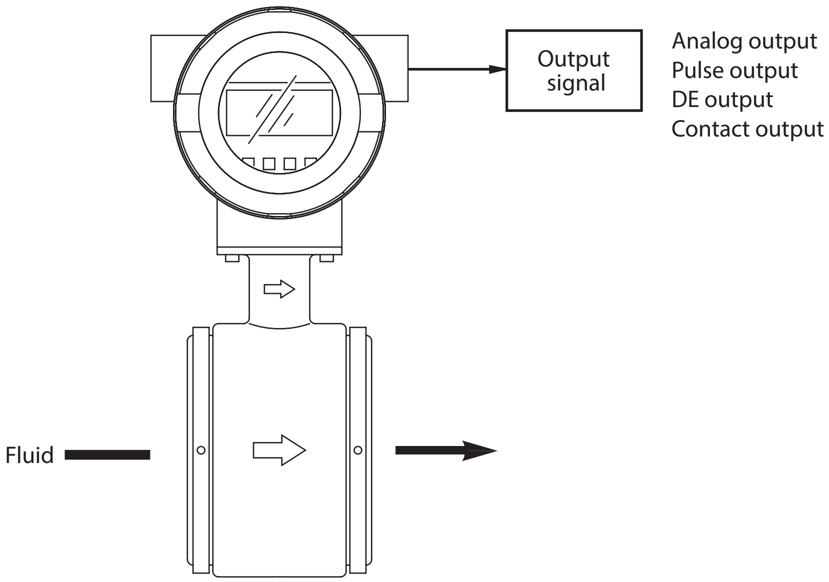


Figure 1-1 Conceptual drawing of measuring system (integral type)

Analog output

If the instantaneous flow rate values are to be output as an analog variable to the control equipment, configure the system to output an analog output.

Digital output (DE output)

Use this system configuration if the instantaneous flow rate values, instrument database and self-diagnosis results are to be output as digital variables (DE outputs) to the control equipment.

Pulse output

As a pulse output, the open-collector output is available. Pulse frequencies up to 200 Hz can be output. The pulse output can be output simultaneously with an analog output.

If the integrated flow values are to be output as a pulse to control equipment, wire an another two-wire to output a pulse output.

Contact output

Instead of the pulse output, a contact output the open-collector output is available. The contact output can be output simultaneously with an analog output.

System configuration for analog output

System configuration

An example of system configuration is shown. The instantaneous flow rate values measured by this instrument are output as a 4-20 mA DC analog signal.

In this system configuration, the analog signal from the instrument can be output directly to a host control system.

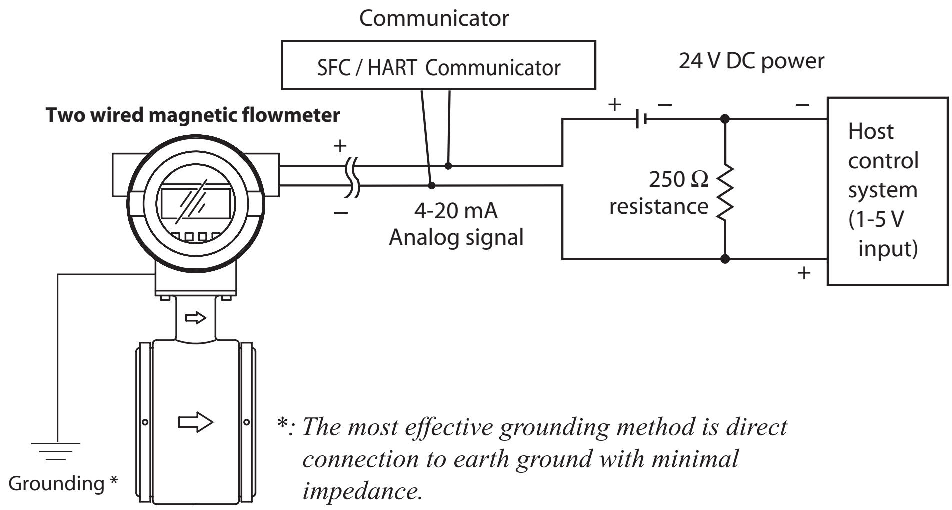


Figure 1-2-1 System configuration for analog output 1 (Integral type)

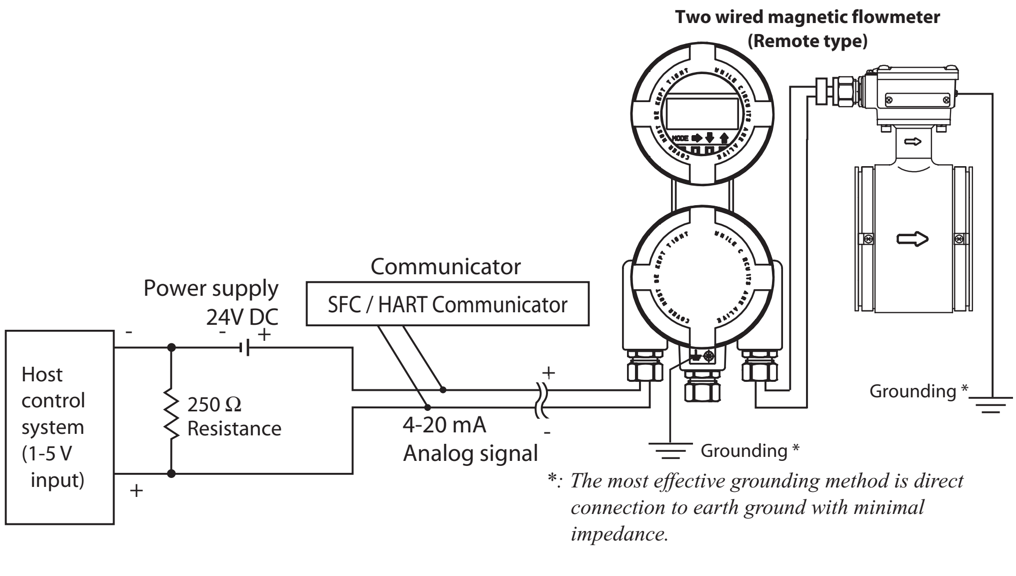


Figure 1-2-2 System configuration for analog output 1 (Remote type)

- Two wired magnetic flowmeter: Measures flow rate and outputs instantaneous flow rate value as an analog signal.
- Communicator: Used to communicate with this instrument, read data and change the instrument data settings.

~Note

- *To use the SFC, read "Chapter 6 : Operation using SFC communicator" in this manual.*
- *To use the HART communicator, read "Chapter 7 : Operation using HART communicator" in this manual.*
- *Compatible with the SFC of Ver 7.0 or higher. However, some functions on the main unit cannot be set.*
- *For DD (device description) of the HART Communicator, use the HCF DD Library Host DD Distribution (HCF-KIT-III) Release 2010 Number 1, Device Description 1, Device Revision 2 or later.*
- *This instrument can communicate on two protocols: Smart Field Communication (SFC) and HART communication (HART communicator). The communication method to be used is selected by the (human) data setting device.*

When configuring a system using this instrument, it is necessary to determine the power supply voltage and load resistance to satisfy the operation conditions of this instrument.

System configuration for analog output and pulse output

System configuration

An example of the system configuration is shown.

The flow rate is available as an analog 4-20 mA DC output and totalized value is available as a pulse output.

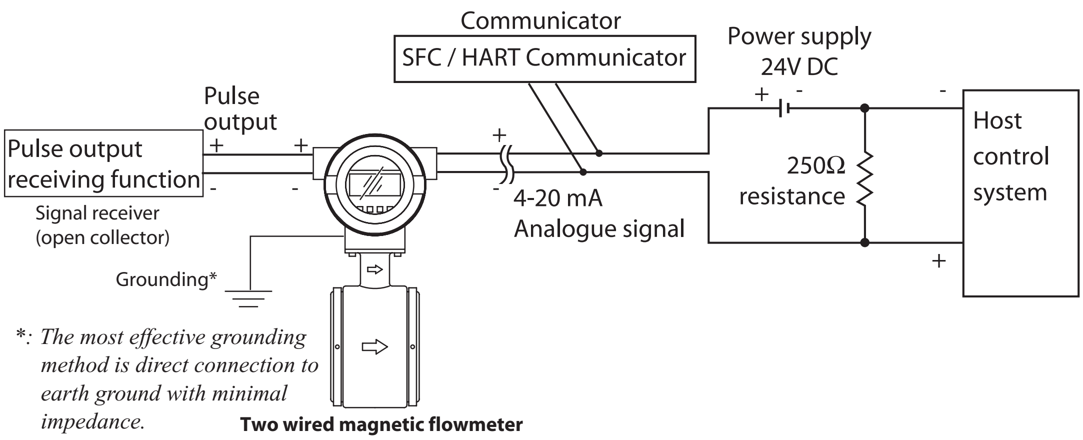


Figure 1-3-1 System configuration for analog output 2 (Integral type)

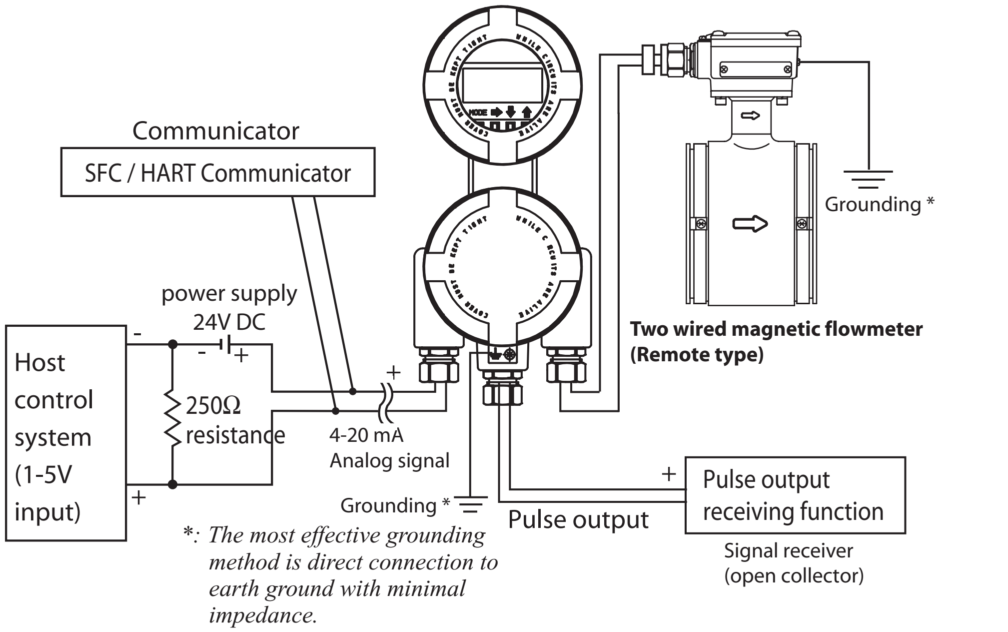


Figure 1-3-2 System configuration for analog output (Remote type)

- Two wired magnetic flowmeter: Measures flow rate and outputs the instantaneous flow rate value as an analog signal.
- Communicator: Used to communicate with this instrument, read data and change the instrument data settings.
- Pulse output receiver equipment: It inputs the pulse output, and displays the totalized value.

~Note ***Open collector: It is pulse output method to use the transistor contact.***

System configuration for analog output and contact output

System configuration

In the system configuration shown below, the instantaneous flow rate is output as 4-20 mA analog signal and alarm is output when the status output is configured for the alarm function. As an alarm, self diagnosis output (critical failure) or upper/lower limit alarm is output.

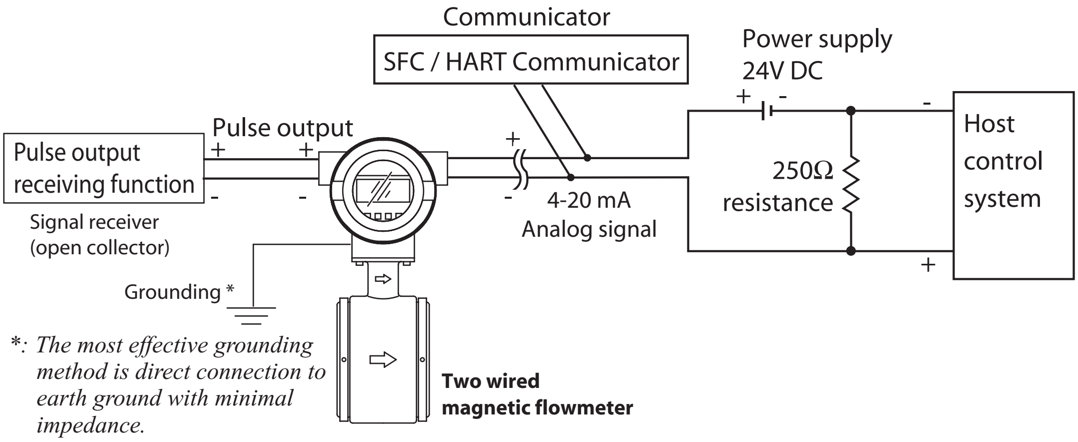


Figure 1-4-1 System configuration for analog output 1 (Integral type)

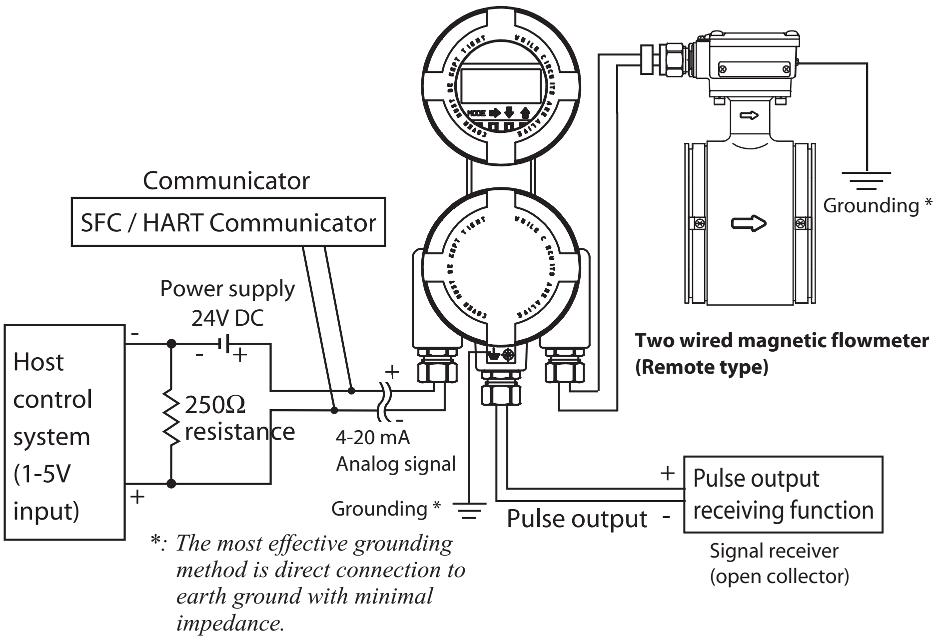


Figure 1-4-2 System configuration for analog output 2 (Remote type)

- Two wired magnetic flowmeter: Measures flow rate and outputs the instantaneous flow rate value as an analog signal.
- Communicator: Used to communicate with this instrument, read data and change the instrument data settings.
- Pulse output receiver equipment: It receiver the pulse output, and displays the totalized value.

~Note ***Open collector: pulse output method using the transistor contact.***

System configuration for digital output (DE output)

System configuration

In the system configuration shown below, the flow rate measurements, database and self-diagnosis results of this instrument are output on the DE (digital enhanced) protocol, which is a communication protocol for digital signals.

When it uses the pulse output or the contact output together and, the wiring of the flowmeter pulse output and the contact output are same as mentioned is the “System configuration” on page 1-5 and page 1-6.

In this system configuration, the instrument transmits digital signals on the DE protocol and the smart protocol converter (SPC) converts the digital signals into analog signals, which is output to a control system. It can also output the DE protocol based digital signals without the conversion to a control system.

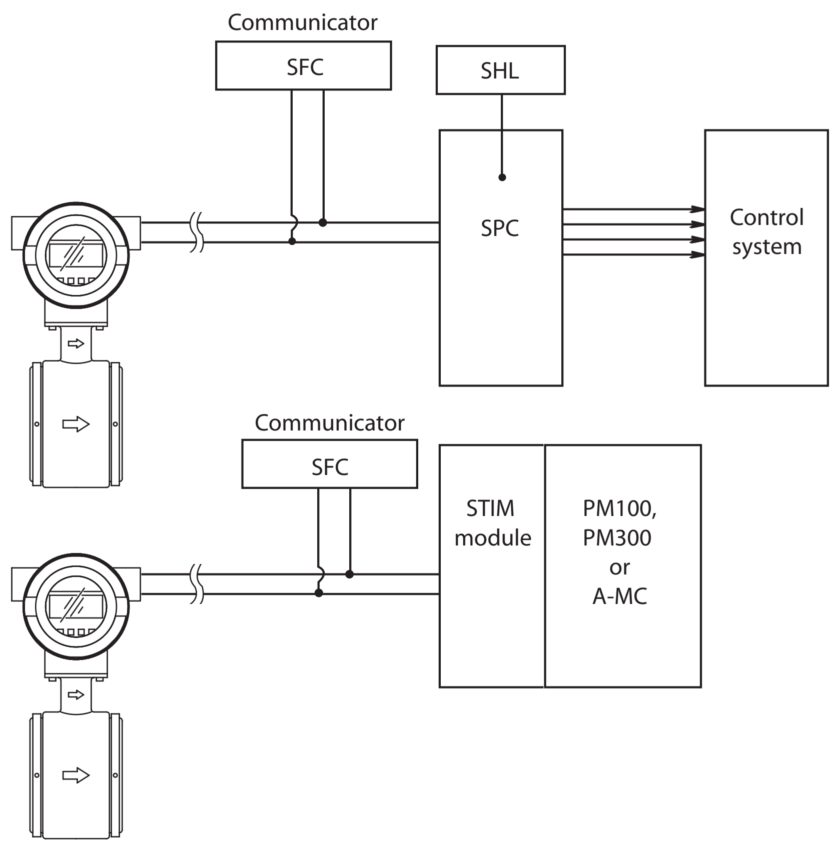


Figure 1-5-1 System configuration for digital output

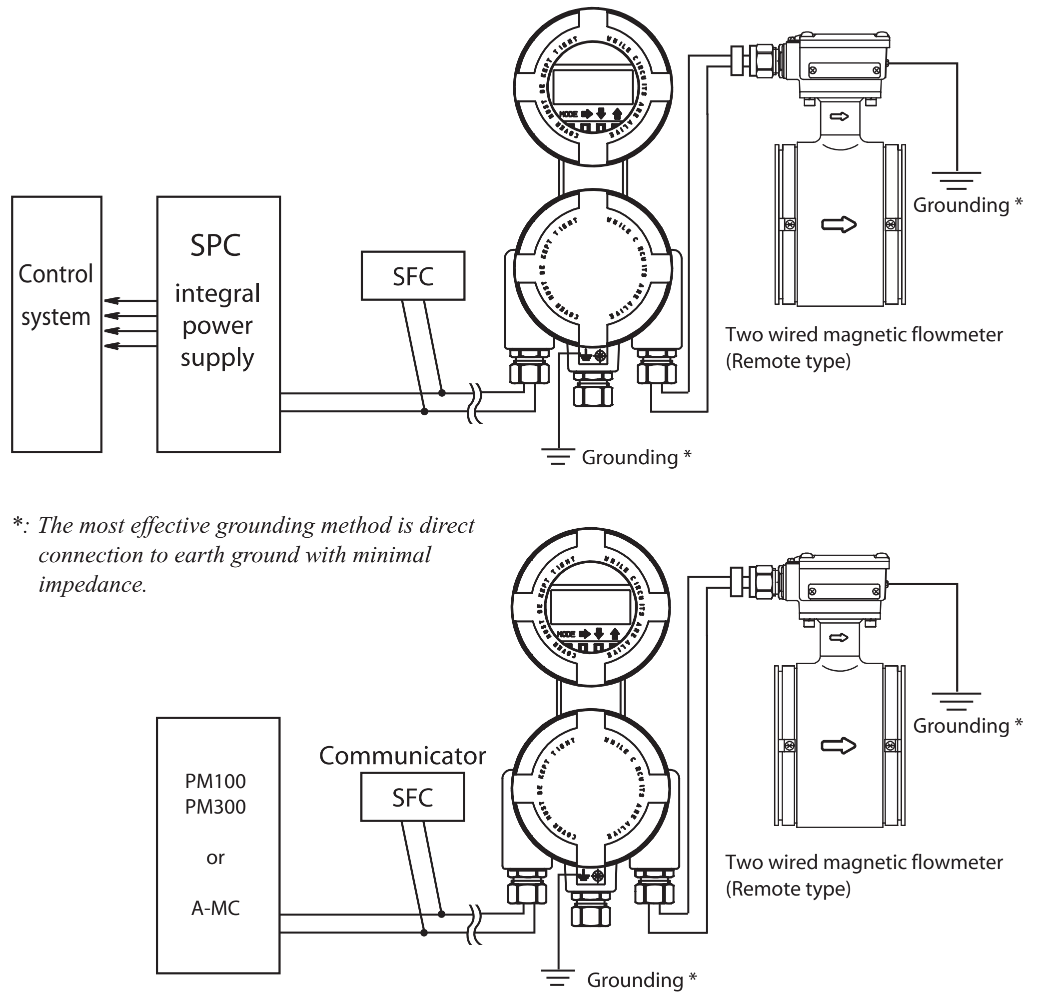


Figure 1-5-2 System configuration for digital output

- Two wired magnetic flowmeter: Measures flow rate and outputs the instantaneous flow rate values and the instrument's self-diagnosis results in the form of digital signals.
- Smart protocol converter (SPC): Receives DE protocol based digital signals from this instrument and converts them and outputs into a 4-20 mA DC or 1-5V DC analog signal.
- Communicator (SFC): Used to communicate with this instrument, read data and change instrument data settings.
- PM100, PM300, A-MC: These are process controllers on the UCN which carries out the regulatory control, sequences, arithmetic operations, process I/O and other functions simultaneously.

1-2 : Structure of this instrument and functions of its various parts

Structure of main unit

Major components

This instrument consists of a detector and converter. The converter, consists of the converter proper, indicator/data setting device and terminal box. Figure 1-6-1 shows overview of the instrument. (For detailed specification and outline drawing, refer to SS2-MTG100-0100)

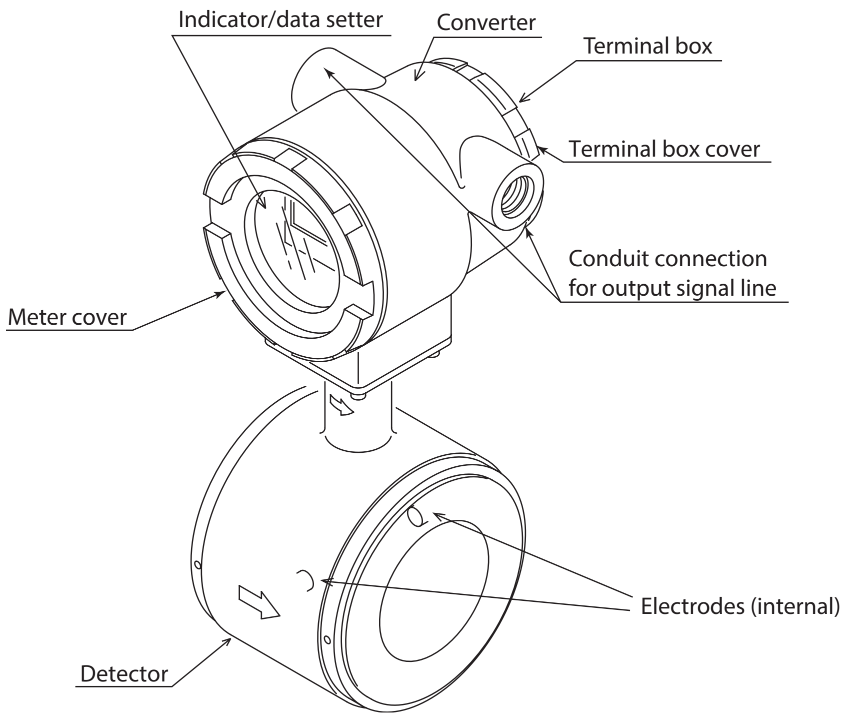


Figure 1-6-1 Overview of integral type

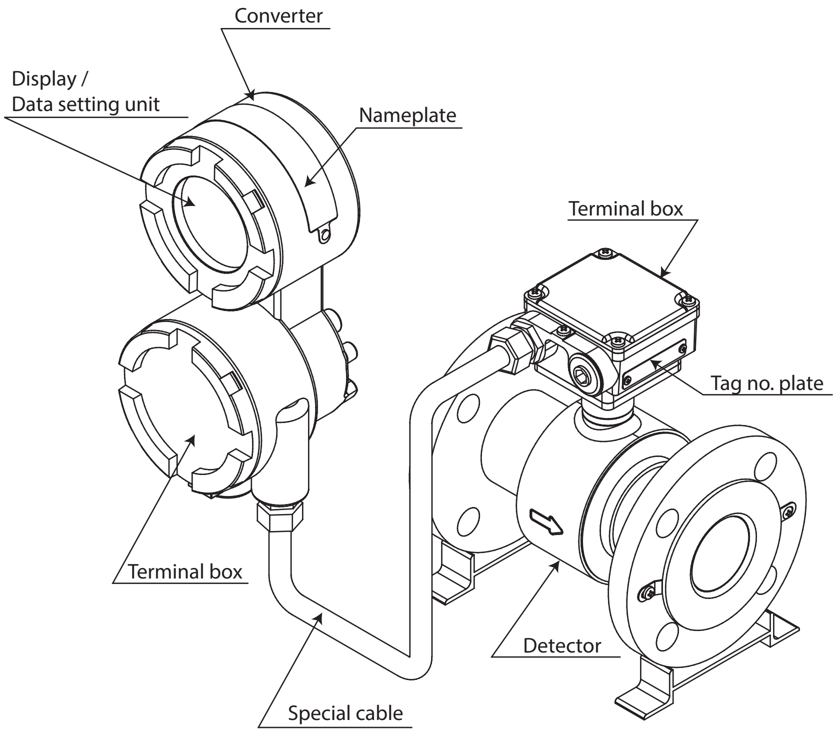


Figure 1-6-2 Overview of remote type

Names and description of various parts

The following table gives a description of the various parts.

Name	Description
Detector	• When a fluid passes through the inside, the detector generates a signal of electromotive force that is proportional to the flow rate of the passing fluid. • Connects to the pipes and supports the entire instrument. • Hoses the electrodes, both electrodes are installed in a horizontal position.
Converter	• Converts the signal of electromotive force generated by the detector into an instantaneous flow rate value and outputs it as a flow rate signal.
Special cable	• It transmits the electromotive force and the excitation current generated by the detector. • The shielded special cable offers strong protection against electromagnetic interferences and environment influences.
Display panel	• It displays the instantaneous flow rate value and the internal state of this flowmeter.
Terminal box	• Contains output signal and grounding terminals.
Nameplate	• MODEL No., PRODUCT No. and detector constant (EX) are written.
TAG No. plate	• TAG No. is written according to the order specification.

Detector 1: Flanged type

Description

The flanged detector has the function and structure as follows:

- Detects an electromagnetic force signal proportional to the flow rate of the fluid passing thought the detector.
- Installs to the pipes and supports the entire instrument.
- Houses the electrodes, both electrodes are installed in a horizontal position.

Names of various parts

The structure and names of various parts of the detector are shown.

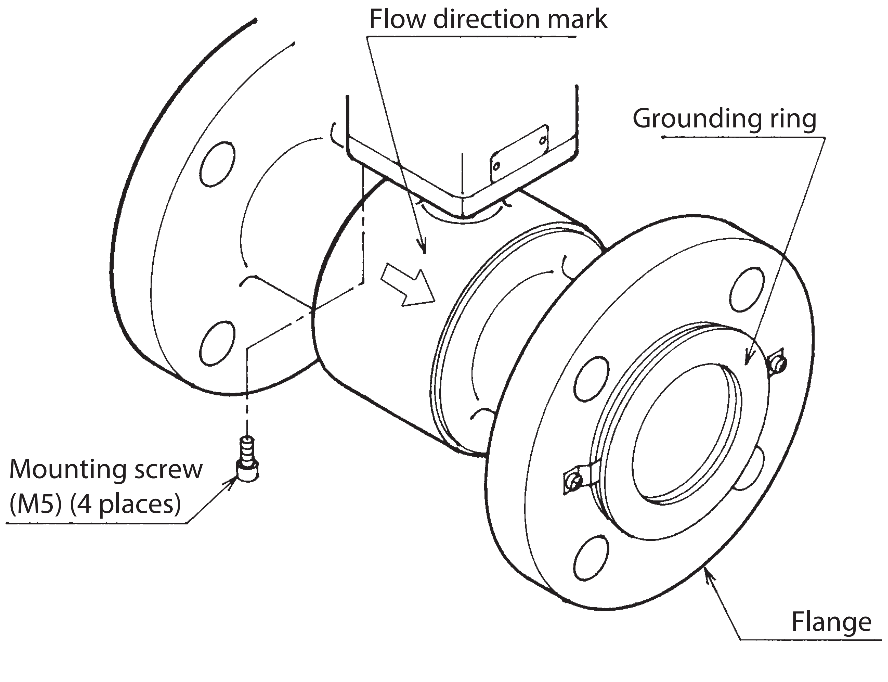


Figure 1-7 Detector details (Flanged detector)

Names and functions of various parts

The following table describes the various parts of the detector.

Name	Description
Flow direction mark	• Indicates the flow direction of the fluid. • Attach the detector so that the direction of fluid flow and this mark agree with each other.
Grounding ring	• Keeps reference voltage to zero by grounding the unit. The grounding ring material varies depending on the corrosion characteristics of the fluid to be measured.
Mounting screw (M5)	• Fixes the detector to the converter. • When these screws are removed, the detector and the converter orientation can be changed.
Flange	The flanges depend on the flanges on the pipes to which to connect.

Detector 2: Wafer type

Description

The wafer type detector has a function and structure as follows:

- Detects an electromagnetic force signal proportional to the flow rate of the fluid passing through the detector.
- Houses the electrodes, both electrodes are installed in a horizontal position.

Names of various parts

The structure and names of various parts of the detector are shown.

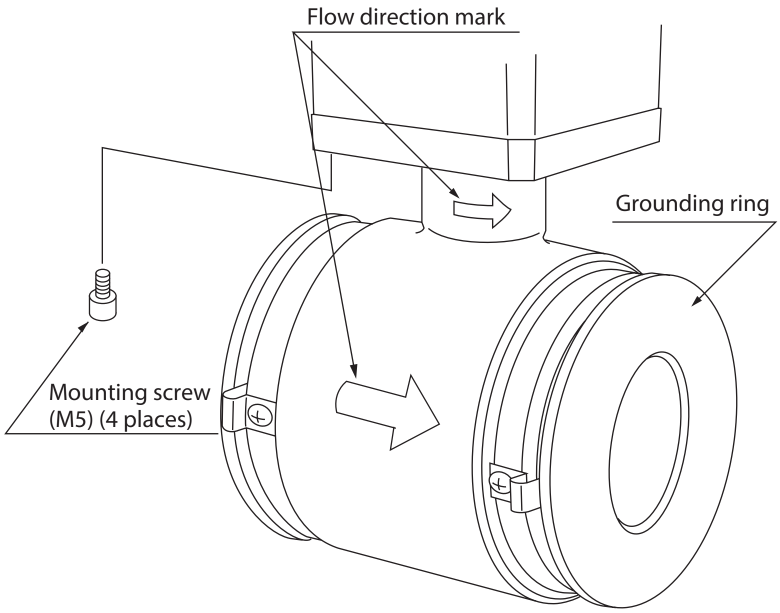


Figure 1-8 Detector details (wafer-type detector)

Names and functions of various parts

The following table describes the various parts of the detector.

Name	Description
Flow direction mark	• Indicates the flow direction of the fluid. • Install the detector so that the direction of fluid flow and this mark meet with each other.
Grounding ring	• Keeps reference voltage to zero by grounding the unit. The grounding ring material varies depending on the corrosion characteristics of the fluid to be measured.
Mounting screw (M5)	• Fixes the detector and converter. • When these screws are removed, the detector and the converter orientation can be changed.

Indicator/data setting device

Description

The indicator/data setting device has the following function and structure.

- Displays the instantaneous flow rate value and internal conditions of the instrument.
- The indicator face can be turned at intervals of 90 degrees through one turn.
- Refer to “Changing the direction of display/data setting device” on page 2-8.

Names of various parts

The names of various parts of the indicator/data setting device are shown.

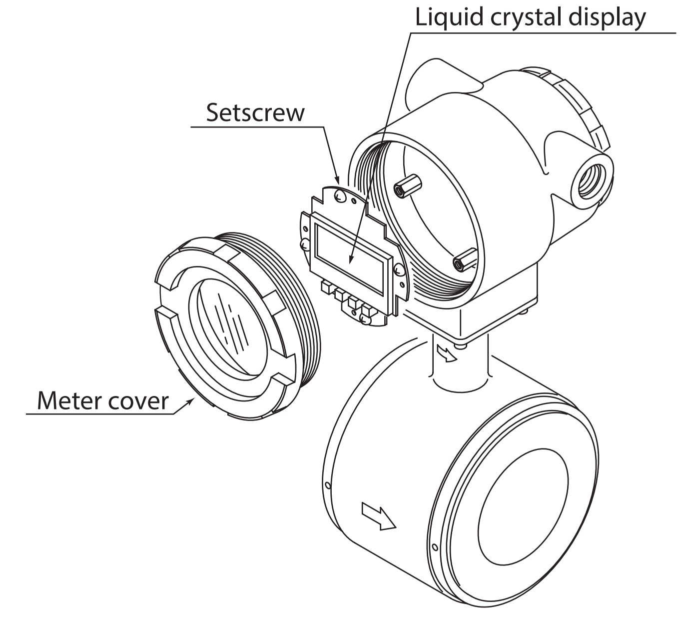


Figure 1-9 Indicator/data setting device details

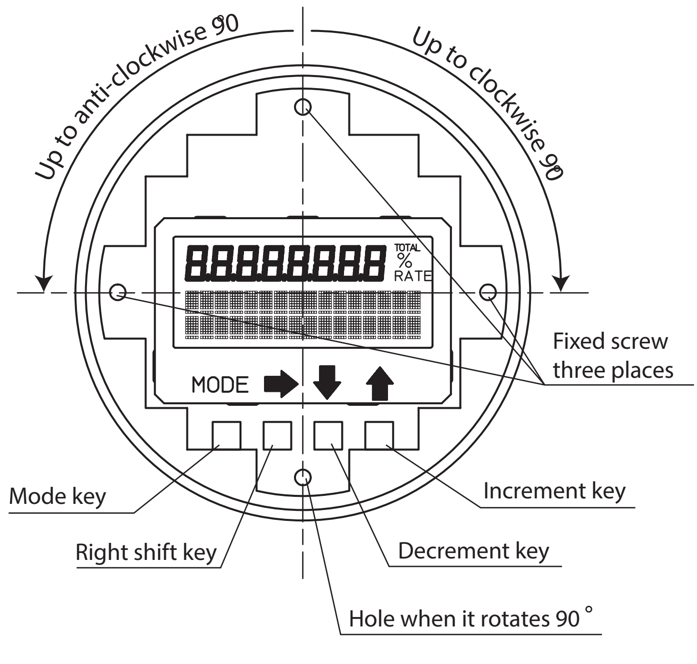


Figure 1-10 Display

Terminal box

Description

The terminal box houses the output signal terminals.

Names of various parts

Figure 1-10 shows the structure and names of various parts of the terminal box.

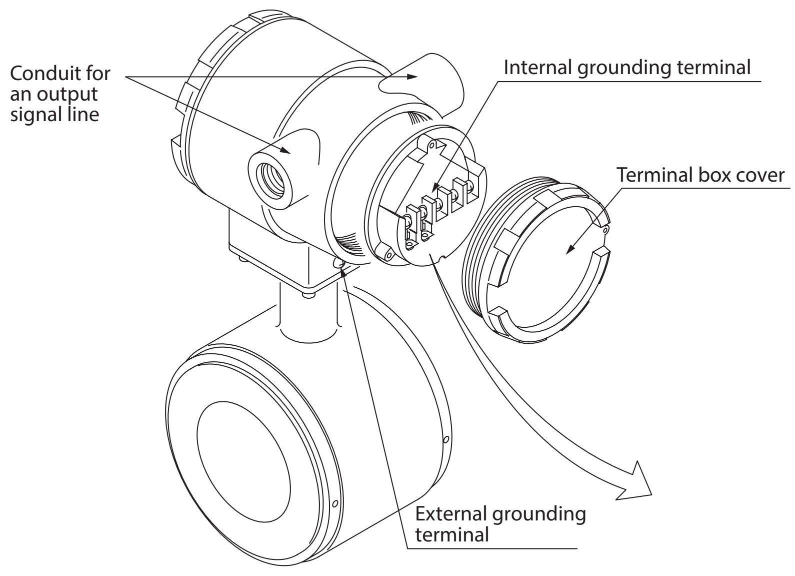


Figure 1-11 Terminal box details

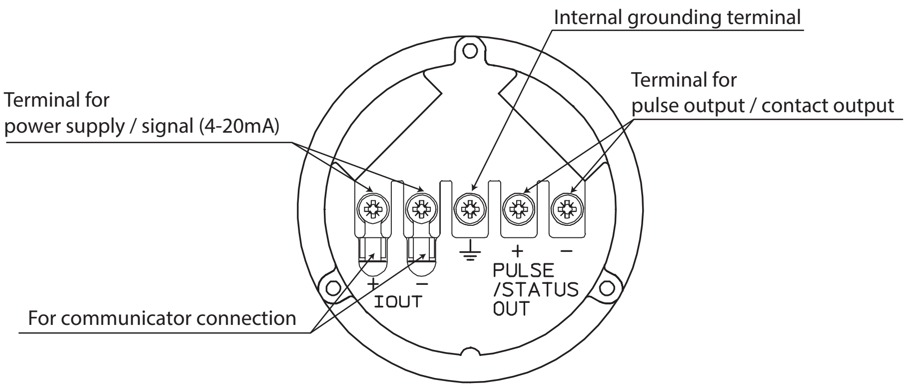


Figure 1-12-1 Terminal block (integral type)

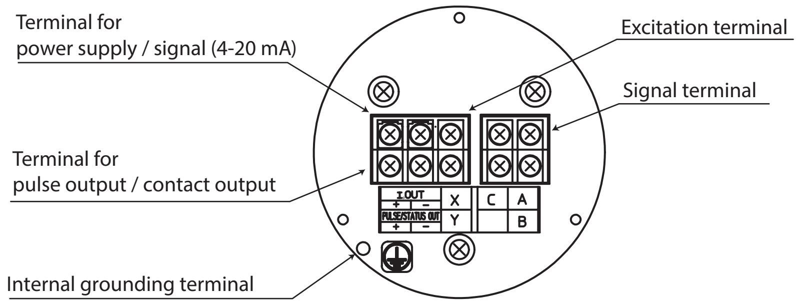
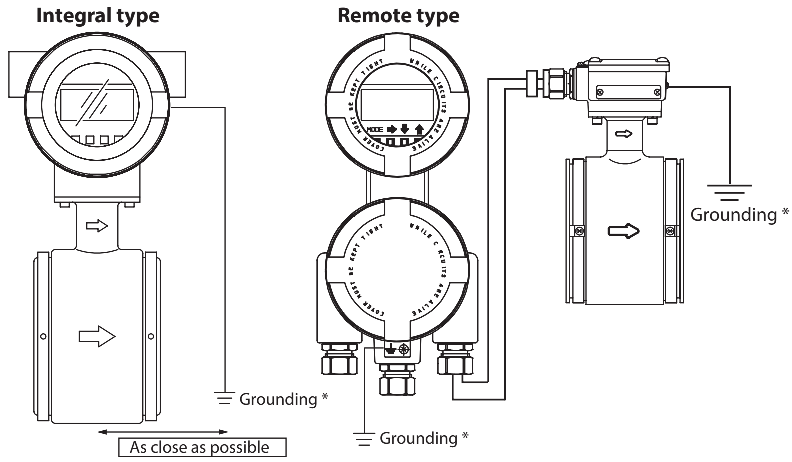


Figure 1-12-2 Terminal block (remote type)

Names and description of various parts

The following table describes the various parts of the terminal box.

Name	Description
Power supply / Output signal terminal	• I.OUT+, -: Analog current output and DC power supply terminals
Pulse / Contact output	• PULSE/STATUS OUT+, -: Open-collector pulse output and contact output terminals
External grounding terminal	• Make a one-point grounding at a place as close to this instrument as possible. • The grounding is essential for flow measurement. Improper grounding can cause malfunctions.  *: *The most effective grounding method is direct connection to earth ground with minimal impedance.*
Internal grounding terminal	• If susceptible to noise (during communication), connect one end of the shielded wire to this terminal (Do not connect in normal cases). • Connected inside to the external grounding terminal. When using, take care not to make a two-point grounding.
Output signal line conduit	• Wire the signal line through this port. • Comes with a plastic dust cover if a type number without a waterproof gland is selected. However, it has no waterproof capability. The customer should provide a waterproof gland.

1-3 : Hazardous area approvals and CE-Mark

1-3-1 : Model MTG18A

Combination of FM approval and CSA certification for Division 1 and Division 2

(1) Approval selection code “1”

FM approval

Protection codes

- Explosionproof with intrinsically safe electrodes for Class I, Division 1, Groups A, B, C and D, T4;
- Dustignitionproof for Class II and III, Division 1, Groups E, F and G, T4;

at -20ºC ≤ Tamb ≤ +60ºC

Enclosure rating; Type 4X and IP67

Cautions

- Seal not required
- Electrode circuit is Intrinsically Safe
- Substitution of components may impair Intrinsic Safety
- Control room equipment shall not use or generate in excess of 250Vr.m.s. or DC

Installation

The equipment shall be installed in accordance with the relevant requirements of the National Electrical Code (ANSI/NFPA70).

Grounding

To maintain Intrinsic safety of system connect conductor to earth ground so that it has less than one ohm (1 Ω) to earth ground.

See ANSI/ISA PR12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations for guidance on installation of intrinsically safe apparatus and systems.

CSA certification

Protection codes

- Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III: Input rating 42V dc, 4-20mA. Provides intrinsically safe output to detector sensing electrodes. Enclosure Type 4X/IP67. MWP 3.0 MPa max. Temperature Code T4, Ta = -20ºC to +60ºC

Cautions

- Seal not required
- Cover must be kept tight while circuits are alive
- Warning: Substitution of components may impair intrinsic safety

Installation

The equipment shall be installed in accordance with the relevant requirements of the Canadian Electrical Code, Part I.

(2) Approval selection code “2”

FM approval

Protection codes

- Nonincendive for Class I, Division 2, Groups A, B, C and D, T4;
- Nonincendive for Class I, Zone 2, Group IIC, T4;
- Suitable for Class II and III, Division 2, Groups F and G, T4

at -20ºC ≤ Tamb ≤ +60ºC

Enclosure rating; Type 4X and IP67

Cautions

Control room equipment shall not use or generate in excess of 250Vr.m.s. or DC

Installation

The equipment shall be installed in accordance with the relevant requirements of the National Electrical Code (ANSI/NFPA70).

CSA certification

Protection codes

- Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F, G; Class III:

Input rating 42V dc, 4-20mA. Provides Non-Incendive circuit to sensing electrodes.
Enclosure Type 4X/IP67. MWP 3.0 MPa max. Temperature Code T4, Ta = -20ºC to +60°C

Cautions

- Warning: Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2

Installation

The equipment shall be installed in accordance with the relevant requirements of the Canadian Electrical Code, Part I.

Process fluid temperature and pressure limit for model MTG18A

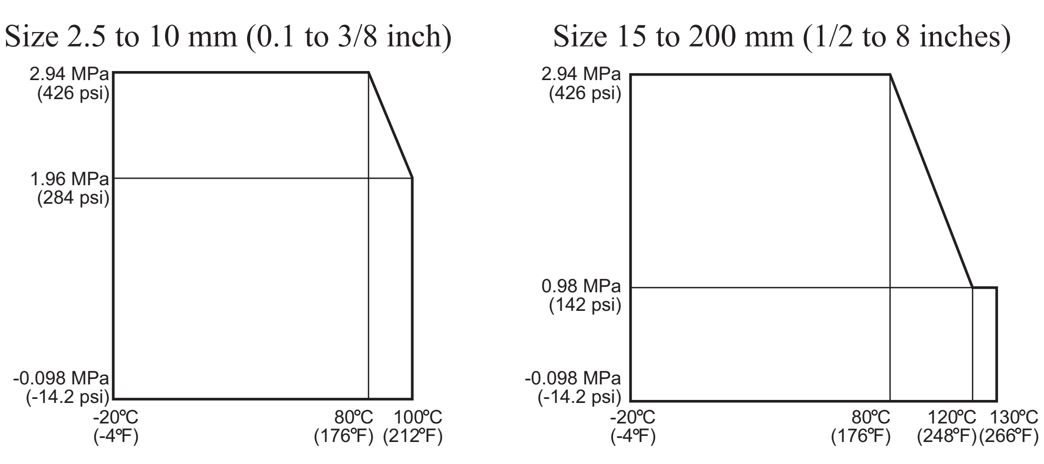


Figure 1-13 Process fluid temperature and pressure limit for model MTG18A

(1) ATEX Type nA Certification (English)

Approval selection code “4”

Marking information

II 3 GD

Ex nA II T6 T135°C at Tprocess: -40 ... +85°C

Ex nA II T5 T135°C at Tprocess: -40 ... +100°C

Ex nA II T4 T135°C at Tprocess: -40 ... +130°C

-40°C ≤ Tamb ≤ +60°C

KEMA 07ATEX0066

IP66/67

Applicable standards

- EN IEC 60079-0 : 2018 Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-15 : 2010 Explosive atmospheres - Part 15: Equipment protection by type of protection “n”
- EN 60079-31 : 2014 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure “t”

Installation instruction for safe use

None

Special conditions for safe use

For the use in the area where Dust ignition protection apparatus is required, electrostatic discharge shall be avoided.

Target model number information

MTG18A-□□□□□□□□□□□□□□4-□□-□

azbil

CED0179, Revision 05
Page: 1 of 1

EU DECLARATION OF CONFORMITY

CE

We declare under our sole responsibility that the following products,

MagneW Neo / MagneW Two-wire PLUS
Smart Two-wire Electromagnetic Flowmeter
Models MTG11A,11B,14C,18A,18B and SMC11

to which this declaration relates, comply with the requirements of the following **Directives** based on the following **harmonized standards.**

No.	Directive:	Harmonized standards:
1	EMC 2014/30/EU	EN 61326-1:2013, EN 61326-2-3:2013
2	ATEX 2014/34/EU	ENIEC60079-0:2018, EN 60079-15:2010, EN 60079-31:2014
3	RoHS 2011/65/EU	EN IEC63000:2018

Details of No. 1
- The models MTG11A,11B,14C and 18A conform with the directive.
- The technical file: CED0180
- The Certificate of Conformity: E9 06 61160 006

Details of No. 2
- The model MTG18A with Approval/Certification Code "4" (ATEX type n) conform with the directive.
- The technical file: AT000145

Details of No. 3
- All models conform with the directive.
- The technical file: AT000084
- The product is classified as Industrial Monitoring and Control Equipment (category 9).

The authorized representative established within the European Community:
Azbil Europe NV
Bosdellestraat 120/2
B - 1933 Zaventem (Sterrebeek)
BELGIUM

The authorized signatory to this declaration, on behalf of the manufacturer, and the responsible person is identified below.

Azbil Corporation

1-12-2 Kawana
Fujisawa-shi, Kanagawa-ken
251-8522 JAPAN

Isamu Ikeda

Isamu Ikeda
Director
Industrial Automation Products
Development Department,
Advanced Automation Company
Issue Date: 30th of September , 20 21

(1) Certification ATEX Type nA (Français)

Code de sélection d'homologation “4”

Information concernant le marquage

II 3 GD

Ex nA II T6 T135°C sous Ttraitement : -40 ... +85°C

Ex nA II T5 T135°C sous Ttraitement : -40 ... +100°C

Ex nA II T4 T135°C sous Ttraitement : -40 ... +130°C

-40°C ≤ Tamb ≤ +60°C

KEMA 07ATEX0066

IP66/67

Normes applicables

- EN IEC 60079-0 : 2018 Atmosphères explosives - Partie 0 : Équipement - Exigences générales
- EN 60079-15 : 2010 Atmosphères explosives - Partie 15 : Protection de l’équipement par type de protection “n”
- EN 60079-31 : 2014 Atmosphères explosives - Partie 31 : Protection de l’équipement contre les explosions dues aux poussières par boîtier “t”

Instruction d'installation pour une utilisation sure

Aucune

Conditions spéciales pour une utilisation sure

En cas d’utilisation dans une zone dans laquelle un appareil de protection contre les explosions dues aux poussières est requis, les décharges électrostatiques doivent être évitées.

Information numéro de modèle cible

MTG18A-□□□□□□□□□□□□□□4-□□-□

azbil

CED0179, Révision 05
Page: 1 sur 1

DÉCLARATION UE DE CONFORMITÉ

CE

Nous déclarons sous notre seule responsabilité que les produits suivants,

MagneW Neo / MagneW Two-wire PLUS
Smart Two-wire Electromagnetic Flowmete
des modèles MTG11A,11B,14C,18A,18B et SMC11

auxquels se réfère cette déclaration, sont conformes aux exigences des **directives** suivantes basées respectivement sur les **normes harmonisées** ci-après.

N°	Directive:	Normes harmonisées:
1	EMC 2014/30/UE	EN 61326-1:2013, EN 61326-2-3:2013
2	ATEX 2014/34/UE	ENIEC60079-0:2018, EN 60079-15:2010, EN 60079-31:2014
3	RoHS 2011/65/UE	EN IEC63000:2018

Détails du N°1
- Les modèles MTG11A,11B,14C et 18A sont conformes à la directive.
- Document technique : CED0180
- L'attestation de conformité: E9 06 61160 006

Détails du N°2
- Le modèle MTG18A dont le code de sélection correspondant au Approbation / Certification "4" (ATEX de type n) est sélectionné
- Document technique : AT000145

Détails du N°3
- Tous les modèles sont conformes à la directive.
- Document technique : AT000084
- L'appareil est un matériel de surveillance et de contrôle classé dans la catégorie 9 à usage industriel.

Le représentant habilité agréé au sein de la communauté européenne est :
Azbil Europe NV
Bosdellestraat 120/2
B - 1933 Zaventem (Sterrebeek)
BELGIQUE

Le signataire autorisé à cette déclaration, au nom du fabricant, et la personne responsable est identifié ci-dessous.

Azbil Corporation

1-12-2 Kawana
Fujisawa-shi, Kanagawa-ken
251-8522 JAPON

Isamu Ikeda
Directeur
Industrial Automation Products
Development Department,
Advanced Automation Company
Fait le: 30/9 , 20 21

(1) ATEX Type nA Bescheinigung (Deutsch)

Genehmigungswahl Kode “4”

Kennzeichnungsinformationen

II 3 GD

Ex nA II T6 T135°C bij Tprocess: -40 ... +85°C

Ex nA II T5 T135°C bij Tprocess: -40 ... +100°C

Ex nA II T4 T135°C bij Tprocess: - 40 ... + 130°C

- 40°C ≤ Tamb ≤ + 60°C

KEMA 07ATEX0066

IP66/67

Gültige Normen

- EN IEC 60079-0 : 2018 Explosionsgefährdete Bereiche – Teil 0: Geräte – Allgemeine Anforderungen
- EN 60079-15 : 2010 Explosionsgefährdete Bereiche – Teil 15: Geräteschutz nach Schutzart “n”
- EN 60079-31 : 2014 Explosionsgefährdete Bereiche – Teil 31: Anlagenschutz gegen Staubentzündung durch Gehäuse “t”

Installationsanleitungen für sicheren Gebrauch

Keine

Spezielle Bedingungen für den sicheren Gebrauch

Bei Verwendung in Zonen, wo ein staubexplosionsgeschütztes Gerät verwendet werden muss, muss elektrostatische Entladung vermieden werden.

Information zur Zielmodellnummer

MTG18A-□□□□□□□□□□□□□4-□□-□

CED0179, Überarbeitung 05
Seite: 1 von 1

EU-KONFORMITÄTSERKLÄRUNG

Wir erklären in alleiniger Verantwortung, dass folgende Produkte,

MagneW Neo / MagneW Two-wire PLUS
Smart Two-wire Electromagnetic Flowmeter
Modelle MTG11A,11B,14C,18A,18B und SMC11

auf welche diese Erklärung Bezug nimmt, mit den Anforderungen der folgenden **Richtlinien** jeweils auf Basis der folgenden **harmonisierten Normen** konform sind.

Nr.	Richtlinie:	harmonisierten Normen:
1	EMV 2014/30/EU	EN 61326-1:2013, EN 61326-2-3:2013
2	ATEX 2014/34/EU	ENIEC60079-0:2018, EN 60079-15:2010, EN 60079-31:2014
3	RoHS 2011/65/EU	EN IEC63000:2018

Details von Nr. 1
- Die Modelle 11A,11B,14C und 18A sind mit der Richtlinie konform.
- Die technischen Unterlagen: CED0180
- Die Konformitätsbescheinigung: E9 06 61160 006

Details von Nr. 2
- Die Modell MTG18A, für welche der Auswahlcode für Zulassung / Zertifizierung "4"
- (ATEX Typ n) gewählt ist.
- Die technischen Unterlagen: AT000145

Details von Nr. 3
- Alle Modelle sind mit der Richtlinie konform.
- Die technischen Unterlagen: AT000084
- Bei dem Produkt handelt es sich um ein Überwachungs- und Kontrollgerät der Kategorie 9 für den industriellen Einsatz.

Die autorisierte, in der Europäischen Union ansässige Vertretung ist:
Azbil Europe NV
Bosdellestraat 120/2
B - 1933 Zaventem (Sterrebeek)
BELGIEN

Der Prokurist dieser Erklärung, im Namen des Herstellers, und die verantwortliche Person ist unten angegeben.

Azbil Corporation

1-12-2 Kawana
Fujisawa-shi, Kanagawa-ken
251-8522 JAPAN

Isamu Ikeda
Director
Industrial Automation Products
Development Department,
Advanced Automation Company
Ausstellungsdatum: 30/9 , 20 21

(1) Certificación ATEX Tipo nA (Español)

Código de selección de aprobación “4”

Información de Marca

II 3 GD

Ex nA II T6 T135°C en Tproceso : -40 ... +85°C

Ex nA II T5 T135°C en Tproceso: -40 ... +100°C

Ex nA II T4 T135°C en Tproceso : -40 ... +130°C

- 40°C ≤ Tamb ≤ + 60°C

KEMA 07ATEX0066

IP66/67

Estándares aplicables

- EN IEC 60079-0 : 2018 Ambiente explosivo - Parte 0: Equipo - Requisitos generales
- EN 60079-15 : 2010 Ambiente explosivo - Parte 15: Protección del equipo por tipo de protección “n”
- EN 60079-31 : 2014 Ambiente explosivo - Parte 31: Protección contra ignición de polvo del equipo mediante cierre “t”

Instrucción de instalación para el uso seguro

No existen

Condiciones especiales para el uso seguro

Para su uso en áreas en las que se requiere un aparato de protección contra ignición de polvo, se deberán evitar posibles descargas electrostáticas.

Información del número del modelo de destino

MTG18A-□□□□□□□□□□□□□4-□□-□

azbil

CED0179, Repaso 05
Página: 1 de 1

DECLARACIÓN UE DE CONFORMIDAD

Declaramos bajo nuestra única responsabilidad que los productos siguientes,

MagneW Neo / MagneW Two-wire PLUS
Smart Two-wire Electromagnetic Flowmeter
Modelos MTG11A,11B,14C,18A,18B y SMC11

a los cuales se relaciona esta declaración, cumplen con los requisitos de las siguientes **Directivas,** basados en los siguientes **normas armonizadas**, respectivamente:

Nº	Directiva:	Normas armonizadas:
1	EMC 2014/30/UE	EN 61326-1:2013 , EN 61326-2-3:2013
2	ATEX 2014/30/UE	ENIEC60079-0:2018, EN 60079-15:2010, EN 60079-31:2014
3	RoHS 2011/65/UE	EN IEC63000:2018

Detalles del nº1
- Los modelos MTG11A,11B,14C y 18A cumplen con la directiva.
- El documento técnico: CED0180
- El certificado de conformidad: E9 06 61160 006

Detalles del nº2
- El modelo MTG18A con código de aprobación / certificación de "4" (ATEX tipo n) cumplen con la directiva
- El documento técnico: AT000145

Detalles del nº3
- Todos los modelos cumplen con la directiva.
- El documento técnico: AT000084
- El producto es el equipo de monitoreo y control clasificado con la categoría 9 para uso industrial.

El representante autorizado en la Comunidad Europea es:
Azbil Europe NV
Bosdellestraat 120/2
B - 1933 Zaventem (Sterrebeek)
BÉLGICA

El firmante autorizado a esta declaración, en nombre del fabricante, y la persona responsable se identifican a continuación.

Azbil Corporation

1-12-2 Kawana
Fujisawa-shi, Kanagawa-ken
251-8522 JAPÓN

Isamu Ikeda
Directora
Industrial Automation Products/ Industrial Development Department,
Advanced Automation Company

Fecha de emisión: 30/9 , 20 21

(1) Certificazione ATEX tipo nA (Italiano)

Codice di selezione di approvazione “4”

Marchi informativi

II 3 GD

Ex nA II T6 T135°C a Tprocess: -40 ... +85°C

Ex nA II T5 T135°C a Tprocess : -40 ... +100°C

Ex nA II T4 T135°C a Tprocess : -40 ... +130°C

- 40°C ≤ Tamb ≤ + 60°C

KEMA 07ATEX0066

IP66/67

Standard applicabili

- EN IEC 60079-0 : 2018 Atmosfere esplosive - Parte 0: Apparecchiatura - requisiti generali
- EN 60079-15 : 2010 Atmosfere esplosive - Parte 15: Protezione dell’apparecchiatura mediante tipo di protezione “n”
- EN 60079-31 : 2014 Atmosfere esplosive - Parte 31: Protezione dell’apparecchiatura da polveri combustibili mediante involucro “t”

Istruzioni di installazione per un uso sicuro

Nessuna

Condizioni speciali per un uso sicuro

In caso di utilizzo in un’area in cui è richiesto un apparecchio con protezione da polveri combustibili, si devono evitare le scariche elettrostatiche.

Informazioni sul numero di modello target

MTG18A-□□□□□□□□□□□□□4-□□-□

azbil

CED00179, Revisione 05
Pagina: 1 di 1

DICHIARAZIONE UE DI CONFORMITA'

CE

Noi dichiariamo, sotto la propria esclusiva responsabilità, che i seguenti prodotti,

MagneW Neo / MagneW Two-wire PLUS
Smart Two-wire Electromagnetic Flowmeter
Modelli MTG11A,11B,14C,18A,18B e SMC11

a cui si riferisce la dichiarazione, risultano in conformità ai requisiti previsti dalle seguenti **Direttive** basate sui seguenti **standard armonizzati**.

N.	Direttive:	Standard armonizzati:
1	EMC 2014/30/UE	EN 61326-1:2013 , EN 61326-2-3:2013
2	ATEX 2014/34/UE	ENIEC60079-0:2018, EN 60079-15:2010, EN 60079-31:2014
3	RoHS 2011/65/UE	EN IEC63000:2018

Dettagli di N.1
- I modelli MTG11A,11B,14C e 18A sono conformi alla direttiva
- La documentazione tecnica: CED0180
- Il Certificato di Conformità: E9 06 61160 006

Dettagli di N.2
- I modello MTG18A con codice di approvazione / certificazione "4" (ATEX tipo n) sono conformi alla direttiva.
- La documentazione tecnica: AT000145

Dettagli di N.3
- Tutti i modelli sono conformi alla direttiva
- La documentazione tecnica: AT000084
- Il prodotto è l'apparecchiatura di monitoraggio e controllo classificata con la categoria 9 per uso industrial.

Il rappresentante autorizzato stabilito all'interno della Comunità Europea:
Azbil Europe NV
Bosdellestraat 120/2
B - 1933 Zaventem (Sterrebeek)
BELGIO

Il firmatario autorizzato alla dichiarazione, per conto del fabbricante, e la persona responsabile è identificata qui di seguito.

Azbil Corporation

1-12-2 Kawana
Fujisawa-shi, Kanagawa-ken
251-8522 Giappone

Isamu Ikeda
Direttore
Industrial Automation Products
Development Department,
Advanced Automation Company
Data di Emissione: 30/9 , 20 21

(1) NEPSI Ex ec and Ex tb Certification

1．标志资讯

GYJ22.1841X

Ex ec IIC T6 Gc; Ex tb IIIC T135 ℃ Db

Ex ec IIC T5 Gc; Ex tb IIIC T135 ℃ Db

Ex ec IIC T4 Gc; Ex tb IIIC T135 ℃ Db

-40 ℃ ≤ Tamb ≤ +60 ℃ IP 67

2．适用的标准

-GB/T 3836.1-2021

-GB/T 3836.3-2021

-GB/T 3836.31-2021

3．产品安全使用特殊条件

防爆合格证号后缀“X”表明产品具有安全使用特殊条件，具体内容如下：

1．现场使用时，应采取措施以防额定电压因瞬态干扰超过40 %。

2．产品使用环境温度范围：-40 ℃～＋60 ℃。

4．产品使用注意事项

1．产品温度组别与最高允许介质温度的关系如下表所示：

温度组别	最高介质温度
T6	85 ℃
T5	100 ℃
T4/T135 ℃	130 ℃

2．产品额定电压：42 V。

3．现场安装时，电缆引入口须选用国家指定的防爆检验机构检验认可、与使用场所相适宜的电缆引入装置或堵封件，冗余电缆引入口须用堵封件有效封堵。电缆引入装置安装后，须确保设备整体外壳防护等级不低于IP67。

4．现场使用和维护时，必须遵循“严禁带电开盖”的原则。

5．可燃性粉尘环境使用时，需采取有效措施清洁产品外壳以避免粉尘堆积，但严禁使用压缩空气吹扫。

6．安装现场不应存在对铝合金有腐蚀作用的有害气体。

7．产品外壳设有接地端子，用户在安装使用时应可靠接地。

8．用户不得自行更换该产品的元器件及零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。

9．产品的安装、使用和维护应同时遵守产品说明书及下列相关标准、规范的要求：

GB/T 3836.13–2021 爆炸性环境 第13 部分：设备的修理、检修、修复和改造

GB/T 3836.15–2017 爆炸性环境 第15 部分：电气装置的设计、选型和安装

GB/T 3836.16–2017 爆炸性环境 第16 部分：电气装置的检查与维护

GB 50257–2014 电气装置安装工程爆炸和火灾危险环境 电气装置施工及验收规范

GB 15577–2018 粉尘防爆安全规程

1-3-2 : MTG18B and MTG14C

FM approval with remote models MTG18B (detector) and MTG14C (converter)

Approval selection code “2”

Protection Codes

Model MTG18B:

- Nonincendive for Class I, Division 2, Groups A, B, C and D, T4; Suitable for Class II, Division 2, Groups F and G, Class III, T4; Ta = 60°C; Control drawing 80391906; Type 4X, IP67
- Nonincendive for Class I, Zone 2, IIC, T4 Ta = 60°C; Control drawing 80391906; Type 4X, IP67

Model MTG14C:

- Nonincendive for Class I, Division 2, Groups A, B, C and D, T4; Suitable for Class II, Division 2, Groups F and G, Class III, T4; Ta = 60°C; Control drawing 80391906; Nonincendive Field Wiring; Type 4X, IP67
- Nonincendive for Class I, Zone 2, IIC, T4 Ta = 60ºC; Control drawing 80391906; Nonincendive Field Wiring; Type 4X, IP67
- Nonincendive Field Wiring Parameters:

Terminals	Vmax	Imax	Ci	Li
Iout+, Iout-	42V	22 mA	0.016 µF	0
Pulse/Status out +, Pulse/Status out -	30V	100 mA	0	0

Special condition of use

Model MTG18B:

- The model MTG18B shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application including access only by the use of tool.
- The process liquid flowing through the model MTG18B must be non-flammable.

Model MTG14C:

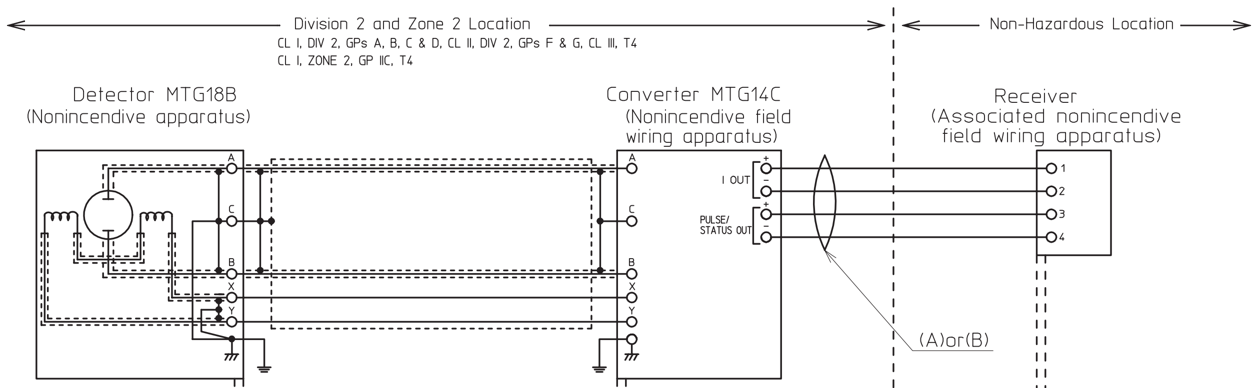
- The model MTG14C shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application including access only by the use of tool.
- The model MTG14C may only be used with the model MTG18B.

Installation

- Installations shall comply with the relevant requirements of the Nation Electrical Code (ANSI/NFPA70).
- Regarding the detailed equipment enclosure requirements, refer to the ANSI/ISA S82.01 or other applicable ordinary location standards

80391906
図番 DWG.NO.

改番 REV.	来 RECORD	歴 DATE	担当 BY	検閲 APPD.
1	Revised	2004-8-3		
2	Revised	2004-8-25		
3	Revised	2004-9-23		
4	Revised	2004-10-1		



● FLUID BEING MESURED MUST BE NON-FLAMMABLE.

● Wiring Methods for Div.2 locations except Nonincendive Field Wiring
[see the National Electrical Code (NEC), 501.4(B)(1), (2), (4) for Class I; 502.4(B)(1), (2), (4) for Class II; 503.3(B) for Class III]
Both the housings of the detector and the converter are provided with threaded entries for 1/2 NPT.

● (A) Wiring Methods for Div.2 locations except Nonincendive Field Wiring
[see the National Electrical Code (NEC), 501.4(B)(1), (2), (4) for Class I; 502.4(B)(1), (2), (4) for Class II; 503.3(B) for Class III]

● (B) Nonincendive Field Wiring
[see NEC, 501.4(B)(3) for Class I; 502.4(B)(3) for Class II]
The entity parameters of nonincendive field wiring appatus are as shown below:

Terminals I OUT+, I OUT-:
Vmax=42V, Imax=22mA,
Ci=0.016 μF, Li=0.

Terminals PULSE/STATUS OUT+,
PLUS/STATUS OUT-:
Vmax=30V, Imax=100mA,
Ci=0, Li=0.

● Division 2 and Zone 2 installation

The nonincendive field wiring circuit concept allows the inter-connection of nonincendive field wiring apparatus, with associated nonincendive field wiring apparatus, using any of the wiring methods permitted for unclassified locations.

The nonincendive field wiring is established under the following conditions:

Vmax ≥ Voc or Vt,
Ca ≥ Ci + Ccable,
La ≥ Li + Lcable.

NOTE: Imax is not required and need not be aligned with Isc or It of the associated nonincendive field wiring apparatus because the converter provides the outputs with the current controlled circuit.

● Associated nonincendive field wiring apparatus is not permitted to use or generate more than 250V r.m.s.

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MW

記入のない許容差 TOLERANCE UNLESS NOTED ~
材料 MATERIAL ~
表面粗さ SURFACE ROUGHNESS ~
鋭角除去 CHAMFER ~
処理 TREATMENT/FINISH ~
尺度 SCALE

設計 DR.	04-7-2	- -
検図 CHK.	04-7-2	04-7-2
認可 APPD.	04-7-2	04-7-2

組立図 ASS'Y ~
名称 TITLE
Installation Drawing
FM
図番 DWG.NO. 80391906
改番 REV. 04
シート SHT.
A3

CSA certification with remote models MTG18B (detector) and MTG14C (converter)

Approval selection code “2”

Protection codes

Model MTG18B:
Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F, G; Class III:

- Supply rated 42V, 22mA max. and 30V, 100mA.
- Enclosure rating Type 4X (IP67 rating tested to IEC 60529)
- Temperature Code T4, Ta = -20ºC to +60ºC

Model MTG14C:
Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F, G; Class III:

- Enclosure rating Type 4X (IP67 rating tested to IEC 60529)
- Temperature Code T4, Ta = -20ºC to +60ºC

Warnings

Model MTG18B:
Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Model MTG14C:
Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

Installation

Installations shall comply with the relevant requirements of the Canadian Electrical Code, Part I.

Process fluid temperature and pressure limit for model MTG18B

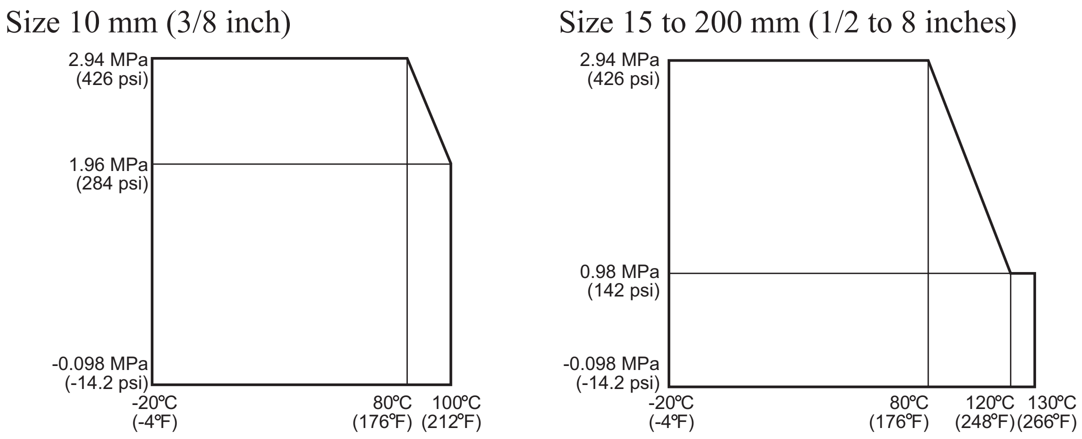


Figure 1-14 Process fluid temperature and pressure limit for model MTG18B

1-3-3 : European Pressure Equipment Directive (2014/68/EU)

The detector of this product is subject to the European Pressure Equipment Directive (PED).

Article 4 of the PED differentiates pressure equipment according to the degree of danger.

The maximum allowable pressure of this product is stated in the specification sheet (No. SS2-MTG300-0100). Note, however, that because this product is designed and manufactured in accordance with sound engineering practice (SEP) as described in article 4, section 3 of the PED, there are restrictions on the pressure range when this product is used in a country where PED is applicable.

Determine the maximum allowable pressure by checking the following items.

(1) Hazard group of the fluid

Check the group of the fluid according to Article 13 of the PED.

- Group 1: Hazardous fluids
- Group 2: Non-hazardous fluids

(2) Vapor pressure at the maximum allowable temperature of the measured fluid

Check the applicable category, (i) or (ii).

(i) Liquid whose vapor pressure at the maximum allowable temperature is greater than 0.5 bar above normal atmospheric pressure (1013 mbar)

(ii) Liquid having a vapor pressure at the maximum allowable temperature of not more than 0.5 bar above normal atmospheric pressure (1013 mbar)

(3) Nominal size (DN) of the electromagnetic flowmeter

Check the nominal size of the flowmeter.

(4) Maximum allowable pressure for equipment designed by SEP.

In table 1-1, find the cell where the results of (1), (2), and (3) meet.

“Tables 6–9” shown in table 1-1 below are taken from article 4 and annex II of the PED.

(5) Maximum pressure

Whichever of the pressures below is the lowest is the applicable pressure.

- Maximum pressure for this product: see specification sheet No. SS2-MTG300-0100
- Maximum pressure for SEP equipment defined by the PED: See (4) above
- Maximum pressure for the flange: see the applicable standard

Table 1-1 Maximum allowable pressure for SEP products

(1) Fluid group		Group 1		Group 2		Group 1		Group 2	
(2) Vapor pressure		(i)		(i)		(ii)		(ii)	
PED table		Table 6		Table 7		Table 8		Table 9	
(3) Nominal size (DN)		(4) Maximum allowable pressure							
	mm	bar	MPa	bar	MPa	bar	MPa	bar	MPa
	2.5	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
	5	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
	10	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
	15	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
	25	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
	40	0.5	0.05	25.0	2.50	No limit	No limit	No limit	No limit
	50	0.5	0.05	20.0	2.00	No limit	No limit	No limit	No limit
	65	0.5	0.05	15.3	1.53	No limit	No limit	No limit	No limit
	80	0.5	0.05	12.5	1.25	25.0	2.50	No limit	No limit
	100	0.5	0.05	10.0	1.00	20.0	2.00	No limit	No limit
	125	0.5	0.05	8.0	0.80	16.0	1.60	No limit	No limit
	150	0.5	0.05	6.6	0.66	13.3	1.33	No limit	No limit
	200	0.5	0.05	5.0	0.50	10.0	1.00	No limit	No limit

MEMO

Chapter 2 : Instrument installation

Outline of this chapter

This chapter describes the instrument installation procedures.

The necessary components and installing methods depend on the grounding ring material and installed pipe material.

The description proceeds in the following order:

- Criteria for selecting an installation environment
- Outline of installation method of the instrument
- Material wise detailed installation methods

2-1 : Before installation

Criteria for installation location (1)

Introduction

To bring out the performance of this instrument to the maximum, choose the optimum installation location according to the following criteria for installation location.

Cautions on surrounding environment

- **Install at a place where the ambient temperature is in the range from -4°F to +140°F (-20°C to +60°C) and ambient humidity in the range from 10 to 90% RH. Otherwise, instrument failure or output errors may result.**
- **Avoid a place close to a large-current cable, motor or transformer that may bring about inductive interferences. Otherwise, instrument failure or output errors may result.**
- **Avoid a place where there are severe vibrations or a highly corrosive atmosphere. Otherwise, a broken detector or damaged instrument may result.**
- **Avoid a place exposed to direct sunlight. Otherwise, output errors may result.**

Cautions on measured fluid

As to the measured fluid, the installation location must satisfy the following conditions to avoid output errors and fluctuations.

- **The electrical conductivity of the fluid to be measured must match the stated specifications (specs vary according to converter used) and should be more or less constant.**
- **The fluid to be measured must be electro chemically homogenized. For example, if two fluids are mixed at an upstream a point, the device should be installed at a point so that the two fluid can be evenly mixed by the time they reach the measuring point.**
- **If an ingredient or additive is mixed in, the ingredient distribution must be nearly uniform or homogeneous.**
- **For the accurate flow measurement, verify the zero point value in each excitation current (Manual zero1, manual zero2, and manual zero3) by using manual zero function, if the normal flow velocity is less than 0.3 m/s (0.98 ft/s).**
- **For the following fluids, do not use this instrument even if the electric conductivity, temperature, pressure and others are within the instrument specifications because they can cause problems in measurement.**
  (1) Fluids that have sufficient conductivity at high temperatures, but do not satisfy the conductivity requirement at room temperature (about 68°F (20°C)). (For example, fatty acids and soap)
  (2) Certain fluids that contain surfactant (For example, rinse, shampoo and CWM)
  (3) Insulating adhesive materials (For example, oil, kaolinite, kaolin, calcium stearate)

(4) Slurry fluids containing solid matter (For example, pulp slurry, mud slurry, cement slurry)

Caution On PLC Connection

A circuit in some PLC may affect the flow measurement and the analog output may fluctuate.
In this case, make sure that the both PLC and the MTG flowmeter are properly grounded. Proper grounding solves the fluctuation problem.

Cautions after installation

CAUTION

(1) After installation, do not use this instrument as a foothold or any others improper purpose. Going so may result in damage to the instrument and/or physical injury.

(2) The integral type of this instrument uses gland for the converter window. Hitting the glass position of the indicator with a tool may break the glass and/or cause physical injury.

WARNING

(1) Before removing this unit, confirm that there is no residual liquid or pressure inside the piping and the detector to avoid personal injury on damage to the unit.

- The output signal or indication may fluctuate depending on pulsation or other conditions of the fluid. In such cases, increase the damping time constant or take some other measure.
- The analog output may fluctuate due to flow noise, which is generated by the process fluid flow. In such a case, connect the upstream grounding ring to the downstream grounding ring by a wire. The output fluctuation may be reduced.
- Keep any transceiver with a transmission frequency of 470 MHz away from the cable because it may affect the output.

Criteria for installation location (2)

Installed position

Install the instrument at a place where the measured fluid always fills inside the detector. An example of installation is shown in the figure below to illustrate this condition.

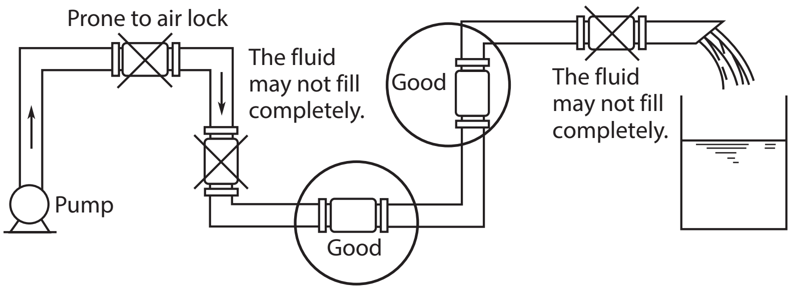


Figure 2-1 Example of installation

~Note

- ***The detector must be positioned as shown by the circled areas in the figure shown above. If the pipe is not filled output errors will occur.***
- *If the measured fluid is highly viscous, we recommend installing the instrument on a vertical pipe, in order to secure an axial symmetrical flow.*
- *Install a straight pipe section on the upstream side of the detector. For the straight section length, see the figure below.*

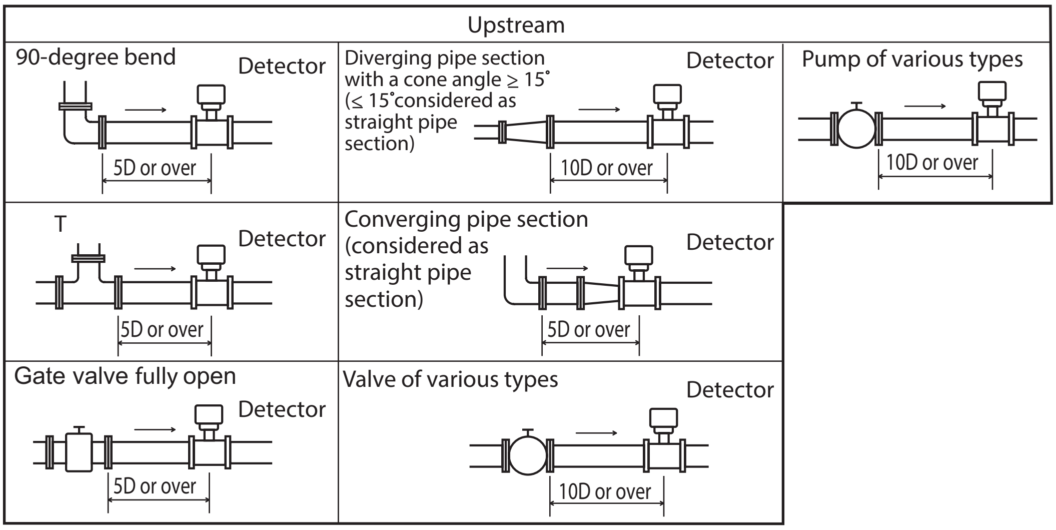


Figure 2-2 Straight pipe section upstream of detector (D: Nominal detector bore diameter)

- No straight pipe section is basically needed on the downstream side. However, ensure 2D or over if influences of drift are foreseen.
- Select an installation location where there is no major flow pulsation or vibration (away from a pump)
- Ensure adequate maintenance space.

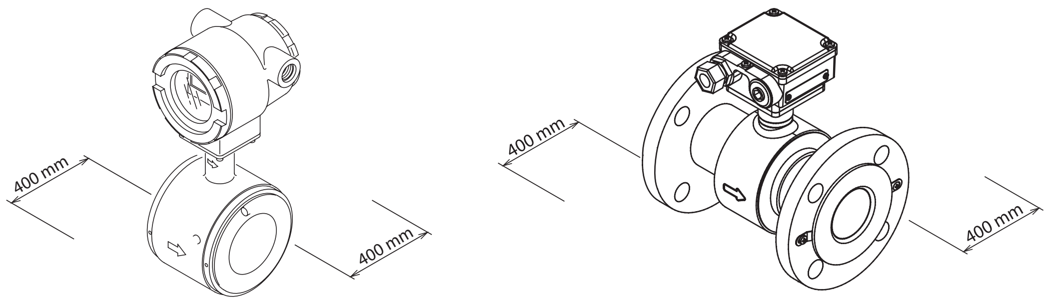


Figure 2-3 Maintenance space

Method of changing the direction of converter

In some location, the direction of the converter may be unsuitable if the detector is installed as it was shipped. In this case, the converter can be repositioned before installation.

The direction of the detector and the converter (integral type) can be changed using the procedure described below.

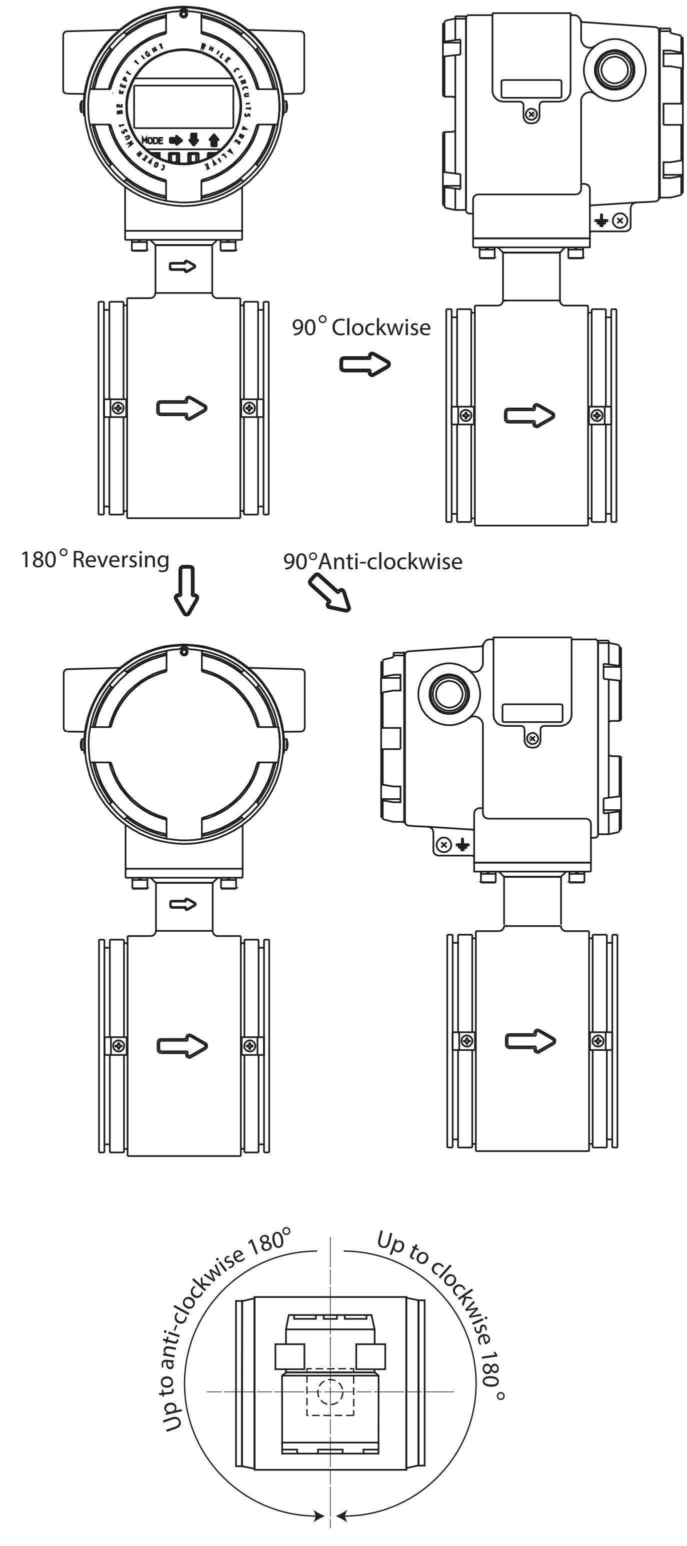


Figure 2-4 Change the direction of converter

Step	Procedure
1	Turn off the power supply (with a breaker etc.) of the converter.
2	Using an M5 wrench remove the four screws securing the converter to the detector. **~Note** ***After removing the screws and when changing the orientation of the detector and the converter. Ensure caution not to apply any force or load to the cable and the connectors. Failure to do so might cause damage to the cable, connector, printed circuit board or cause open circuit and malfunctions.***
3	Decides the direction between the detector and the converter. **~Note** ***Do not twist the cable when the connected cable between the detector and the converter rotate. Damage might cause connector and it cause the open circuit etc. of wiring.***
4	Tightens the four set screw (The tightening torque: 4.4 N•m ±15%). It tighten four screws in the diagonal, and four screws must tighten almost evenly. Moreover, note that there is possibility to bites the dust into the tapped hole after tightening work in the place with dust.

~Note

- ***Disconnect all cables before proceeding to change the orientation of the detector and the converter.***
- ***Do not perform the orientation change in locations containing humidity and dust.***
- ***During reassembly check the sealing surface and the condition of the O-ring for any damage.***

Changing the direction of display/data setting device

Changing the display / data setting device direction

The display / data setting device can be repositioned to a horizontal or vertical direction.

Step	Procedure
1	Turn off the power supply (with a breaker etc.) of the converter
2	The converter front cover is fixed by hexagon socket head setscrews (M3). Loosen the setscrews with an Allen wrench (1.5).
3	Remove the converter front cover by turning it counterclockwise with the dedicated tool. **~Note** ***Remove the front cover straight towards you with care.***
4	The display / data setting device is fixed by three screws. Remove these screws. **~Note** ***The screws are not captive to the display / data setting device, so take care not to drop them.***
5	Remove the display / data setting device. **~Note** ***A cable is attached to the rear side of the display / data setting device. This cable is connected to the connector on the converter proper.***
6	Turn the display / data setting device to the desired direction and align it to the threaded holes in the converter proper. **~Note** ***Sets the direction of the display/data setting unit in a movable range in Figure 2-6.***
7	Fix the display / data setting device again using the three screws. When tightening the screws, take care not to entangle the cable.
8	Attach the front cover. **~Note** ***Take care not to injure your fingers by the cover edge or the thread in the case.***

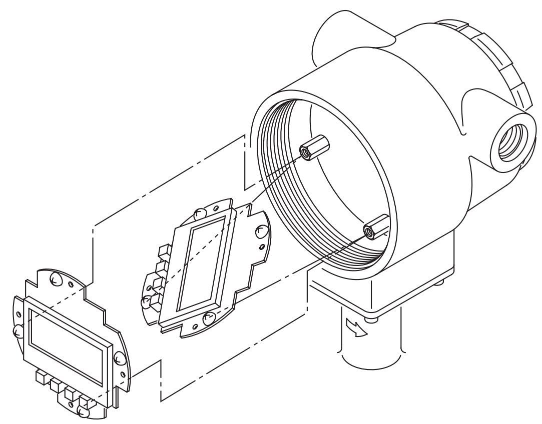


Figure 2-5 Changing the display / data setting device direction

Movable range of display/data setting device

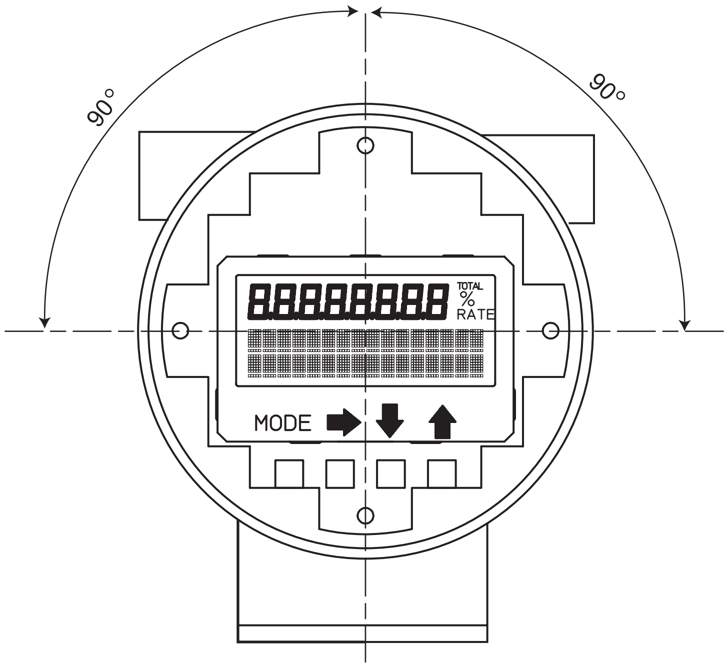


Figure 2-6 Movable range of display/data setting device

~Note ***Do not unpack the flowmeter in a location containing high humidity, corrosive gas atmosphere and dusty. There is an effect of preventing injury by static electricity when working to be near to prevent and internal element being damaged by static electricity when touches an internal display board after it lightly touches the metal structure (However, it should be grounded).***

Wiring connection distance of remote-type converter and detector

When installing the converter and the detector, there is limitation on the cable length by the conductivity of the fluid to be measured and the diameter of the detector.
Select the wiring distance (cable length) after confirming the following specification.
Use our special cable (model SMC11) for the wiring between the converter and the detector.

For the diameter 10 mm or 15 mm

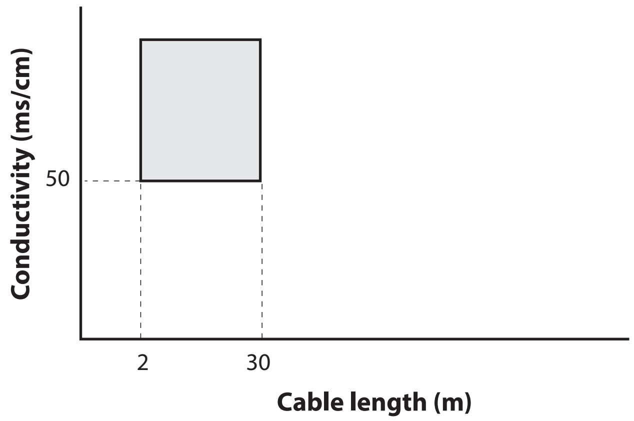


Figure 2-7 Cable length (m) between converter and detector

For the diameter 25 mm or more

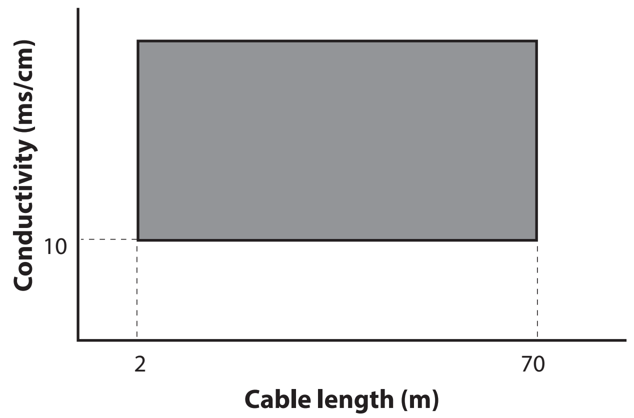


Figure 2-8 Cable length (m) between converter and detector

2-2 : Installation method

2-2-1 : Installing a wafer type detector

Basic installation

Introduction

Process connection of the instrument are wafer type, flange type, union, hose, or clamp unit. Referring to the appropriate method of installation, install the unit properly.

Installation example

Figure 2-9 shows the basic method for installing the device.

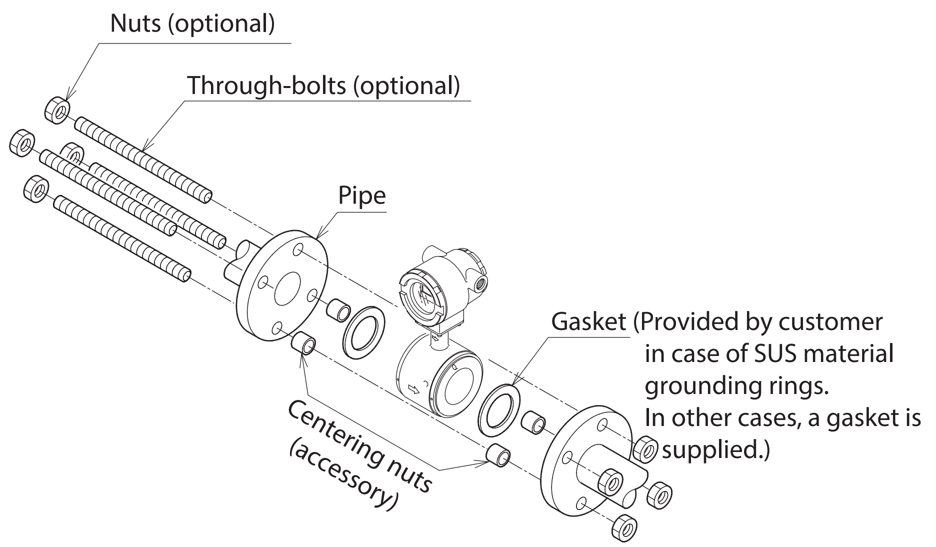


Figure 2-9 Device installation example

CAUTION

Be careful in handling this unit. It is heavy, dropping it accidentally could cause injury.

Fastening torque

CAUTION

Table 2-1 shows the fastening torque for each pipe bore. Using centering hardware, apply the prescribed fastening torque to prevent any liquid leak from the pipe.

Table 2-1 Fastening torque

Diameter and flange ratings		Fastening torque N•m (kgf•cm)*	
25 mm (1 inch)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	21 to 31 21 to 32 11 to 17 22 to 34	(214 to 316)* (214 to 326)* (112 to 173)* (224 to 347)*
40 mm (1½ inch)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	22 to 32 22 to 34 13 to 18 36 to 57	(224 to 326)* (224 to 347)* (132 to 184)* (367 to 581)*
50 mm (2 inches)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	24 to 34 19 to 31 23 to 32 20 to 32	(245 to 347)* (194 to 316)* (235 to 326)* (204 to 326)*
65 mm (2½ inches)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	20 to 31 37 to 61 26 to 35 37 to 57	(204 to 316)* (377 to 622)* (265 to 357)* (377 to 581)*
80 mm (3 inches)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	20 to 31 37 to 61 26 to 35 37 to 57	(204 to 316)* (377 to 622)* (265 to 357)* (377 to 581)*
100 mm (4 inches)	JIS 10K JIS 20K ANSI/JPI 150 ANSI/JPI 300	22 to 33 41 to 66 21 to 31 43 to 66	(224 to 337)* (418 to 673)* (214 to 316)* (439 to 673)*

Flange shape

The flanges used should be such that the area of contact with the gasket is maximized, as shown in Figure 2-10.

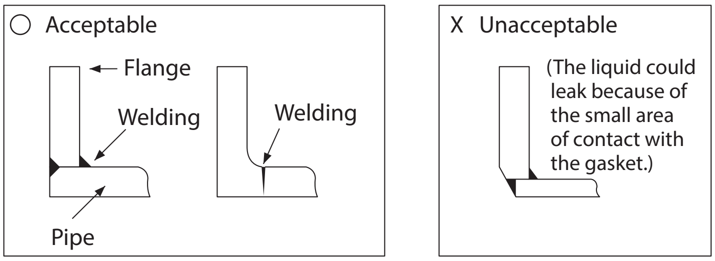


Figure 2-10 Flange shape

~Note

- ***Before installing the detector be sure to flush out any foreign matter that may be present inside the detector. Residual foreign matter could cause output fluctuations.***
- ***Do not touch the electrodes by your hand or waste cloth with oil. It could cause output fluctuations.***
- ***Install the detector in accordance with the flow direction mark on the detector with the direction of the liquid flow. Misalignment could result in a negative output.***

CAUTION

Before installing the detector make sure that the pipe is exactly straight and centered. Any irregularity in these respects could cause leakage or other hazards.

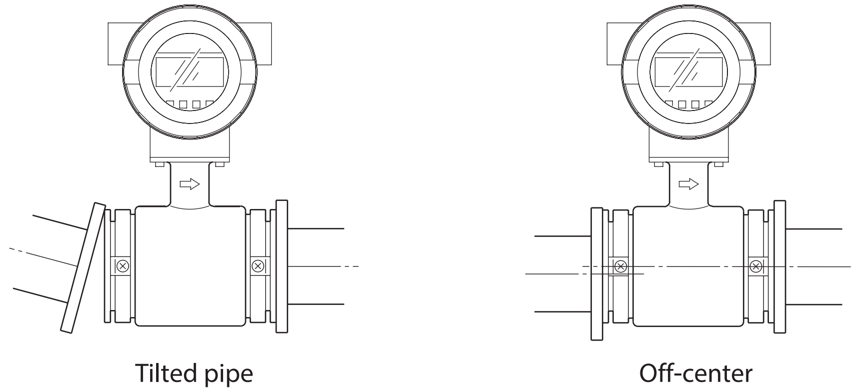


Figure 2-11 Examples of unacceptable installations (1)

~Note ***Never attempt to force the detector between two piping flanges when the space is too narrow. It can damage the detector.***

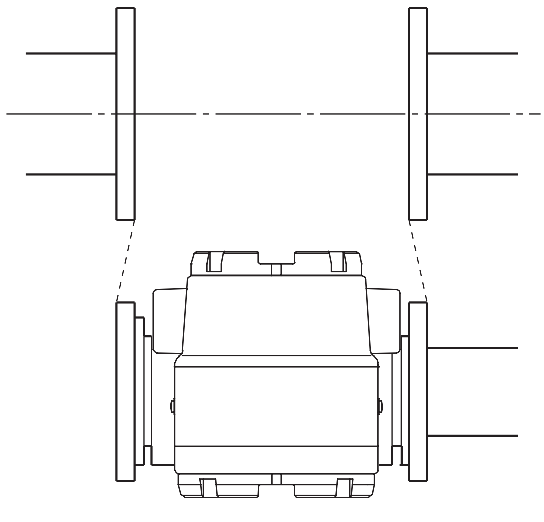


Figure 2-12 Examples of unacceptable installations (2)

WARNING

Ensure the bore diameters of the pipe and the detector are exactly the same, install the detector so that the gasket does not protrude into the internal bore of the pipe, as this could result in leakage or other hazards.

~Note ***Tighten each bolt a little at a time and apply uniform torque to all the bolts. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then tighten each bolt little by little. Install the detector carefully and ensure continue to that the fastening torque does not exceed the prescribed limit, otherwise the detector could be damaged.***

Accessory parts for installation

Introduction

The following parts are necessary for the installation of the detector:

- Centering nuts (standard accessory: 4 pcs.)
- Through bolts and nuts (option)
- Gaskets: Gaskets are to be provided by the customer when using grounding rings made of SUS material.
  Gasket are supplied as a standard accessory, when using gro unding rings made of hastelloy, titanium, tantallum, or platinum.
- Protective plate: Required when connecting the detector to polyvinyl chloride (PVC) piping

Centering nuts

To install the detector, use centering nuts to ensure the exact center line alignment of the pipe and the detector.

Slip the centering nuts onto the through-bolts, and set the detector on top of the nuts so that the nuts are on four sides of the detector.

The positions of the centering nuts depend on the direction in which the detector is installed.

For the positions of the centering nuts, refer to Figure 2-13 and Figure 2-14.

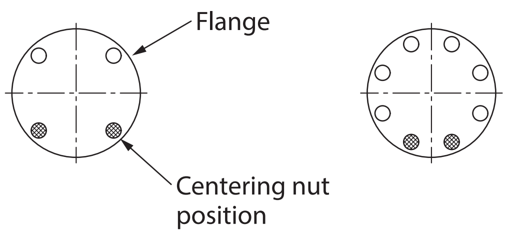


Figure 2-13 Horizontal centering of the detector (Position two centering nuts against each flange)

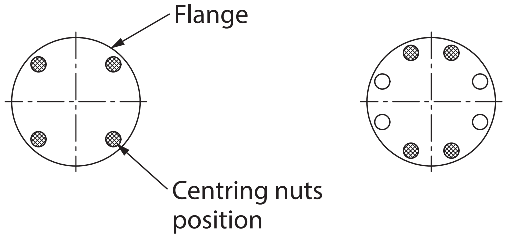


Figure 2-14 Vertical centering of the detector (Position the four centering nuts on the bottom flange)

Gaskets

Gaskets are supplied with the grounding ring as standard accessory, except when it is made of SUS material. Secure gaskets when you use a grounding ring made of SUS material. We recommend gasket material such as joint sheet or PTFE. For the internal diameters of the gaskets, refer to Table 2-2. We do not recommend the use of rubber gaskets. Observe the precautions below.

~Note

- ***A gasket with too small internal diameter may generate turbulent flow, resulting in inaccurate measurements.***
- ***A gasket with too large internal diameter may cause leakage. Also, any solid substance in the fluid to be measured could accumulate between the gasket and the flange, resulting in inaccurate measurements.***

Table 2-2 Recommended internal diameters of gaskets

(Unit: mm)

Nominal detector bore diameter / Dimensions	25 mm (1 inch)	40 mm (1½ inch)	50 mm (2 inches)	65 mm (2½ inches)	80 mm (3 inches)	100 mm (4 inches)
Gasket internal diameter	25.5 ±1	40.5 ±1	52 ±1	65 ±1	79 ±1	104 ±1

If you install the detector at a lower torque level using rubber gaskets, you must use gaskets with the internal and external diameters shown in Table 2-3 and Table 2-4 for the respective pipe size. Depending on the grounding ring material, two gaskets of different thicknesses may be required. (See Figure 2-20 on page 2-23 and Figure 2-23 on page 2-25.)

Table 2-3 Internal and external diameters of rubber gaskets (0.5 to 1 mm thick)

(Unit: mm)

Nominal detector bore diameter / Dimensions	25 mm (1 inch)	40 mm (1½ inch)	50 mm (2 inches)	65 mm (2½ inches)	80 mm (3 inches)	100 mm (4 inches)
Gasket internal diameter	25.5 ±1	40.5 ±1	52 ±1	65 ±1	79 ±1	104 ±1
Gasket external diameter	50 ±1	75 ±1	91 ±1	111 ±1	121 ±1	146 ±1

Table 2-4 Internal and external diameter of rubber gaskets (3 to 4 mm thick)

(Unit: mm)

Nominal detector bore diameter / Dimensions	25 mm (1 inch)	40 mm (1½ inch)	50 mm (2 inches)	65 mm (2½ inches)	80 mm (3 inches)	100 mm (4 inches)
Gasket internal diameter	25.5 ±1	40.5 ±1	52 ±1	65 ±1	79 ±1	104 ±1
Gasket external diameter	50 ±1	68 ±1	84 ±1	104 ±1	114 ±1	139 ±1

Selecting an installation method

⚠ CAUTION

The necessary materials and the installation method vary according to the material of the ring and that of the pipe on which the detector is to be installed. Select the appropriate method of installation after confirming the specifications of the detector to be installed and the conditions of installation. Improper installation may result in leakage or damage to the pipe flanges.

Installation method according to materials

Select the appropriate installation method from the table below.

Pipe material	Grounding ring material	See page
Metal	SUS material	page 2-20
	Non-SUS material	page 2-21
PVC	SUS material	page 2-22
	Non-SUS material	page 2-24

Installation on horizontal pipe

CAUTION

Improper installation may result in leakage or cause damage to the pipe flanges.

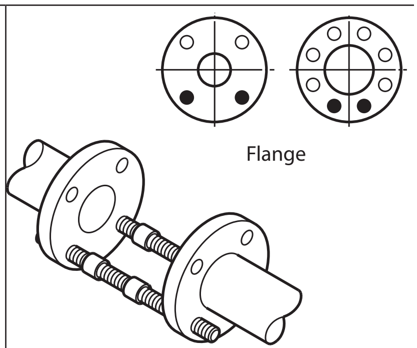
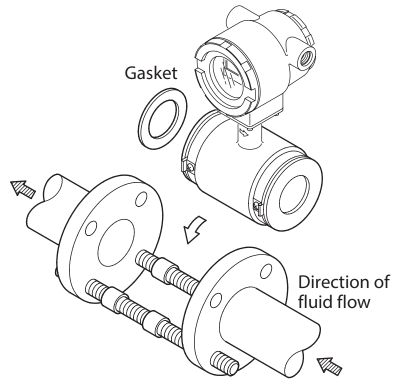
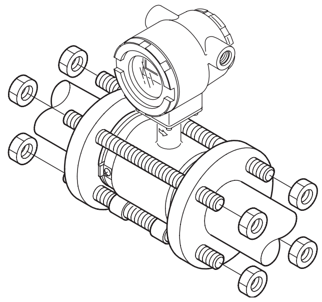
Required accessories

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: The required gasket material will vary according to the material of the pipe on which the detector is to be installed. See the installation procedures for different pipe materials described on page 2-20 to page 2-25.

Procedure

Follow this procedure to install the detector on a horizontal pipe.

Step	Action	Drawing
1	• Insert through-bolts in the flange holes shown by black dots in the drawing. Slip two centering nuts onto each through-bolt before inserting the bolts.	
2	• Turn the detector so that the direction mark on the detector matches the direction of fluid flow. • Insert the detector and gaskets between the pipe flanges. • Position the detector so that it sits on top of the centering.	
3	• Make sure that the detector remains properly centered. • Make sure that the gaskets do not protrude beyond the edges of the pipe flanges. • When you have checked these items, insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torque given on page 2-11.	

Installation on vertical pipe

CAUTION

Improper installation may result in leakage or damage to the pipe flanges.

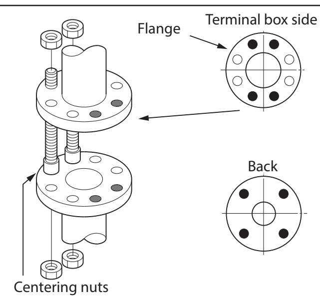
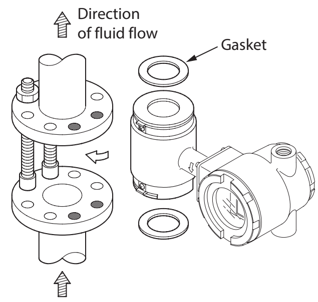
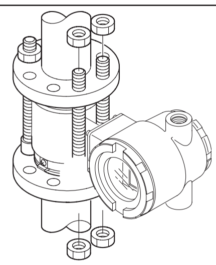
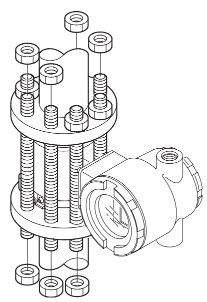
Required accessories

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: The required gasket material will vary according to the material of the pipe on which the detector is to be installed. See the installation procedures for different pipe materials described on page 2-20 to page 2-25.

Procedure

Follow this procedure to install the detector on a vertical pipe.

Step	Action	Drawing
1	• Of the flange holes shown by black dots in the drawing, insert through-bolts into the two holes at the back and fasten them lightly with nuts. Slip one centering nut onto each through bolt before inserting the bolts.	
2	• Turn the detector so that the direction mark on the detector matches the direction of fluid flow. • Insert the detector and gaskets between the pipe flanges.	
3	• Insert through-bolts fitted with one centering nut each into the remaining two flange holes shown by black dots in steps 1 and 2.	
4	• Make sure that the detector remains properly centered. • Make sure that the gaskets do not protrude beyond the edges of the pipe flanges. • When you have checked these items, insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torque given on page 2-11.	

Installation on metal pipe (1)

Introduction

The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-17.

Pipe material: Metal

Grounding ring material: SUS

Required accessories

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: We recommend using non-rubber gaskets such as those made of joint sheet or PTFE.
  For recommended internal diameters, refer to Table 2-2 on page 2-16.
  Although rubber gaskets may be used, it is not possible to reduce the fastening torque.

Installation procedure

- Install the detector as shown in Figure 2-15. The torque level for tightening the bolts is not related to the gasket material. See Table 2-1 on page 2-12 for the appropriate torque. For the internal diameter of the gaskets, see Table 2-2 on page 2-16.
- To use rubber gaskets for a low fastening torque, refer to page 2-25.

CAUTION

Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

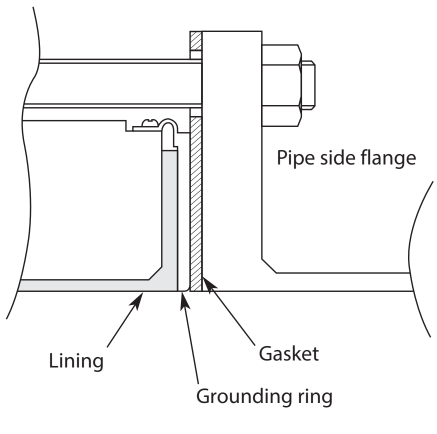


Figure 2-15 Installation using SUS material grounding ring and metal pipe

Installation on metal pipe (2)

Introduction

The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-17.

Pipe material: metal

Grounding ring material: Non-SUS

Required accessories

The following parts are required. No gaskets are necessary since PTFE gaskets are provided.

- Through-bolts and nuts
- Centering nuts

Installation procedure

- Install the detector as shown following figures. See Table 2-1 on page 2-12 for the appropriate fastening torque.
- To use rubber gaskets for a low fastening torque, refer to page 2-25.

⚠CAUTION

Please note that the use of an additional gasket besides the existing PTFE gasket may result in leakage (see Figure 2-17)

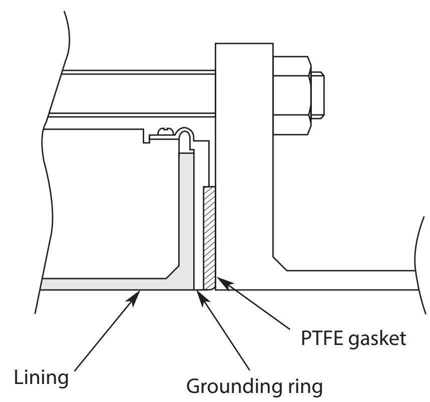


Figure 2-16 Installation using Non-SUS material grounding ring and metal pipe

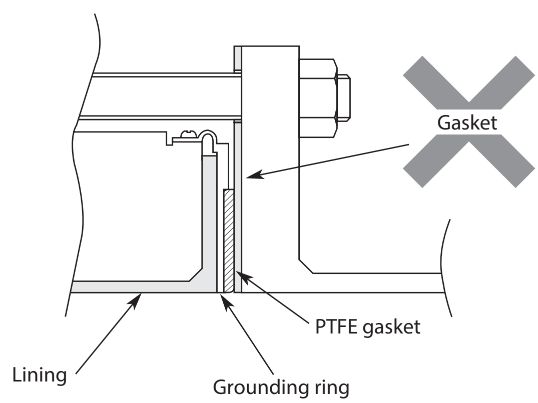


Figure 2-17 Example of incorrect installation

Installation on PVC pipe (1)

Introduction

The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-17.

Pipe material: PVC

Grounding ring material: SUS

Required accessories

The following parts are required:

- Through-bolts and nuts
- Centering
- Gaskets: Non-rubber gaskets are recommended (i.e. joint sheet or PTFE). See Table 2-2 on page 2-16 for the recommended bore diameters. When using rubber gaskets, another gasket of the same material and with a thickness of 0.5 to 1.0 mm is required. See Table 2-3 on page 2-16 for the appropriated dimensions.
- Protective plate: Use the protective plate if bolt tightening at the specified torque threatens to warp or damage the PVC pipe. See Figure 2-19 for an illustration of the protective plate.

Installation procedure

The installation procedure varies with such conditions as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

1. Use this method to install the detector with a specified fastening torque.

   Install the detector as shown in Figure 2-18.

   The torque level for tightening the bolts is not related to the gasket material. See Table 2-1 on page 2-12 for the appropriate torque. For the internal diameter of the gaskets, see Table 2-2 on page 2-16.

CAUTION

Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

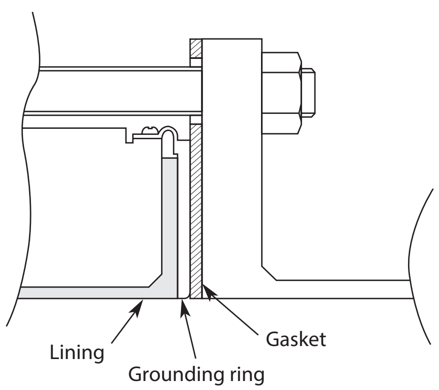


Figure 2-18 Installation using SUS material grounding ring

2. Use this method to install the detector using a protective plate to prevent the PVC pipe from being deformed or damaged when the bolts are tightened with the specified torque.

   Install the protective plate between the outer side of the PVC flange and the detector, as shown in Figure 2-19. The protective plate protects the PVC pipe from deformation or damage when secured at the specified torque. The torque level is unrelated to the pipe or grounding ring material. See Table 2-1 on page 2-12 for the appropriate torque.

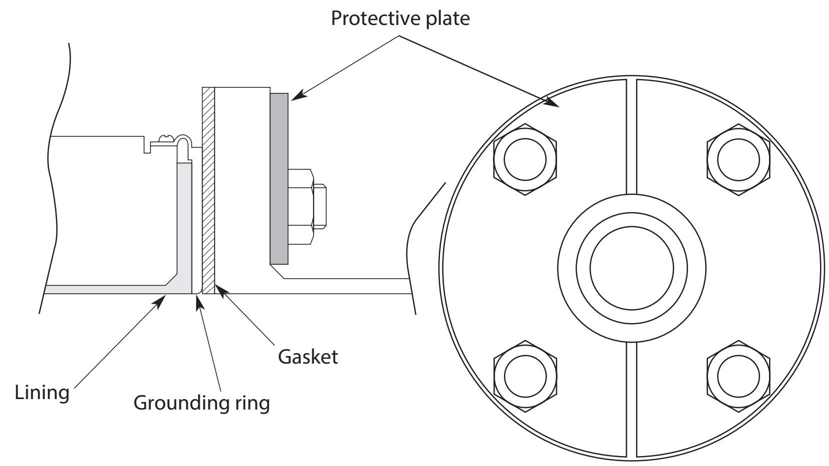


Figure 2-19 Installation using SUS material grounding ring (with protective plate)

3. Use this method to install the detector using a low fastening torque and rubber gaskets.

   Remove the grounding ring from the detector, insert a rubber gasket 0.5 to 1.0 mm thick, then reinsert the grounding ring on top of the rubber gasket. With the rubber gasket in the position shown in Figure 2-20, attach the detector to the pipe. Fasten the bolts with a torque that provides a leakproof joint. In this case, use the two kinds of rubber gaskets made of the same material.

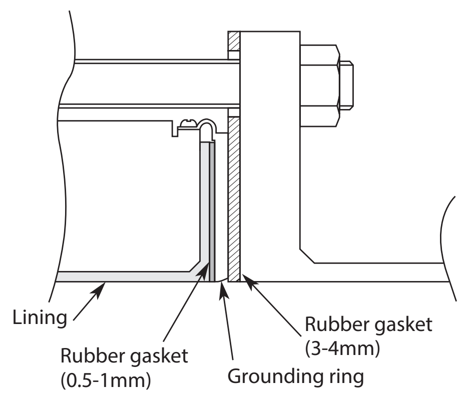


Figure 2-20 Installation using SUS material grounding ring (with rubber gasket)

Installation on PVC pipe (2)

Introduction

The installation method described in this section corresponds to the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-17.

Pipe material: PVC

Grounding ring material: Non-SUS material

Required accessories

The following parts are required:

- Through-bolts and nuts
- Centering nuts
- Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. When using a rubber gasket, two gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are required. See Table 2-3 and Table 2-4 on page 2-16 for the appropriate dimensions.
- Protective plate: A protective plate is required if tightening the bolts to the specified torque may deform or damage the PVC pipe. Use stainless steel or similar hard metal 1 mm thick or more. For the shape, see Figure 2-19.

Installation procedure

The installation procedure varies with such conditions as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

1. Use this method to install the detector with the specified fastening torque.

   Install the detector as shown in Figure 2-21. See Table 2-1 on page 2-12 for the appropriate fastening torque.

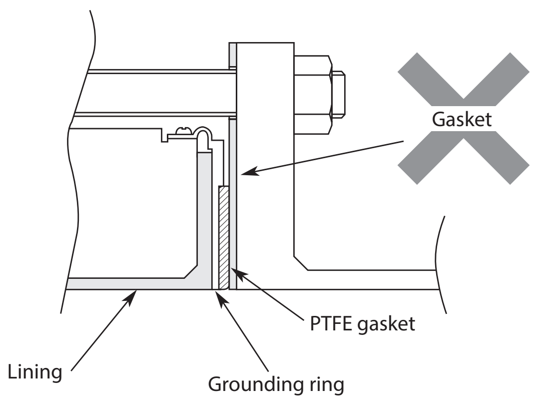


Figure 2-21 Installation using Non-SUS material grounding ring

2. Use this method to install the detector along with a protective plate to prevent PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

   Insert a protective plate between the outer side of the PVC flange and the detector as shown in Figure 2-22. The protective plate protects the PVC pipe from deformation or damage when it is secured to the specified torque. For the appropriate torque, see Table 2-1 on page 2-12.

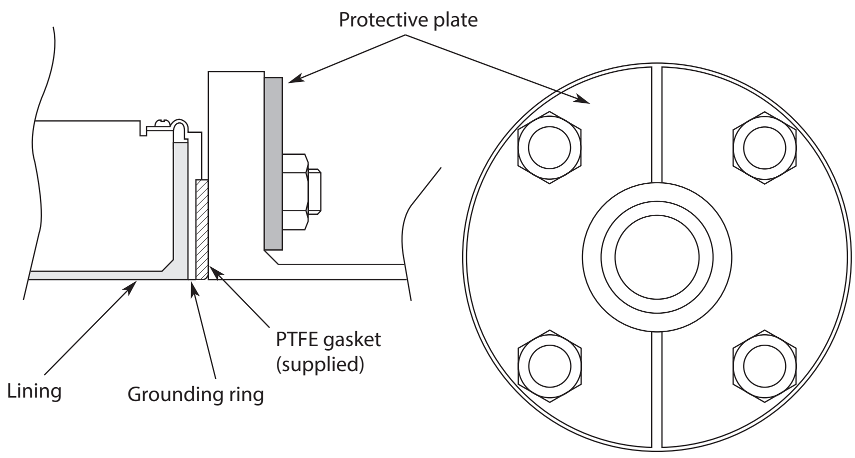


Figure 2-22 Installation using Non-SUS grounding ring (with protective plate)

3. Use this method to install the detector using a low fastening torque and rubber gaskets.

   First, remove the grounding ring from the detector, then insert a rubber gasket with a thickness of 0.5 to 1.0 mm. Then reinsert the grounding ring on top of the rubber gasket.

   Next, remove the PTFE gasket and insert a rubber gasket 3.0 to 4.0 mm thick to replace it. Under these conditions, install the detector on the pipe as shown in Figure 2-23. Tighten the bolts to the torque required to achieve a fluid seal for the rubber gasket. In this case, the two kinds of rubber gaskets that are used should be made of the same material. For the dimensions of the rubber gaskets, refer to Table 2-3 and Table 2-4 on page 2-16.

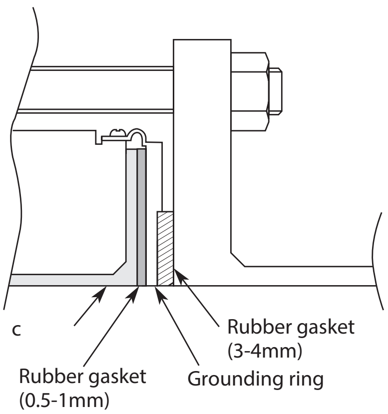


Figure 2-23 Installation using Non-SUS grounding ring (with rubber gasket)

2-2-2 : Installation a flange type detector

Basic installation method

Installation example

Figure 2-20 shows the basic method for installing the device.

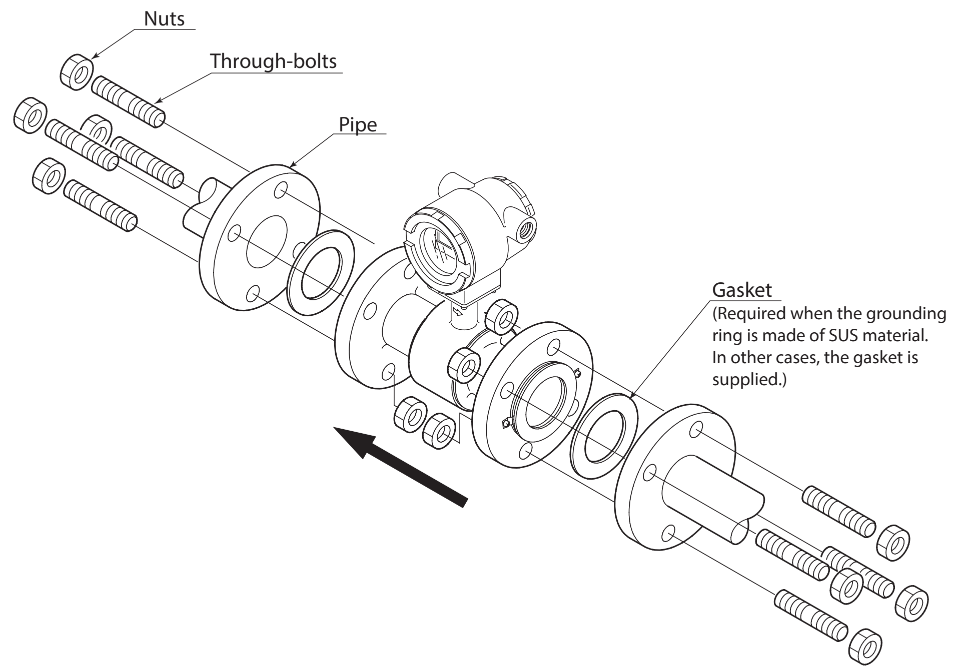


Figure 2-24 Installation example

Fastening torque

CAUTION

Be careful in handling this unit. It is heavy, dropping it accidentally could cause injury.

WARNING

Table 2-5 shows the fastening torque for each pipe bore. Apply the prescribed fastening torque to prevent leakage.

Table 2-5 Fastening torque

Diameter and flange ratings		Fastening torque N•m (kgf•cm)*	
2.5 to 15 mm	JIS 10K	8 to 13	(82 to 132)*
	JIS 20K	8 to 13	(82 to 132)*
	ANSI/JPI 150	9 to 14	(92 to 143)*
	ANSI/JPI 300	10 to 16	(102 to 163)*
25 mm (1 inch)	JIS 10K	21 to 31	(214 to 316)*
	JIS 20K	21 to 32	(214 to 326)*
	ANSI/JPI 150	11 to 17	(112 to 173)*
	ANSI/JPI 300	22 to 34	(224 to 347)*
40 mm (1½ inch)	JIS 10K	22 to 32	(224 to 326)*
	JIS 20K	22 to 34	(224 to 347)*
	ANSI/JPI 150	13 to 18	(132 to 184)*
	ANSI/JPI 300	36 to 57	(367 to 581)*
50 mm (2 inches)	JIS 10K	24 to 34	(245 to 347)*
	JIS 20K	19 to 31	(194 to 316)*
	ANSI/JPI 150	23 to 32	(235 to 326)*
	ANSI/JPI 300	20 to 32	(204 to 326)*
65 mm (2½ inches)	JIS 10K	20 to 31	(204 to 316)*
	JIS 20K	37 to 61	(377 to 622)*
	ANSI/JPI 150	26 to 35	(265 to 357)*
	ANSI/JPI 300	37 to 57	(377 to 581)*
80 mm (3 inches)	JIS 10K	20 to 31	(204 to 316)*
	JIS 20K	37 to 61	(377 to 622)*
	ANSI/JPI 150	26 to 35	(265 to 357)*
	ANSI/JPI 300	37 to 57	(377 to 581)*
100 mm (4 inches)	JIS 10K	22 to 33	(224 to 337)*
	JIS 20K	41 to 66	(418 to 673)*
	ANSI/JPI 150	21 to 31	(214 to 316)*
	ANSI/JPI 300	43 to 66	(439 to 673)*
150 mm (6 inches)	JIS 10K	47 to 67	(479 to 683)*
	JIS 20K	58 to 91	(592 to 928)*
	ANSI/JPI 150	42 to 60	(428 to 612)*
	ANSI/JPI 300	50 to 74	(510 to 755)*
200 mm (8 inches)	JIS 10K	44 to 65	(449 to 663)*
	JIS 20K	66 to 102	(673 to 1040)*
	ANSI/JPI 150	42 to 59	(428 to 602)*
	ANSI/JPI 300	81 to 120	(826 to 1224)*

~Note **: The numerical value in parentheses is a reference value.*

Flange shape

Use flanges that will maximize the area of contact with the gasket, as shown in Figure 2-25.

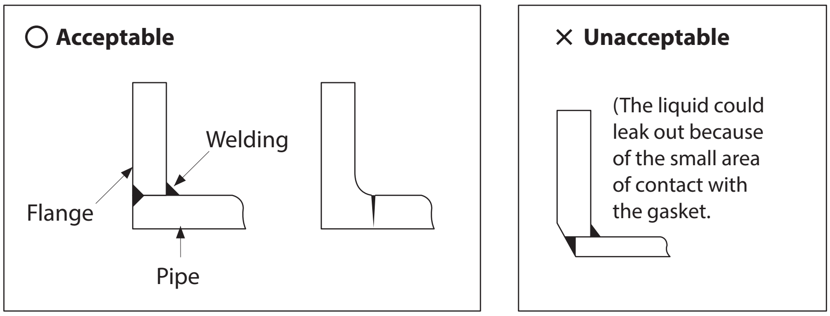


Figure 2-25 Flange shape

~Note

- ***Before installing the detector, make sure any foreign matter is flushed from the inside of the detector. Residual foreign matter could cause output fluctuations.***
- ***Do not touch the electrodes by your hand or wasted cloth with oil. This could cause output fluctuations.***
- ***Install the detector in accordance with the flow direction mark on the detector in the direction of the liquid flow. Misalignment could result in a negative output.***
- ***Never attempt to force the detector between two flanges when the space is too narrow. It can damage the detector***

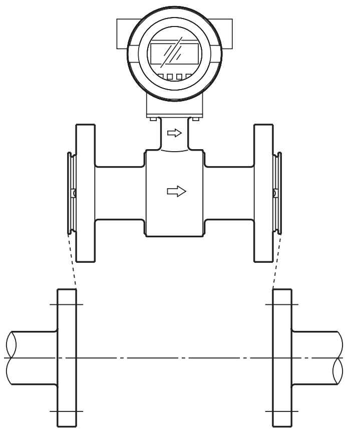


Figure 2-26 Example of incorrect mounting

⚠WARNING

After ensuring that the internal diameter of the pipe and that of the detector are the exactly the same, install the detector so that the gasket does not protrude into the internal diameter of the pipe. Failing to do so could result in leakage or other hazards.

~Note

Tighten each bolt a little at a time, apply uniform torque to all the bolts. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then continue to tighten each bolts little by little. Install the detector carefully and ensure that the fastening torque does not exceed the prescribed limit. Otherwise, the detector could be damaged.

Accessory parts for installation

Introduction

The following parts are necessary for the installation of the detector:

- Gaskets: Gaskets are to be provided by the customer when using grounding rings made of SUS material.
  Gaskets are supplied as standard accessory, when using grounding rings made of other material.

Gaskets

Gaskets are supplied with the grounding ring, except when it is made of SUS material. Gasket are to be provided by the customer when using a grounding ring made of SUS material. We recommend a non-rubber gasket material such as joint sheet or PTFE.

For the internal diameters of the gaskets, refer to Table 2-6.

~Note

- ***A gasket with small internal diameter may generate turbulent flow and affect, resulting in inaccurate measurements.***
- ***A gasket with too large internal diameter may cause leakage. Also, any solid substance in the fluid to be measured could accumulate between the gasket and the flange, resulting in inaccurate measurements.***

Table 2-6 Recommended internal diameters of gaskets

Body diameter	Internal diameter (mm)
2.5 mm	11±1
5 mm	11±1
10 mm	11±1
15 mm (½ inch)	16±1
25 mm (1 inch)	25±1
40 mm (1½ inch)	40±1
50 mm (2 inches)	51±1
65 mm (2½ inches)	64±1
80 mm (3 inches)	76±1
100 mm (4 inches)	95±1
150 mm (6 inches)	148±1
200 mm (8 inches)	196±1

Selecting an installation method

Caution

CAUTION

The necessary materials and the method of installation vary depending on the material of the grounding ring and the material. Select the applicable method of installation after checking the specifications of the detector to be installed and the conditions of installation. Improper installation may result in leakage or damage to the pipe flanges.

Installation method according to material

Select the appropriate installation method from the table below.

Pipe material	Grounding ring material	See page
Metal	SUS material	page 2-31
	Non-SUS material	page 2-32
PVC	SUS material	page 2-33
	Non-SUS material	page 2-35

Installation on metal pipe (1)

Introduction

The installation method described in this section is to be used with the following grounding ring materials. For the installation method used for any other grounding ring material, refer to the table on page 2-30.

Pipe material: Metal

Grounding ring material: SUS material

Required accessories

The following parts are required:

- Bolts and nuts
- Gaskets: We recommend using non-rubber gaskets such as those made of joint sheet or PTFE. For recommended internal diameters, refer to Table 2-6 on page 2-29.

Installation procedure

- Install the detector as shown in Figure 2-27. The torque level for tightening the bolts is not related to the gasket material. See Table 2-5 on page 2-27 for the appropriate torque. For the internal diameter of the gaskets, see Table 2-2 on page 2-16.

CAUTION

A lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

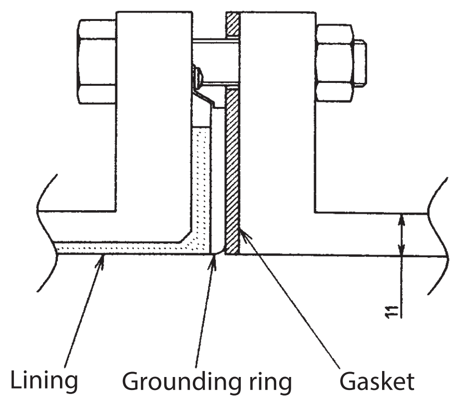


Figure 2-27 Installation using SUS material grounding rings

Installation on metal pipe (2)

Introduction

The installation method described in this section is to be used with the following grounding ring materials. For the installation method used with grounding rings of SUS material, refer to the table on page 2-30.

Pipe material: metal

Grounding ring material: Non-SUS material

Required accessories

The following parts are required. No gaskets are necessary since PTFE gaskets are provided.

- Bolts and nuts

Installation procedure

- Install the detector as shown in Figure 2-28. See Table 2-5 on page 2-27 for the appropriate fastening torque.

CAUTION

Please note that the use of an additional gasket besides the existing PTFE gasket may result in leakage (see Figure 2-29).

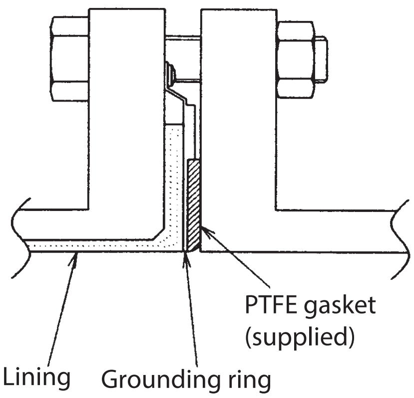


Figure 2-28 Installation using Non-SUS material grounding ring

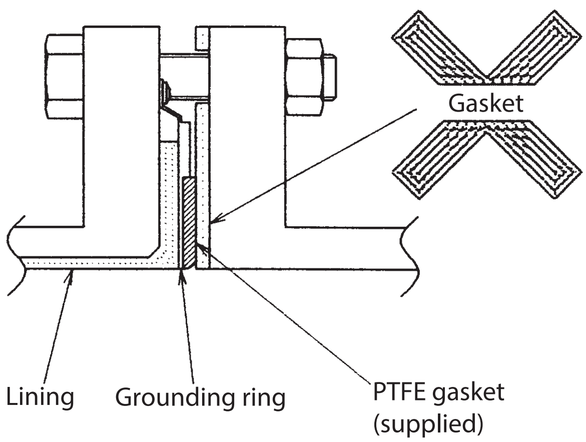


Figure 2-29 Example of incorrect installation

Installation on PVC pipe (1)

Introduction

The installation method described in this section is used for the following combination of pipe and grounding ring materials. For the installation method corresponding to any other combination, refer to the table on page 2-30.

Pipe material: PVC

Grounding ring material: SUS material

Required parts

The following parts are required:

- Through-bolts and nuts
- Gaskets: Non-rubber gaskets are recommended (i.e. joint sheet or PTFE). See Table 2-6 on page 2-29 for the recommended bore diameters. When using rubber gaskets, another gasket of the same material and with a thickness of 0.5 to 1.0 mm is required. See Table 2-3 on page 2-16 for the appropriated dimensions.
- Protective plate: Use a protective plate if bolt tightening to the specified torque threatens to warp or damage the PVC pipe. The plate material must be metal (such as stainless steel at least 6 mm thick) that will not deform when the nuts are tightened. For the shape of the protective plate, see Figure 2-31.

Installation procedure

The installation procedure varies depending on conditions such as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

1. Use this method to install the detector to the specified fastening torque.

   Install the detector as shown in Figure 2-30. The torque level for tightening the bolts is not related to the gasket material. See Table 2-5 on page 2-27 for the appropriate torque. For the internal diameter of the gaskets, see Table 2-2 on page 2-16.

⚠ CAUTION

Please note that the use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, resulting in leakage.

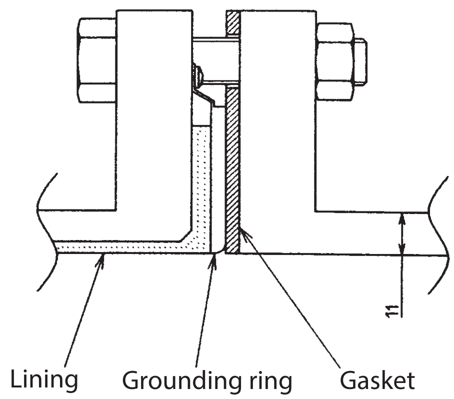


Figure 2-30 Installation using SUS material grounding ring

2. Use this method to install the detector using a protective plate to prevent PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

   Install the protective plate between the outer side of the PVC flange and the detector, as shown in Figure 2-31. The protective plate protects the PVC pipe from deformation or damage when secured at the specified torque. The torque level is unrelated to the pipe or grounding ring material. See Table 2-5 on page 2-27 for the appropriate torque. For the internal diameters of the gaskets, see Table 2-6 on page 2-29.

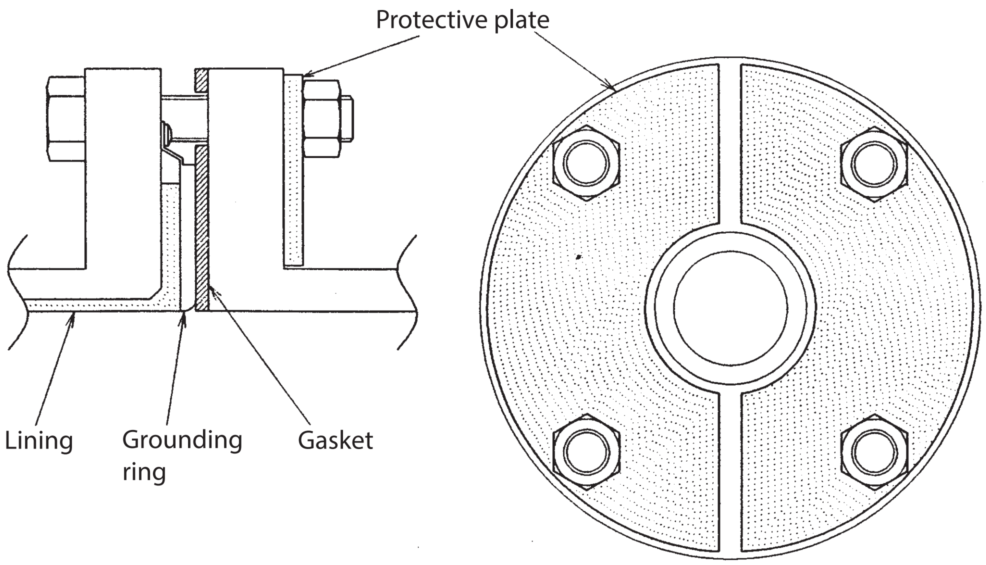


Figure 2-31 Installation using SUS material grounding ring (with protective plate)

3. Use this method to install the detector using a low-fastening torque and rubber gaskets.

   Remove the grounding ring from the detector, insert a rubber gasket 0.5 to 1.0 mm thick between the lining and the grounding ring, then reinsert the grounding ring. Then remove the PTFE gasket, and attach a gasket 3 to 4 mm thick instead. Under these conditions, attach the detector to the pipe as shown in Figure 2-32. Fasten the bolts to a torque that provides a leakproof joint

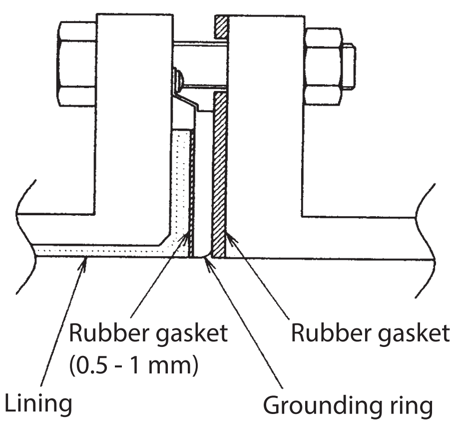


Figure 2-32 Installation using SUS material grounding ring (with rubber gasket)

Installation on PVC pipe (2)

Introduction

The installation method described in this section is to be used for the following combination of pipe and grounding ring materials. For the installation method used for any other combination, refer to the table on page 2-30.

Pipe material: PVC

Grounding ring material: Non-SUS material

Required parts

The following parts are required:

- Through-bolts and nuts
- Gaskets: No gaskets are necessary due to the provision of a PTFE gasket. When using a rubber gasket, two gaskets of the same material and of two thicknesses, 0.5 to 1.0 mm and 3.0 to 4.0 mm, are required. See Table 2-3 and Table 2-4 on page 2-16 for the appropriate dimensions.
- Protective plate: A protective plate is required if tightening the bolts to the specified torque may deform or damage the PVC pipe. Use stainless or hard metal 1 mm thick or more. For the shape of the metal, see Figure 2-31.

Installation procedure

The installation procedure varies depending on conditions such as the fastening torque and the need for a protective plate. Choose one of the following three methods as applicable.

1. Use this method to install the detector to the specified fastening torque.

   Install the detector as shown in Figure 2-33. See Table 2-5 on page 2-27 for the appropriate fastening torque.

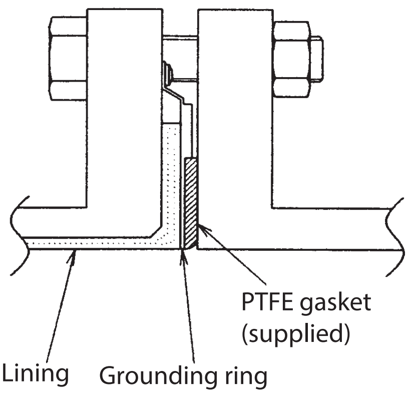


Figure 2-33 Installation using Non-SUS material grounding ring

2. Use this method to install the detector along with a protective plate to prevent PVC pipe from being deformed or damaged when the bolts are tightened to the specified torque.

   Insert a protective plate between the outer side of the PVC flange and the detector as shown in Figure 2-34. The protective plate protects the PVC pipe from deformation or damage when it is secured to the specified torque. For the appropriate torque, see Table 2-5 on page 2-27.

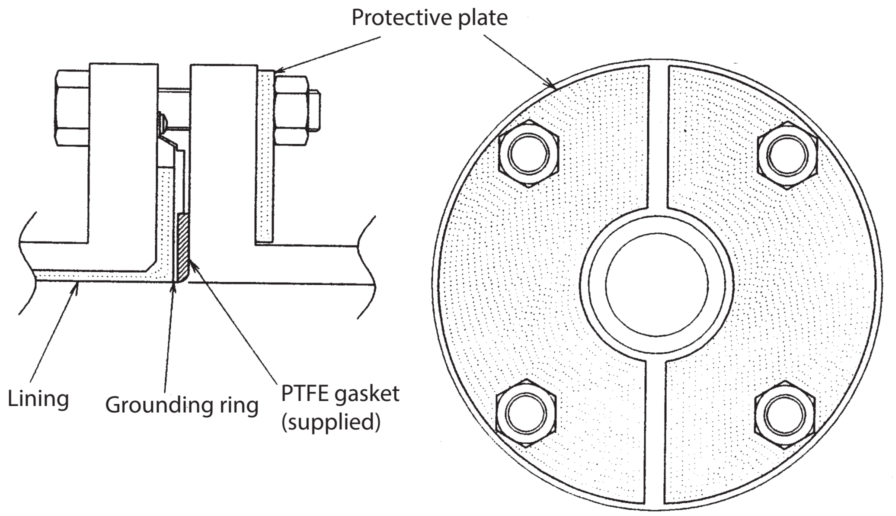


Figure 2-34 Installation using Non-SUS material grounding ring (with protective plate)

3. Use this method to install the detector using a low fastening torque and rubber gaskets.

   First, remove the grounding ring from the detector, then insert a rubber gasket with a thickness of 0.5 to 1.0 mm. Then reinsert the grounding ring on top of the rubber gasket.

   Next, remove the PTFE gasket and insert a rubber gasket 3.0 to 4.0 mm thick to replace it. Under these conditions, install the detector on the pipe as shown in Figure 2-35. Tighten the bolts to the torque required to achieve a fluid seal for the rubber gasket. In this case, the two kinds of rubber gaskets that are used should be made of the same material. For the dimensions of the rubber gaskets, refer to Table 2-3 and Table 2-4 on page 2-16.

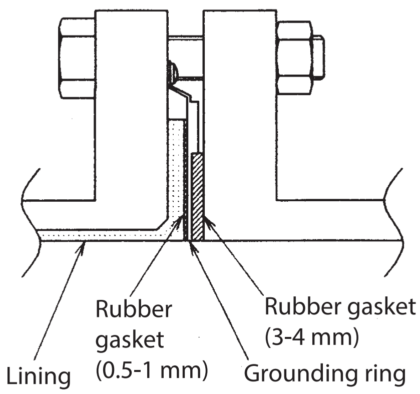


Figure 2-35 Installation using Non-SUS material grounding ring (with rubber gasket)

2-2-3 : Installation of remote-type converter

Basic installation

There are three methods of installations of the converter integral type, wall installation with the detector, and 2-inch pipe mounting.

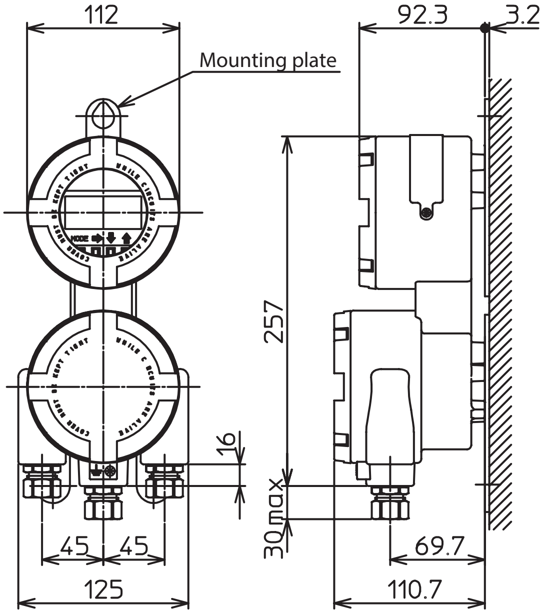


Figure 2-36 Wall mounting

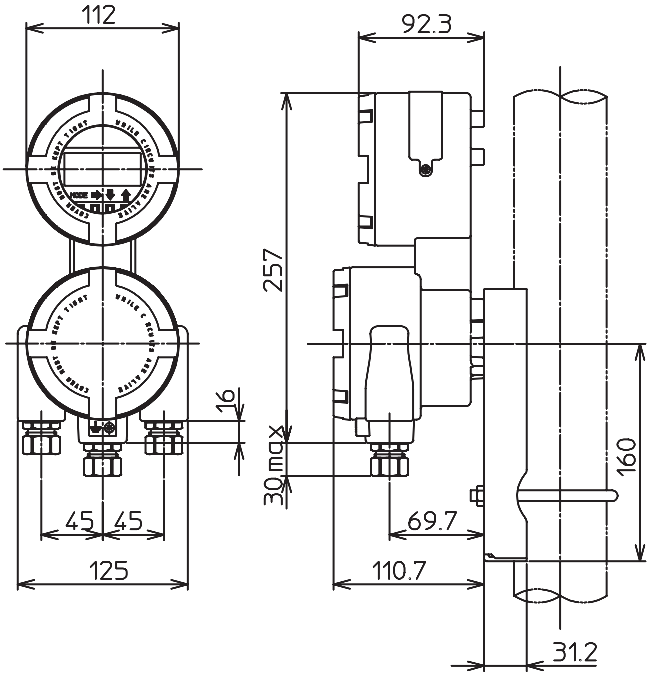


Figure 2-37 2-inch pipe mounting

MEMO

Chapter 3 : Electrical wiring

Outline of this chapter

This chapter describes the electrical wiring of the main unit, SFC and HART Communicator.

3-1 : Electrical wiring

Electrical wiring

Introduction

For this instrument to operate, 15.3 to 42V DC power supply is required to signals wiring. The electrical wiring of this instrument is described below as to the following items:

- Wiring cable connecting positions
- Dedicated cable connecting positions (detector and converter)
- Power source and load resistance
- Cable selection and cabling
- Grounding
- Wiring connection of power supply and analog current output
- Wiring connection for pulse output
- Wiring connection for contact output
- Wiring procedure
- Wiring connection between detector and converter

~Note *Do not connect commercial power directly to this instrument. Impressing commercial power on this instrument causes unrecoverable damage to the internal measuring circuit.*

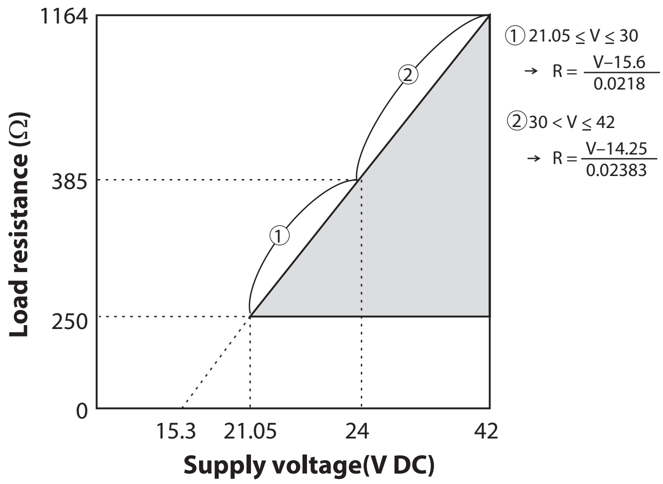
Power and load resistance

Use a direct current (15.3 to 42V DC) for the power.

Supply 50V DC or over or 35V AC or over causes unrecoverable damage to the instrument.

The power ripple factor should be 1V or less in peak-to-peak value.

See that the load resistance of the loop wiring should within the operational range shown in Figure 3-1-1 with respect to the power supply voltage used.



~Note *A load resistance of at least 250Ω is needed for communication with the SFC or HART communicator.*

Figure 3-1-1 Supply power voltage-load resistance characteristics

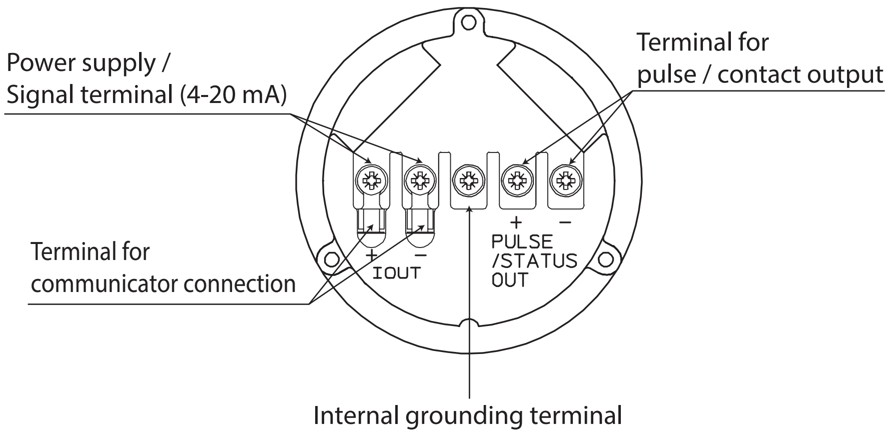


Figure 3-1-2 Terminal block - Integral type

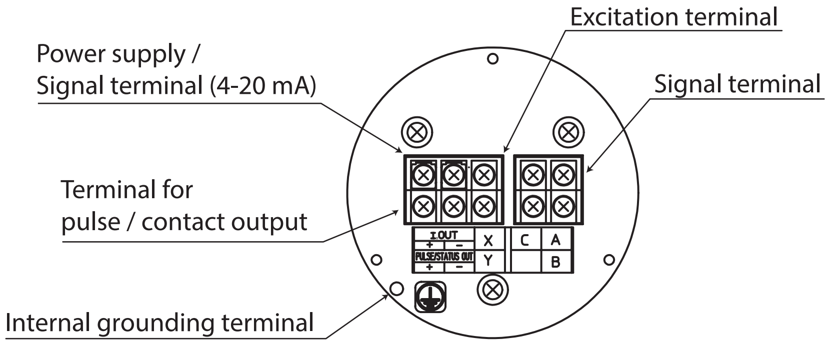


Figure 3-1-3 Terminal block - Remote type

Selecting the wiring cable

For the electrical cable, we recommend 600V vinyl insulation, vinyl sheath wire CVV with a conductor area of 2 mm^2 or a stranded wire cable having equivalent or superior performance.

To avoid influences or damages due to electromagnetic induction, we recommend using two core shielded cables for wiring.

Select a sheath material that can endure the environment (ambient temperature, corrosive gas, corrosive fluid and the like) in which the cable is running.

The cable is wired in to the terminal box through a conduit cable ground (with G1/2 internal thread, CM20 internal thread or 1/2NPT internal thread). Therefore, the optimum cable external diameter is ϕ11.

For the terminal treatment of the cable, we recommend a crimp terminal (M4 screw) with an insulating sleeve.

The maximum length of wiring cable is 1500 meters.

Cabling

When running a cable between the instrument and a controller, pay attention to the following:

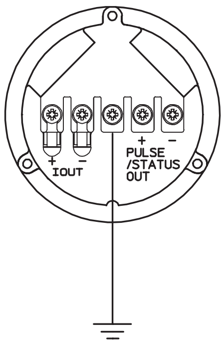
- The cabling should avoid a large-capacity transformer, motor, power source or other noise source. Do not put the cable in the same tray or duct with other power cables.
- For waterproofing and damage prevention of the wire, we recommend cabling work using conduits and ducts. Use a waterproof gland at the conduit cable ground.

Grounding

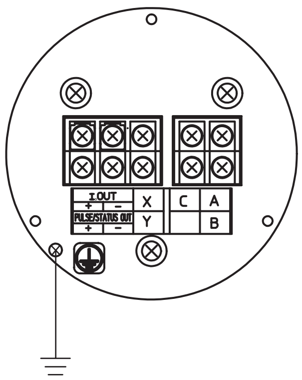
The grounding is essential for flow measurement.

The most effective grounding method is direct connection to earth ground with minimal impedance.

For the grounding terminal, carry out grounding work (grounding resistance 100Ω or less) according to Figure 3-2 or Figure 3-3. Do not ground internal & external at the same time.

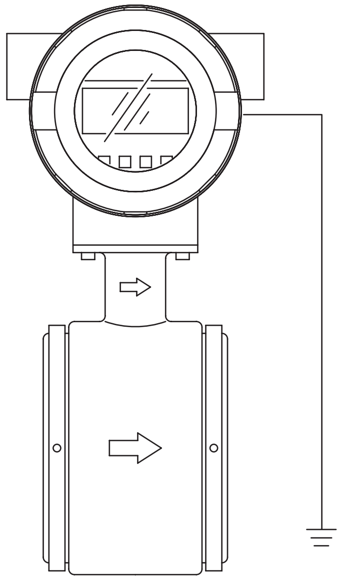


<Integral type>

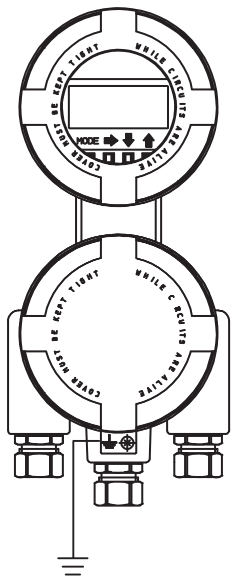


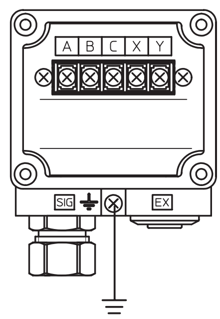
<Remote type>

Figure 3-2 Grounding procedure that uses internal grounding terminal



<Integral type>





<Remote type converter> <Remote type detector>

Figure 3-3 Grounding procedure that uses external grounding terminal

Wiring connection of power supply and analog current output

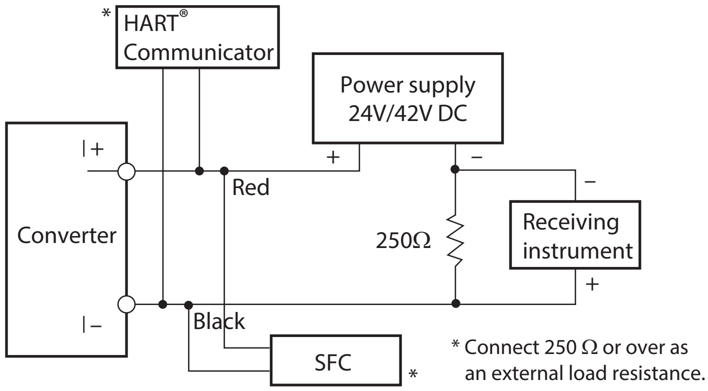


Figure 3-4 Wire connection diagram

Input circuit such as sequence controllers

It must use 4-20 mA such as sequence controllers and the input to the equipment with A/D at high speed must use the following optional circuits.

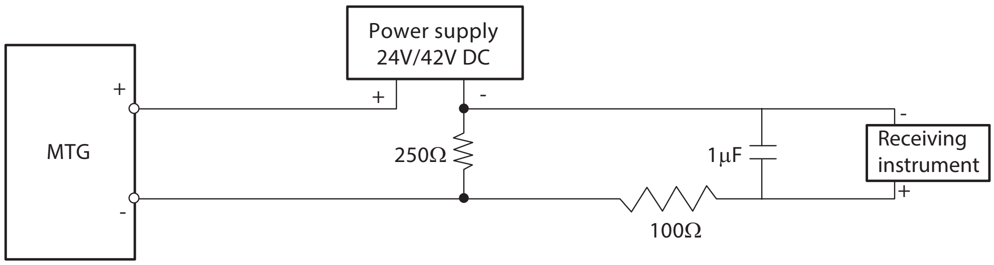


Figure 3-5 Wire connection diagram (When inputting to the sequence controller etc.)

⚠ CAUTION

- Incorrect wiring polarity can cause damage to the equipment. Double-check the wiring position.
- The SFC and HART Communicator cannot be used simultaneously.
- Only the communication method selected by the data setting device is available.

Wiring connection for pulse output

The pulse output is an open-collector output.
Carry out the wiring paying attention to the voltage and polarity.

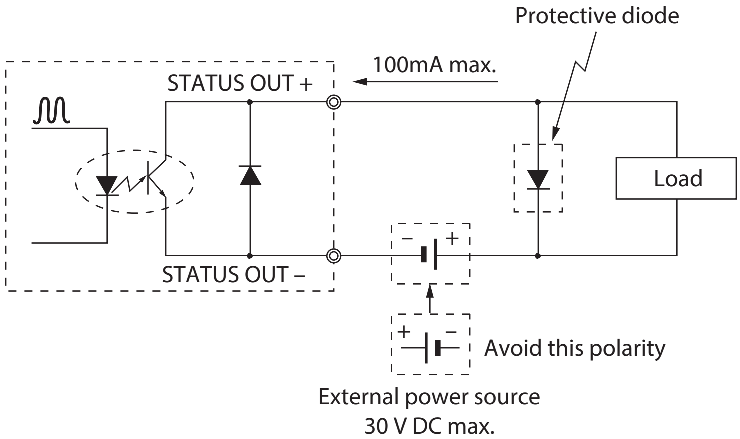


Figure 3-6 Pulse output wire connection diagram

⚠CAUTION

- Incorrect wiring polarity can cause damage to the equipment. Double-check the wiring position.
- Use an external power source that meets the voltage and capacity specifications.

Wiring connection for contact output

Because of an open-collector output, carry out wiring paying attention to the polarity.

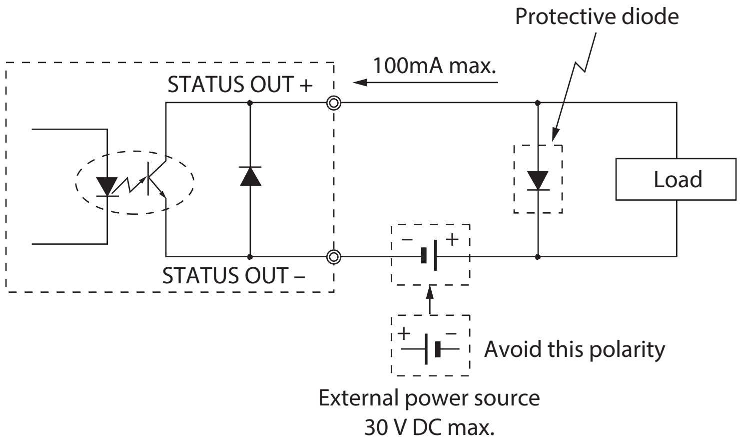


Figure 3-7 Contact output wire connection diagram

⚠ CAUTION

- Incorrect wiring polarity can cause damage to the equipment. Double-check the wiring position.
- Use an external power source that meets the voltage and capacity specifications.

Wiring procedure

Carry out the wiring between the instrument and a power supply must be done according to the following procedure.

Step	Procedure
1	The terminal box cover is fixed by hexagon socket head setscrews (M3). Loosen the setscrews with an Allen wrench (1.5).
2	Remove the terminal box cover by turning it counterclockwise with the dedicated tool.
3	Remove the dust plug from the socket for an output signal line conduit.
4	Insert the cable into the conduit cable ground. **~Note** • ***Take care not to damage the cable sheath.***
5	Referring to Figure 3-6, connect the cable to the output signal terminals (IOUT+, -) of the terminal box. **~Note** • ***Pay attention to the polarity.*** • ***Tighten the terminal screws adequately. The recommended tightening torque is 1.1 ft·lb (1.5 N·m)*.***
6	Waterproof the conduit sufficiently to prevent ingression of rainwater, etc. **~Note** • ***We recommend using a silicon resin-based non-curing sealant.***
7	Attach the terminal box cover and tighten it adequately with the dedicated tool. Then, fix the cover with the setscrews. **~Note** • ***Take care not injure your fingers on the cover edge or the carrying thread.***

**: The numerical value in parentheses is a reference value.*

Wiring for power supply

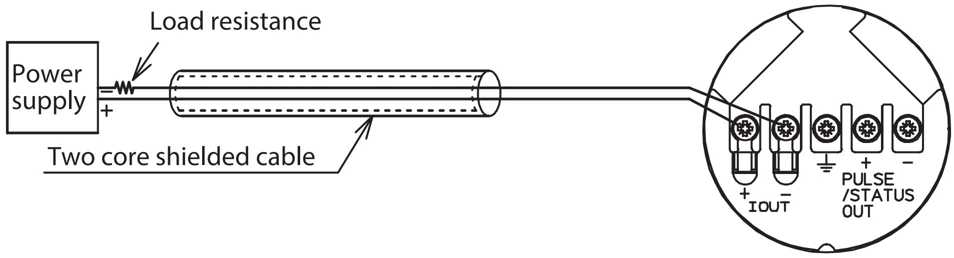


Figure 3-8 Wiring for power supply - Integral type

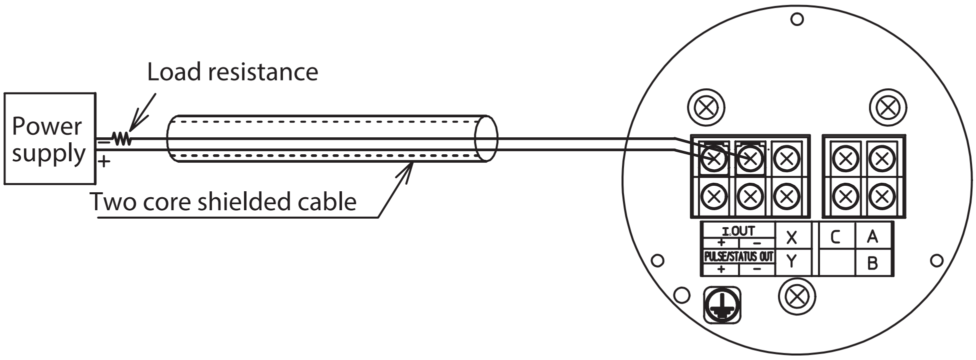


Figure 3-9 Wiring for power supply - Remote type

Wiring connection between detector and converter

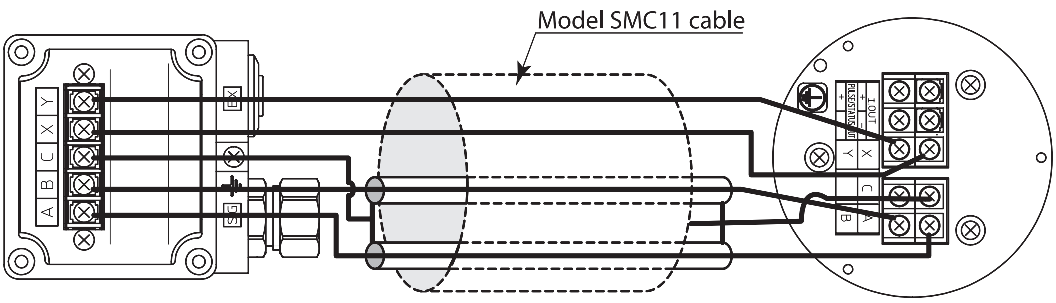


Figure 3-10 Wiring connection between detector and converter

Please use model SMC11 cable for wiring connection between detector and converter.

⚠ CAUTION

The cable connecting the detector and the converter should be wired in the metal conduit to meet the requirement of EMC standard EN 61326.

Chapter 4 : Operation

Outline of this chapter

This chapter describes the procedure for start-up of the instrument and making zero adjustment. It also describes termination of measuring system.

When starting up and operating the instrument for the first time, carefully follow the descriptions in this chapter.

4-1 : Confirmation before start-up

Introduction

Before you start up the instrument, confirm the following items. Numbers in parentheses indicate the chapter to refer.

(1) Confirm that the electromagnetic flowmeter is installed correctly in the pipes (Chapter 2 : Instrument installation).

(2) Confirm that the electrical wiring is correct (Chapter 3 : Electrical wiring).

(3) If communication is required, confirm that the communication equipment is wired correctly (Chapter 3 : Electrical wiring).

(4) Fill the electromagnetic flowmeter detector with a fluid and reform zero adjustment in a static state (Chapter 5 : Operation using the data setting device).

(5) Confirm that there is no leakage at the joint of the electromagnetic flowmeter's detector (Chapter 2 : Instrument installation).

(6) Confirm that the electromagnetic flowmeter detector is filled with water and there are no stagnant bubbles.

(7) Turn on power and warm up for 30 minutes.

(8) Confirm whether the settings of the data sheet inserted in the converter have been setup and configured. If there is need to change settings to meet your usage, change them using the data setting device or the like.

(9) For the accurate flow measurement, verify the zero point value in each excitation current (Manual zero1, manual zero2, and manual zero3) by using manual zero function, if the normal flow velocity is less than 0.3 m/s (0.98 ft/s).

~Note

- ***If the detector is not filled with water or many bubbles have adhered inside, the indication may not reach zero flow rate. In such cases, make a flow of water once to ensure that the detector is free of bubbles and filled with water.***
- ***With incorrect grounding, the indication of flow rate may fluctuate largely. In such cases, check the grounding condition.***

4-2 : Stopping

Caution

⚠ CAUTION

When stopping the instrument from operation and shutting down the output to control equipment, always change over the control equipment to manual control. This is for preventing the instrument's output shutdown from directly influencing the control equipment.
When the following operations are performed, the set or changed data are saved in nonvolatile memory. The time required to write data to nonvolatile memory is about 1 minute, so do not stop operation during that time.

· Checking data and changing the mode to MEASURING MODE with the data setting device
· Changing data and changing the mode to MEASURING MODE with the data setting device
· Changing data using HART or SFN communication

Procedure

When stopping the instrument, follow the following procedure:

Step	Procedure
1	Change over the control equipment of this instrument to be stopped to manual control.
2	Turn off power.

MEMO

Chapter 5 : Operation using the data setting device

This section describes how to operate this system from the data setting device. This system configuration and settings can be made using the four keys on the data setting device.

5-1 : Startup

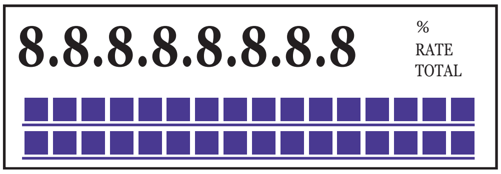
Introduction

With the model MTG, all settings can be configured from the data setting unit.

Startup

When the power supply is turned on, the display changes in the order of OVERALL DISPLAY, SELF CHECK MODE, and MEASURING MODE.

OVERALL DISPLAY



8.8.8.8.8.8.8.8
Main display: 7-segment, 8-digit display
% flow rate Actual flow rate Integration value

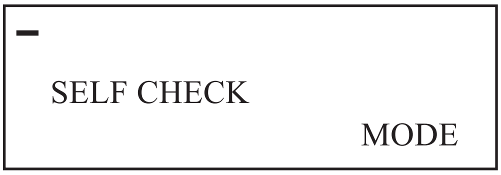
Unit display

Sub-display Display screen for setting

Displayed for 2 seconds.

⇩

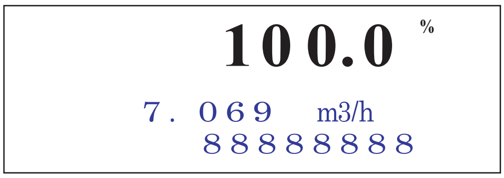
SELF CHECK MODE



Main display 7-segment, 8-digit blinks.
The display (-) moves from left to right.
Sub display: SELF CHECK MODE
Displayed for 5 seconds

⇩

MEASURING MODE



Display and operation contents of data setting device

Overview of mode

This system provides the following four modes available in accordance with the operations:

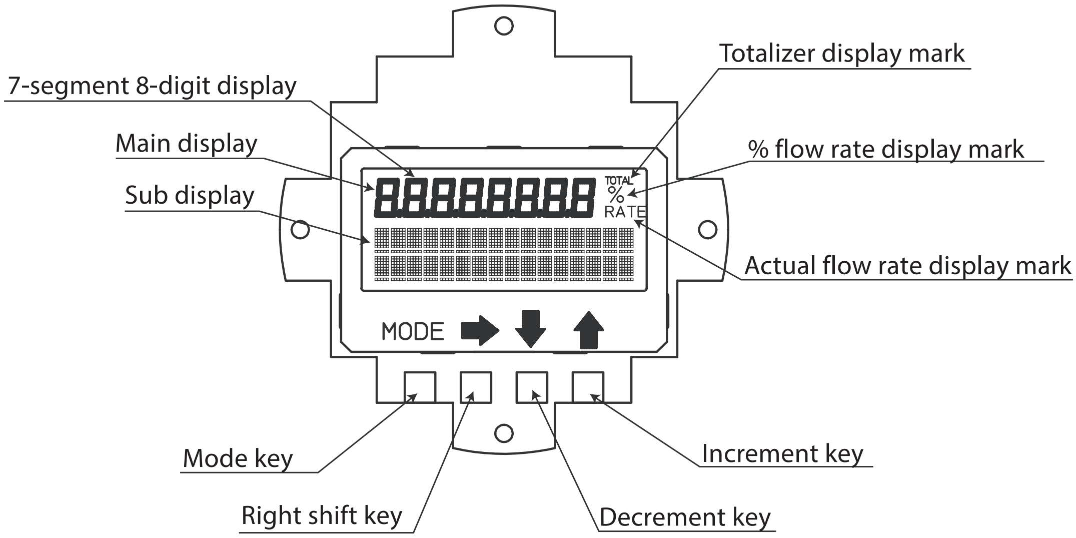
Mode	Description
MEASURING MODE	Mode that shows measuring status.
OPERATOR’S MODE	Mode that is set for the operator. This mode is comprised of setting and configuration of data that are set or changed frequently during startup. In this mode, settings can be changed only when the write protect levels are set to 0, 1 and 2. At level 3, only the set data can be checked. (See “5-3-2 : Display of write protect level”) [Damping constant, auto zero adjustment, counter reset, counter preset value, etc.] **CAUTION** Set or changed data are temporarily written into the memory. Note that if the configured data are not saved/written into the memory within 10 minutes, the configured data returns to the previous values. Be sure to press the MODE key to return to the MEASURING MODE and to save data.
ENGINEERING MODE	In the set mode for engineering, the mode is comprised of data that is set or changed less frequently than the data in “OPERATOR'S MODE.” Data can be set and changed at write protect level 0 or 1. At level 2 or 3, only the set data check is allowed. [ID, function selection, detector data, flow rate range, hysteresis width, pulse data, low flow cut, selecting false mode for output, etc.] **CAUTION** • When the mode is changed to MEASURING MODE by pressing the MODE key, the set/changed data are saved into a non-volatile memory. Be sure to press the MODE key, to save the configured data. • Set or changed data are temporarily written into the memory. Note that if the configured data are not saved/written into the memory within 10 minutes, the configured data returns to the previous values. Be sure to press the MODE key to return to the MEASURING MODE and to save data.

Mode	Description
MAINTENANCE MODE	A mode for maintenance that is used when adjustments and checks are needed for regular maintenance and when troubles occur. Adjustments and checks are allowed only at write protect level 0. [Loop check, output adjustment, gain adjustment, etc.] This mode is furthermore divided into the following three types: OUTPUT CHECK MODE CALIBRATION MODE CRITICAL MODE **CAUTION** • CALIBRATION MODE and CRITICAL MODE contains very important adjustment values or operations for the flow rate measurement. Wrong settings make accurate flow rate measurement impossible. For the operation, contact our service engineers. **CAUTION** • When the mode is changed to MEASURING MODE by pressing the MODE key, the set/changed data are saved into a non-volatile memory. Be sure to press the MODE key, to save the configured data. • Set or changed data are temporarily written into the memory. Note that if the configured data are not saved/written into the memory within 10 minutes, the configured data returns to the previous values. Be sure to press the MODE key to return to the MEASURING MODE and to save data. • Data is written to nonvolatile memory regardless of whether there has been a change in the data. The time required to write data to nonvolatile memory is about 1 minute, so after changing to MEASURING MODE by pressing the MODE key, wait for at least 1 minute before stopping operation.

5-2 : Functions of the data setting device

5-2-1 : Data setting device

Name of parts



Names and Descriptions of Parts

This section describes displays shown on the data setting device.

- Flow rate display

  The flow rate display is given at three stages:% flow rate, actual flow rate and totalized value. Operating the key, the main display to be shown at the top stage can be set selecting from the actual flow rate, % flow rate and totalized value. RATE appears for the actual flow rate display, % for the % flow rate display, and TOTAL for the totalized value display (see “5-3-1 : Display overview”.).

Area	Description
Main display 7-segment 8-digit display	Displays the flow rate display selected for the main display by DISP SELECT in OPERATOR'S MODE.
% flow rate display mark (%)	Displays when % flow rate is shown for the main display.
Actual flow rate display mark (RATE)	Displays when the actual flow rate is shown for the main display.
Totalized value display mark (TOTAL)	Displays when the totalized value is shown for the main display.
Sub display	• In MEASURING MODE, shows a flow rate display other than a flow rate display selected for the main display by DISP SELECT in OPERATOR'S MODE. • In modes other than MEASURING MODE, indicate procedures for setting and adjusting parameters.

This section describes keys on the data setting device.

Name	Description
MODE key	• Enters OPERATOR'S MODE. • When parameters and configured data have been changed in ENGINEERING MODE or MAINTENANCE MODE, press this key to save the data.
Right shift key	• Moves the cursor to the right.
Decrement key	• Changes the parameter at a cursor position. • Displays the previous screen. * OPERATOR'S MODE Cursor If the key is pressed, when the cursor is placed at the upper left end (*, #, >), the screen will change * DAMPING 001.0 S Cursor If the key is pressed, when the cursor is placed at a number, the number is decremented. # 1.0000 m/s SPAN 07.069 m^3/h Cursor If the cursor is placed at a decimal point, the decimal point moves rightward.
Increment key	• Changes the parameter at a cursor position. • Displays the following screen. * OPERATOR'S MODE Cursor If the key is pressed, when the cursor is placed at the upper left end (*, #, >), the screen will change. * DAMPING 001.0 S Cursor If the key is pressed, when the cursor is placed at a number, the number is incremented. # 1.0000 m/s SPAN 07.069 m^3/h Cursor If the key is pressed, when the cursor is placed at a decimal point, the decimal point moves to the left. * AUTO ZERO READY Cursor If the cursor is placed over READY, pressing the key starts operation.

5-3 : Description of MEASURING MODE

5-3-1 : Display overview

% flow rate display 100.0 % 7. 069 m3/h 88888888	1st line (Main display): 7-segment 4-digit display % flow rate (%) 2nd line: Actual flow rate display (Significant value of 5 digits) 3rd line: Totalized value display (Significant figure of 8 digits) Write protect level display (WP0 to 3)
Actual flow rate display 7.06 9 % RATE 100. 0 m3/h 88888888	1st line (Main display): 7-segment 4-digit display Actual flow rate (RATE) 2nd line: % flow rate display (Significant figure of 4 digits), unit of actual flow rate 3rd line: Totalized value display (Significant figure of 8 digits) Write protect level display (WP0 to 3)
Totalizer display 12345678 TOTAL 7. 069 m3/h 100. 0%	1st line (Main display): 7-segment 8-digit display Totalized value (TOTAL) 2nd line: Actual flow rate display (Significant figure of 4 digits) 3rd line: % flow rate display (Significant figure of 4 digits) Write protect level display (WP0 to 3)

Totalization is not performed, when the output selection is set to the contact output. However, the previous value is displayed as the totalized value.

*** Details on display**

% flow rate display: The % flow rate display range is from -115.0% to 115.0%.

A value up to the first decimal place is displayed. The position of the decimal point is fixed.

The integer part to be displayed has up to three digits (0 to 115).

In the main display, unnecessary zeros are deleted (but are not deleted in the sub display).

Example) 019.8% → 19.8%

-000.5% → -0.5%

The position of the negative sign (-) is fixed. (The positive sign is not displayed.)

Actual flow rate display: The flow rate displayed in the actual flow rate display is up to 115% of the range or the equivalent.

However, if the flow rate equivalent to 115% of the range exceeds the range of significant figure, the highest value (e.g., 9.999) will be displayed.

In the main display, unnecessary zeros are deleted (but are not deleted in the sub display).

Totalized value display: An totalized value is displayed in 8 digits without signs and decimal points.

In the main display, unnecessary zeros are deleted (but are not deleted in the sub display).

Next to 99999999, totalization starts from 00000000.

5-3-2 : Display of write protect level

Protect level

The write protect levels and their corresponding settings and operating condition are shown below.

Write protect level	SW1	SW2	LSC (Key operation)			Communication		
			OPERATOR'S MODE	ENGINEERING MODE	MAINTENANCE MODE	OPERATOR'S MODE	ENGINEERING MODE	MAINTENANCE MODE
0	OFF	OFF	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE
1	ON	OFF	R/W ENABLE	R/W ENABLE	R/W ENABLE	R ONLY	R ONLY	R ONLY
2	OFF	ON	R/W ENABLE	R ONLY	R/W ENABLE	R ONLY	R ONLY	R ONLY
3	ON	ON	R ONLY	R ONLY	R/W ENABLE	R ONLY	R ONLY	R ONLY

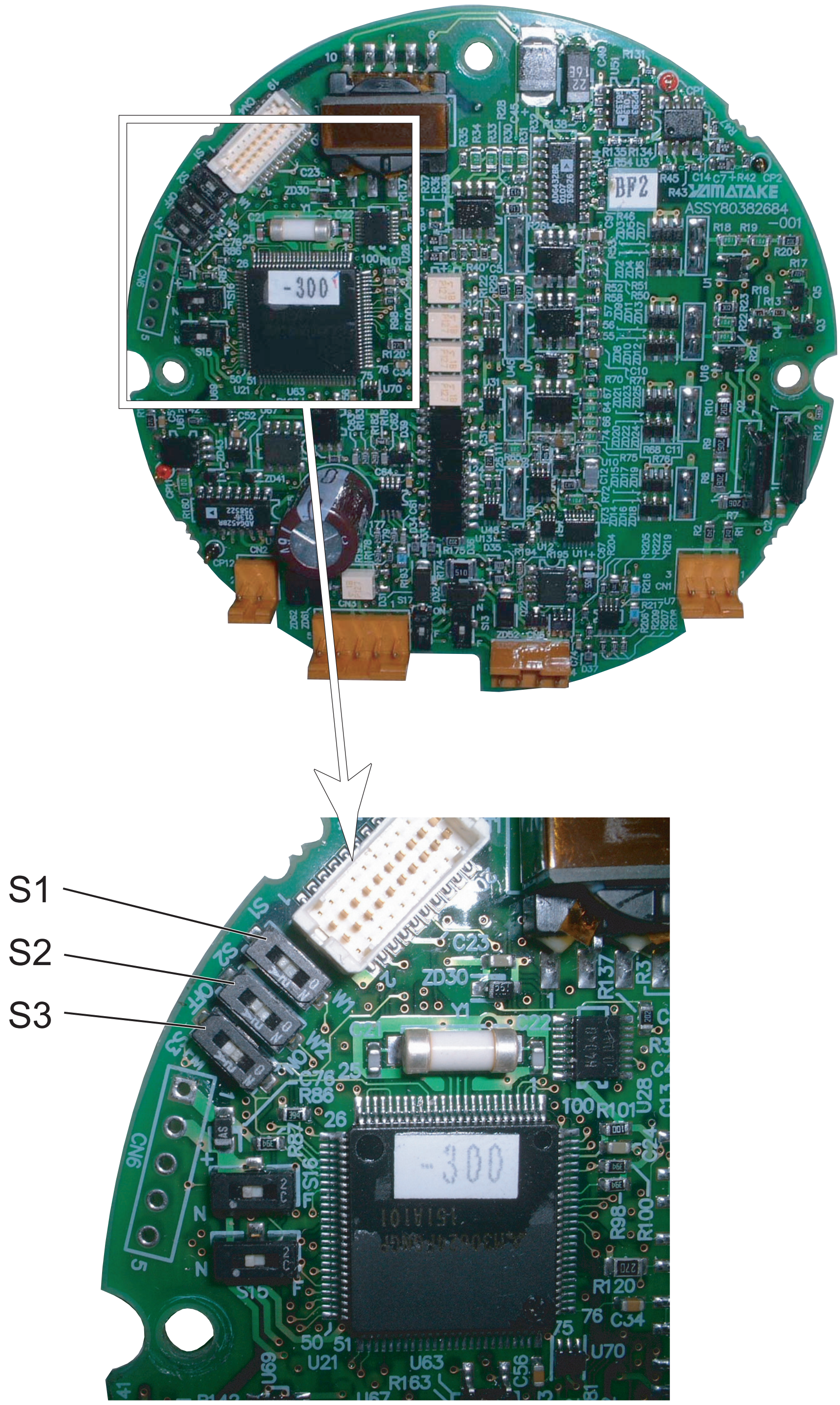
R/W: Read and write (Reads and writes set values.)
R: Read
W: Write
ENABLE: Enabled
Disable: Disabled
ONLY: Only the indicated operation is enabled.

~Note *Be sure to turn off the power supply before changing the write protect level dip switch settings.*

Settings of write protect switches

SW No.	At shipment
S1	Determined by WP LEVEL.
S2	Determined by WP LEVEL.
S3	ON (No data change is allowed.)

Main board



5-4 : Overview of operation using the data setting device

Introduction

The data setting device has three types of modes: OPERATOR'S MODE, ENGINEERING MODE, and MAINTENANCE MODE. MAINTENANCE MODE is furthermore divided into three of sub-modes: OUTPUT, CALIBRATION, and CRITICAL. The screen flow is as follows:

Entire display flow 1

OPERATOR'S MODE

- ※OPERATOR 'S / MODE
- ※DAMPING / 003.0s
- ※AUTO ZERO / READY
- ※CNT−RESET VALUE / 00000000
- ※CNT−RESET READY / PREV 00000000
- ※SPIKE CUT / OFF
- ※AVERAGING / ON 30.0s
- ※ELECTRODE_ST / SENSITIVITY OFF
- ※ELECTRODE_ST / OUTPUT MODE ZERO
- ※DISP SELECT / TOTAL
- ※COM SELECT / HART
- ※MODE ENTER / ENGINEERING
- ※MODE ENTER / MAINTENANCE

ENGINEERING MODE

- # ENGINEERING / MODE
- # ID SET / XXXXXXXX
- # FUNC SET / PULSE
- # EX 300.0 / MTG DIA 200
- # C1 1.0000 / C2 1.0234
- # 1.0000m/s / SPAN 7.0690 GPM
- #GRAVITY / 1.0000
- #COEFFICIENT / 1.0000
- #PLS 10.000Hz / SCL 196.36mG/P
- #PLS 30.000% / WID 0010ms
- #DROP OUT / 10%
- #LOW FLOW CUT / 10%
- #HI−ALM 100% / LO−ALM 100%
- #ERROR OUT MODE / I.OUT HOLD
- #ERROR OUT MODE / P.OUT HOLD
- #ST. OUT MODE / NORMAL CLOSE

MAINTENANCE MODE

- ≥MAINTENANCE / MODE
- ≥OUTPUT CHECK / MODE OFF
- ≥OUTPUT CHECK / W/CALIBRATOR
- ≥OUTPUT CHECK / I.OUT 100%
- ≥OUTPUT CHECK / P.OUT 100% *1
- ≥ OUTPUT CHECK / ST.OUT CLOSE *2
- ≥OUTPUT CHECK / EX EX0
- ≥CALIBRATION / MODE OFF
- ≥CAL EX OFF / LOW 3.5mA
- ≥CAL EX OFF / 4.9mA
- ≥CAL EX OFF / 7.0mA
- ≥CAL EX OFF / 11.9mA
- ≥CAL EX OFF / 14.0mA
- ≥CAL I.OUT OFF / LOW 4.000mA
- ≥CAL I.OUT OFF / HIGH 20.000mA
- ≥CAL P.OUT OFF / FREQ 90Hz
- ≥CAL GAIN / ZERO READY
- ≥CAL GAIN / 2.5m/s READY
- ≥CAL GAIN / 10.0m/s READY
- ≥MANUAL ZERO1 / READY
- ≥MANUAL ZERO2 / READY
- ≥MANUAL ZERO3 / READY

CRITICAL MODE

- ≥CRITICAL / MODE OFF
- ≥ROM VER. 3.00 / DATE 02−07−15
- ≥SHIPPING DATA / RECOVERY READY
- ≥INITIAL DATA / RECOVERY READY

*1 Displayed only when PULSE is selected by FUNC SET in ENGINEERING MODE.

*2 Displayed only when STOUT is selected by FUNC SET in ENGINEERING MODE.

5-5 : Configuration of OPERATOR'S MODE

Introduction

OPERATOR'S MODE provides the following setting and adjustment items.

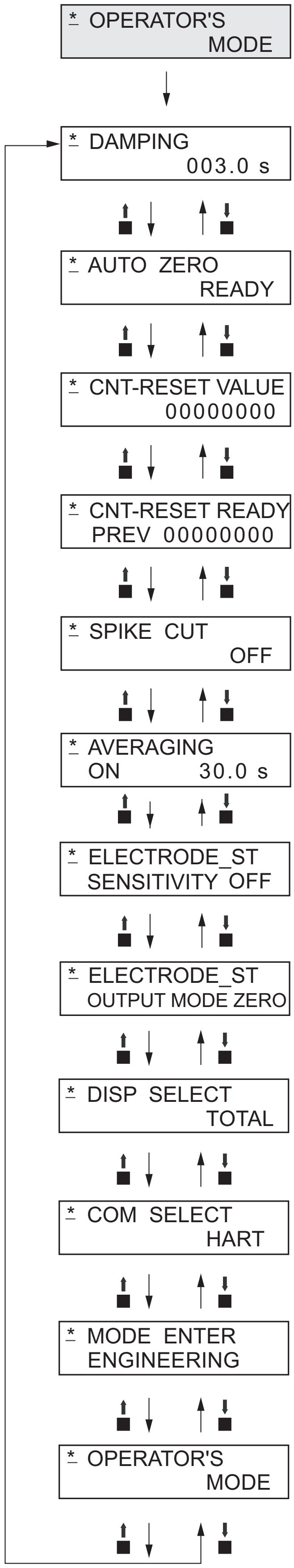
For details on functions in the items, see “5-5-1 : Changing setting of damping time constant” and later.

Item	Contents	Screen
DAMPING	Sets a damping time constant.	20.0 % * DAMPING 005.0 s
AUTO ZERO	Auto zero adjustment	20.0 % * AUTO ZERO READY
CNT-RESET VALUE	Sets a built-in counter reset value.	20.0 % * CNT-RESET VALUE 0 0 0 4 4 4 4
CNT-RESET READY	Resets totalized value to a built-in counter reset value.	20.0 % * CNT-RESET READY 0 0 0 0 0 0 0 0
SPIKE CUT	Sets auto spike cut.	20.0 % * SPIKE CUT OFF
AVERAGING	Sets a moving average function.	20.0 % * AVERAGING OFF
ELECTRODE_ST SENSITIVITY	Sets electrode status diagnostic function. Selects a sensitivity level of electrode status diagnostic function.	20.0 % * ELECTRODE_ST SENSITIVITY OFF
ELECTRODE_ST OUTPUT MODE	Sets output mode when the electrode status diagnostic function detects the empty or scale on electrode condition.	20.0 % * ELECTRODE_ST OUTPUT MODE OFF
DISP SELECT	Selects either % flow rate, actual flow rate or totalized value to be displayed in the main display.	20.0 % * DISP SELECT %

Item	Contents	Screen
COM SELECT	Selects a communication method.	20.0 % * COM SELECT SFN. A
MODE ENTER ENGINEERING	Enters the ENGINEERING MODE.	20.0 % * MODE ENTER ENGINEERING
MODE ENTER MAINTENANCE	Enters the MAINTENANCE MODE.	20.0 % * MODE ENTER MAINTENANCE

LCD display flow

The LCD display flow of the OPERATOR'S MODE is as shown below:



5-5-1 : Changing setting of damping time constant

Damping means a response time of the primary time lag (63.2% response) for a step response of the flow rate. If the out fluctuations are large, increase the damping. A large damping value stabilizes the output but lowers the response performance. We suggest setting the damping to the largest value the system can accept.

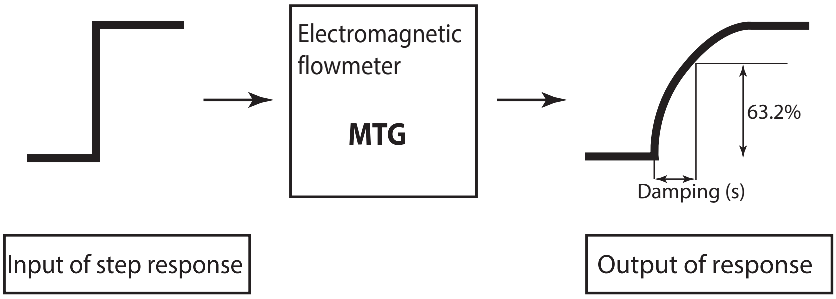


Figure 5-1 Damping output characteristics

Set the damping time constant in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the → key until the cursor is at the value to be changed. In this example, the key is pressed three times to move to the position “5.”	20.0 % * DAMPING 005.0 s
4	Press the ↑ or ↓ key to display a time constant to be changed. In this example, the ↑ key is pressed five times to change the damping time from 5 seconds to 10 seconds.	20.0 % * DAMPING 005.0 s
5	Press the → key until the cursor is back at the mode indicator. Press the MODE key to return to the MEASURING MODE and to save data.	20.0 % * DAMPING 005.0 s

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-2 : Auto zero adjustment

Auto zero must be carried out only under the condition when the detector is filled with process fluid at zero flow. Run this function only after installing the electromagnetic flowmeter to the process pipe. Performing this function under a condition where the process fluid is not at zero flow may cause measurement errors.

Set range: None in particular

Default None in particular

~Note *The zero adjustment takes approx. two minutes. During the zero adjustment, the output of analog current may rise to approx. 9 mA in some cases. This is not abnormal. To carry out the zero adjustment, set the control loop to manual.*

Make the auto zero adjustment in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	1.0 % 01.94 m^3/h 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	1.0 % * OPERATOR'S MODE 1.0 % * DAMPING 005.0 s
3	Press the ↑ key once to display the screen as shown.	0.0 % * AUTO ZERO READY
4	Press the → key to move the cursor to the position READY.	0.0 % * AUTO ZERO READY
5	Press the ↑ key to start the auto zero adjustment. If the main display selects % flowrate, the display of 0.0 blinks during adjustment. With the adjustment completed, the display stops blinking with ON switched to READY. This zero adjustment takes about two minutes.	0.0 % * AUTO ZERO ON 0.0 % * AUTO ZERO READY
6	Press the → key to move the cursor to the position under *. Press the MODE key to return to the MEASURING MODE and save data.	0.0 % * AUTO ZERO READY

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-3 : Setting of built-in counter reset value

Set a start value of the built-in counter. The scale of this value is considered as the weight of the pulse. Carry out the built-in counter reset in Section 5.4.5 to start totalization from any totalized value.

Set range: 00000000 - 99999999

Default: 00000000

Set an internal counter reset value in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at the right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key twice to display the screen.	20.0 % * CNT-RESET VALUE 00044444
4	Press the → key to move the cursor to the position under a target value to be changed.	20.0 % * CNT-RESET VALUE 00000000
5	Press the ↑ or ↓ key to set a desired value.	20.0 % * CNT-RESET VALUE 00005000
6	Press the → key to move the cursor to the position under *. Press the MDOE key to return to the MEASURING MODE and to save data.	20.0 % * CNT-RESET VALUE 00005000

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-4 : Setting of built-in counter reset value

Reset the built-in counter to start totalization from a value set as the built-in counter reset value. If this value is set to 1000, the built-in counter starts totalization from 1000 after the counter is completely reset.

If the built-in counter is reset, the built-in counter value just before the reset appears at the side of PREV on the LCD display.

Set range: None

Default: None

Reset the internal counter in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at the right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key three times to display the screen shown on the right.	20.0 % * CNT-RESET READY PREV 00000000
4	Press the → key to move the cursor to the position READY.	20.0 % * CNT-RESET READY PREV 00000000
5	Press the ↑ key to reset. In 0.5 seconds, the reset is completed with ON changing to READY.	20.0 % * CNT-RESET ON PREV 00000000 20.0 % * CNT-RESET READY PREV 00123456
6	Press the → key to move the cursor to the position under *. Press the MODE key to return to the MEASURING MODE and save data.	20.0 % * CNT-RESET READY PREV 00123456

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-5 : Setting auto spike cut

This function eliminates steep noise spikes (spike noise) in the flow rate. Noise generated when foreign matters collide with electrode is an example of the spike noise.

When the flow rate changes sharply, this function holds the outputs according to the damping time. Generally the spike noise occurs in a few milliseconds and settles down within the output holding time and the outputs are not affected. For ordinary flowrate changes, the output responds after the damping hold time.

It is not recommended to use this function for applications requiring high response and performance, e.g., the function should not be used when a pump frequently generates pulsation.

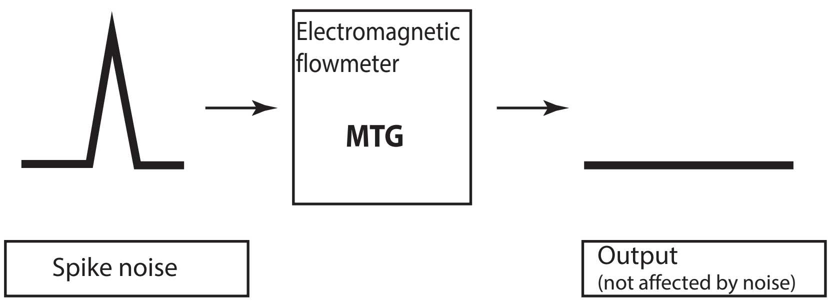


Figure 5-2 Auto spike cut output characteristics

Set the auto spike cut in accordance with the following procedure.

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key four times to display the screen shown on the right.	20.0 % * SPIKE CUT OFF
4	Press the → key to move the cursor to the OFF position.	20.0 % * SPIKE CUT OFF

Step	Procedure	Screen
5	Press the ↑ or ↓ key to select ON or OFF.	20.0 % * SPIKE CUT ON
6	Press the → key to move the cursor to the position under *. Press the MODE key to return to the MEASURING MODE and save data.	20.0 % * SPIKE CUT OFF

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-6 : Setting moving average processing

This function is used to carry out the moving average processing of the measured flow rate values. The model MTG performs the flow rate calculation every 400 ms. For example, if the moving average process time is set to 2 seconds, the moving average processing will be carried out 2 sec./400 ms = 5 times.

If pulsation are generated, this function can be used to suppress the flow rate fluctuations.

The moving average processing can be given by the following formula:

$$Qcurrent = \frac{\sum_{n=1}^{k} Qk}{k}$$

Example) When the moving average processing is set to 2 sec.:

$$Qcurrent = \frac{q_k + Q_{k-1} + Q_{k-2} + Q_{k-3} + Q_{k-4}}{5}$$

where q_k is a value currently measured, and Q_k is a previous output value.

Set range: ON / OFF

ON (1.0 to 30.0 s)

Default: OFF

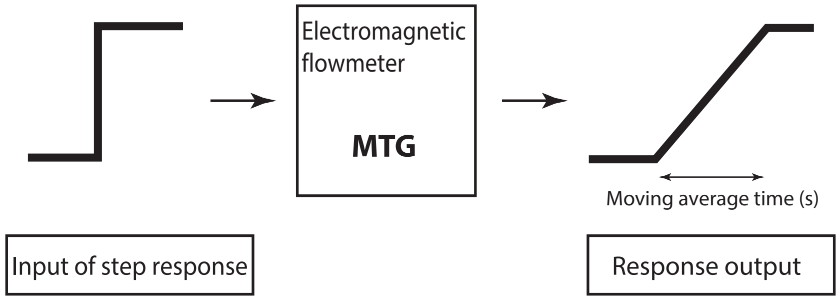


Figure 5-3 Output characteristics of moving average processing

Set the moving average processing in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ or ↓ key to display the screen shown on the right.	20.0 % * AVERAGING OFF
4	Press the → key to move the cursor to the OFF position.	20.0 % * AVERAGING OFF
5	Press the ↑ key to switch the OFF screen to the ON screen. Press the → key to move the cursor to the value to be changed.	20.0 % * AVERAGING ON 01.0 s
6	Press the ↑ or ↓ key to display a value to be set.	20.0 % * AVERAGING ON 05.0 s
7	Press the → key to move the cursor back to the position under *. Press the MODE key to return to the MEASURING MODE and save data.	20.0 % * AVERAGING ON 05.0 s

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-7 : Setting Electrode Status Diagnostic function

Overview of electrode status diagnostic function

Electrode status diagnostic function detects the condition of the empty pipe or the scale on the electrodes. The Electrode status diagnostic function makes the analog output and pulse output to the values as selected in the below "Electrode status output mode" table.

The display alternately shows the output values selected and "EMPTY OR SCALE ON ELECTRODE".

"Electrode status output mode" table

Output/Display	Parameter selection in the "Electrode status output mode"		
	OFF	ZERO	HOLD
Analog 4 – 20mA output	Output values as the meter measures.	Analog output is fixed to 0% (4mA).	Analog output is held at its last good value.
Pulse output	Output values as the meter measures.	Pulse output is fixed to 0 (does not generate pulses).	Pulse output is held at its present state.
Display	Display the value as it measures.	Flashes the message 0% and "Empty or scale on electrode" alternately (when % flow rate is specified for the main display). Flashes the message 0.000 RATE and "Empty or scale on electrode" alternately (when actual flow rate is specified for the main display). Flashes the message XXXXXXXX (totalized value at setup) and "Empty or scale on electrode" alternately (when totalized value is specified for the main display).	Flashes the values at its last good values and a message of "Empty or scale on electrode" alternately.

Mechanism of Electrode Status Diagnostic function

Detect empty pipe condition or scale on electrode condition by monitoring flow rate signal. Once the flow rate signal fluctuates over a certain threshold, the device judges that the flowtube is empty or scale appears on the electrodes.

There are five threshold levels to meet an environment where the device is installed. Set an appropriate threshold level from below.

SENSITIVITY HIGH
SENSITIVITY MID
SENSITIVITY LOW
SENSITIVITY LL
SENSITIVITY LLL

Outputs

Refer to the following table.

Output/Display	Parameter selection in the "Electrode status output mode"		
	OFF	ZERO	HOLD
Analog 4 – 20mA output	Output values as the meter measures.	Analog output is fixed to 0% (4mA).	Analog output is held at its last good value.
Pulse output	Output values as the meter measures.	Pulse output is fixed to 0 (does not generate pulses).	Pulse output is held at its present state.
Display	Display the value as it measures.	Flashes the message 0% and "Empty or scale on electrode" alternately (when % flow rate is specified for the main display). Flashes the message 0.000 RATE and "Empty or scale on electrode" alternately (when actual flow rate is specified for the main display). Flashes the message XXXXXXXX (totalized value at setup) and "Empty or scale on electrode" alternately (when totalized value is specified for the main display).	Flashes the values at its last good values and a message of "Empty or scale on electrode" alternately.

Operation conditions

- The grounding work must be securely carried out (grounding resistance 100Ω or less).
- The fluid conductivity must be 30 μS/cm or greater.
- The noise level must be higher than or equal to the set threshold value when the pipe is empty.
- The noise level must be lower than or equal to the set threshold value when the pipe is filled with fluid.

Default

SENSITIVITY OFF

Setting parameters

Table 5-1 Set Levels for Electrode Status Diagnostic Function

Electrode Status Diagnostic sensitivity	Noise detection level
SENSITIVITY OFF	Electrode Status Diagnostic Function OFF
SENSITIVITY HIGH	Signal level Threshold LOW
SENSITIVITY MID	Signal level Threshold MID
SENSITIVITY LOW	Signal level Threshold HIGH
SENSITIVITY LL	Signal level Threshold very HIGHER
SENSITIVITY LLL	Signal level Threshold extremely HIGHER

~Note 1 *This function is only available for detectors with a bore diameter of 10 mm or more. When the diameter is 2.5 mm or 5 mm, the setting screen for this function appears in the converter's display, but is not applicable.*

~Note 2 *This function is applicable for the converters with ROM version 7.0 or higher. If it is 6.0 or lower, the setting screen for this function is not displayed. To check the ROM version, refer to 5.7.7 “Displaying ROM version and date”.*
To use the electrode status diagnostic function with the ROM version 6.0 or lower, the main board must be replaced. For details, contact our sales representative.

Set the electrode status diagnostic function in accordance with the following procedure.

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state).	20.0 % 01.94 m³/h WP0 00069401
2	Press the MODE key. The OPERATOR'S MODE screen appears for approx. two seconds, and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key to display the screen shown on the right.	20.0 % * ELECTRODE_ST SENSITIVITY OFF
4	Press the → key to move the cursor to the OFF position.	20.0 % * ELECTRODE_ST SENSITIVITY OFF
5	Press the ↑ key to select SENSITIVITY HIGH.	20.0 % * ELECTRODE_ST SENSITIVITY HIGH
6	Press the → key to move the cursor to the position under *. Press the MODE key to return to the MEASURING MODE, and save the data.	20.0 % * ELECTRODE_ST SENSITIVITY HIGH
7	Empty the pipe with SENSITIVITY HIGH set to check if the function detects the empty status. Or, in case that you find the scale on the electrode, set the SENSITIVITY HIGH to check the function detects the scale on electrode status. Perform the checking when 30 seconds or more have passed, because it takes at least 30 seconds to detect the empty status after the pipe becomes empty or detect the scale on electrode status. (Result) When the empty status or scale on electrode is detected, the screen at right appears. The "EMPTY OR SCALE ON ELECTRODE" message is flashing, the analog output and the pulse output show the output values as selected in the "Electrode status output mode" table.	0.0 % EMPTY OR SCALE ON ELECTRODE

(To the next page)

Step	Procedure	Screen
8	Repeat steps 1 to 5 to set SENSITIVITY MID, SENSITIVITY LOW, SENSITIVITY LL or SENSITIVITY LLL to check if the function also detects the empty or scale on electrode status with the converter's display. Depending on whether the empty or scale on electrode status is detected in each setting, the result falls into one of the following.	

(Results of electrode status diagnostic operation check in empty or scale on electrode status)

Setting	Results (1)	Results (2)	Results (3)	Results (4)	Results (5)	Results (6)
LLL	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes
LL	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes
LOW	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes
MID	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE does not flashes	EMPTY OR SCALE ON ELECTRODE does not flashes
HIGH	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE flashes	EMPTY OR SCALE ON ELECTRODE does not flashes

- If the empty or scale on electrode status is not detected when HIGH has been set (in the case of result (6)), this function is not available in that installation environment. Repeat steps 1 to 5 to set the function to OFF.

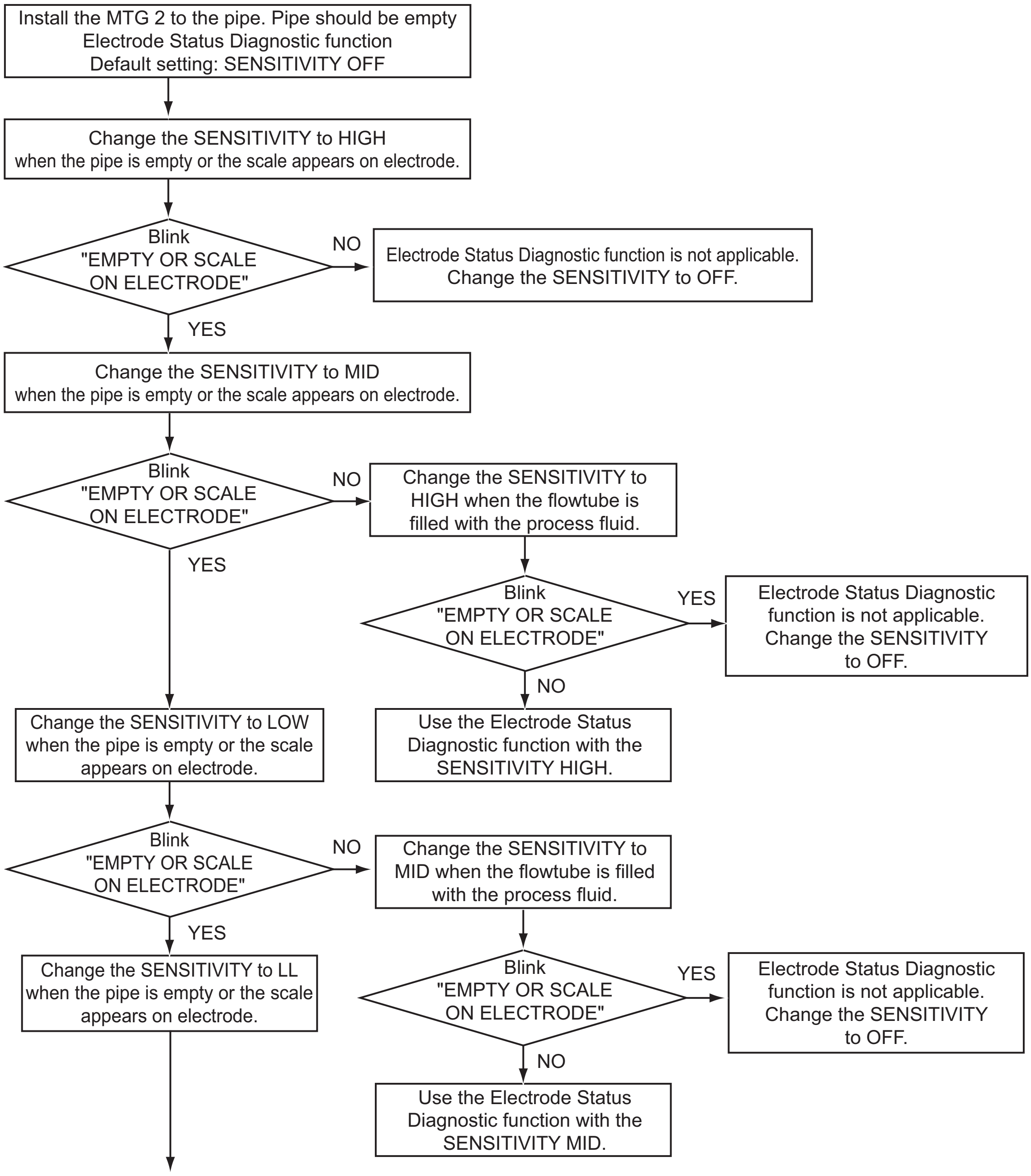
(To the next page)

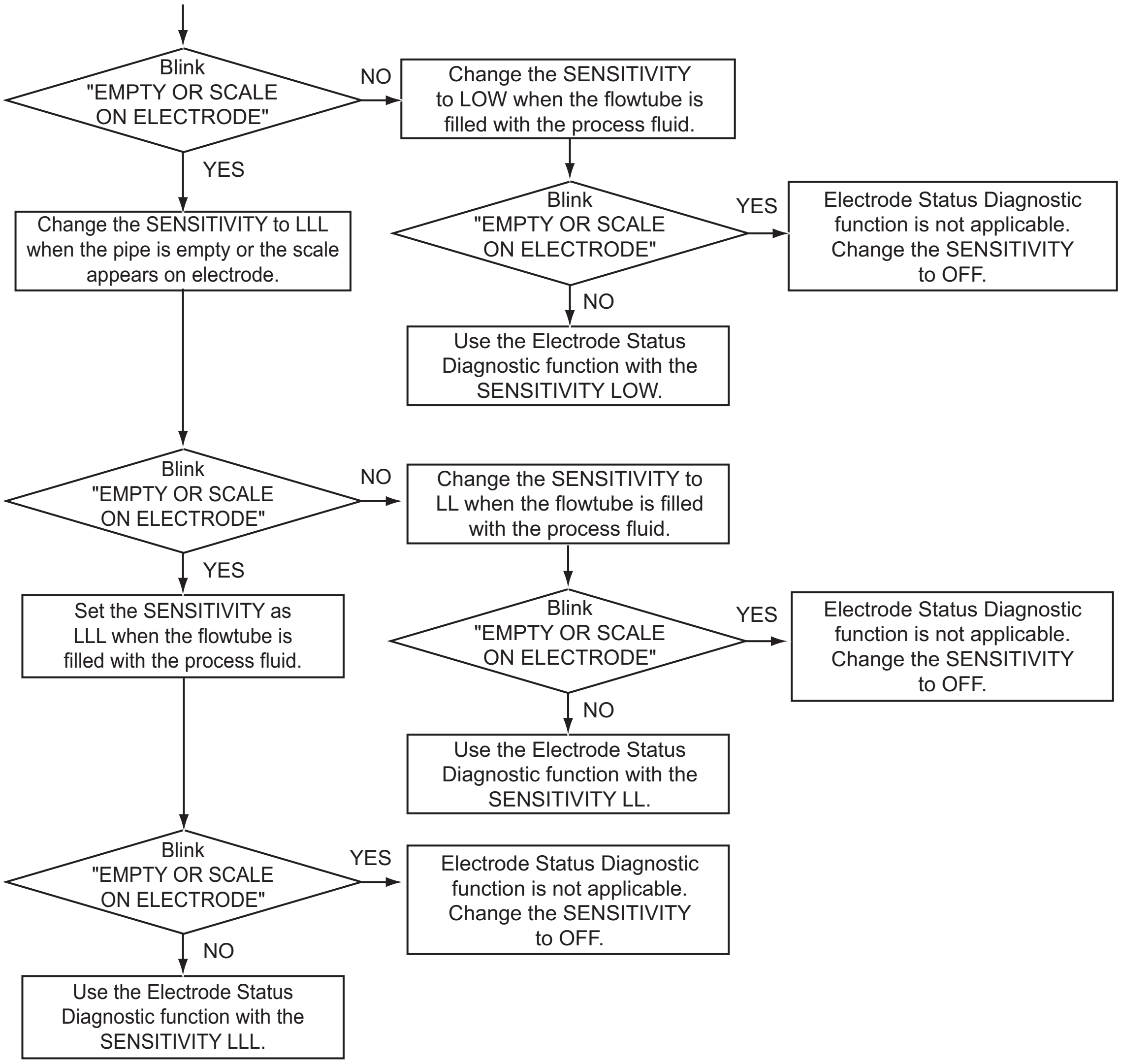
Step	Procedure	Screen
9	Next, fill fluid into the pipe. If the scale appears on the electrode, clean the electrode and fill fluid. Check that the empty or scale on electrode status is not detected in this condition. Since it takes at least 30 seconds to clear the empty or scale on electrode status after fluid is filled in the pipe, perform checking when 30 seconds or more have passed after fluid is filled. (Branch 1) • When the result is (1) in step 8 Check that the empty or scale on electrode status is not detected when SENSITIVITY LLL has been set. (Result) • If the empty or scale on electrode status is not detected, use that SENSITIVITY LLL setting without change. • If the empty or scale on electrode status is detected and the screen shown on the right appears, this function is not available in that environment. Set the function to OFF. (Branch 2) • When the result is (2) in step 8 Check that the empty or scale on electrode status is not detected when SENSITIVITY LL has been set. (Result) • If the empty or scale on electrode status is not detected, use that SENSITIVITY LL setting without change. • If the empty or scale on electrode status is detected and the screen shown on the right appears, this function is not available in that environment. Set the function to OFF. (Branch 3) • When the result is (3) in step 8 Check that the empty or scale on electrode status is not detected when SENSITIVITY LOW has been set. (Result) • If the empty or scale on electrode status is not detected, use that SENSITIVITY LOW setting without change. • If the empty or scale on electrode status is detected and the screen shown on the right appears, this function is not available in that environment. Set the function to OFF.	0.0 % EMPTY OR SCALE ON ELECTRODE 0.0 % EMPTY OR SCALE ON ELECTRODE 0.0 % EMPTY OR SCALE ON ELECTRODE

(To the next page)

Step	Procedure	Screen
9 (Continued)	(Branch 4) • When the result is (4) in Step 8 Check that the empty or scale on electrode status is not detected when SENSITIVITY MID has been set. (Result) • If the empty or scale on electrode status is not detected, use that SENSITIVITY MID setting without change. • If the empty or scale on electrode status is detected and the screen shown on the right appears, this function is not available in that environment. Set the function to OFF.	0.0 % EMPTY OR SCALE ON ELECTRODE
	(Branch 5) • When the result is (5) in Step 8 Check that the empty or scale on electrode status is not detected when SENSITIVITY HIGH has been set. (Result) • If the empty or scale on electrode status is not detected, use that SENSITIVITY HIGH setting without change. • If the empty or scale on electrode status is detected and the screen shown on the right appears, this function is not available in that environment. Set the function to OFF.	0.0 % EMPTY OR SCALE ON ELECTRODE

Electrode status diagnostic flow chart




Blink
"EMPTY OR SCALE
ON ELECTRODE"
NO
Change the SENSITIVITY
to LOW when the flowtube is
filled with the process fluid.
YES
Change the SENSITIVITY to LLL
when the pipe is empty or the scale
appears on electrode.
Blink
"EMPTY OR SCALE
ON ELECTRODE"
YES
Electrode Status Diagnostic
function is not applicable.
Change the SENSITIVITY
to OFF.
NO
Use the Electrode Status
Diagnostic function with the
SENSITIVITY LOW.
Blink
"EMPTY OR SCALE
ON ELECTRODE"
NO
Change the SENSITIVITY to
LL when the flowtube is filled
with the process fluid.
YES
Set the SENSITIVITY as
LLL when the flowtube is
filled with the process fluid.
Blink
"EMPTY OR SCALE
ON ELECTRODE"
YES
Electrode Status Diagnostic
function is not applicable.
Change the SENSITIVITY
to OFF.
NO
Use the Electrode Status
Diagnostic function with the
SENSITIVITY LL.
Blink
"EMPTY OR SCALE
ON ELECTRODE"
YES
Electrode Status Diagnostic
function is not applicable.
Change the SENSITIVITY
to OFF.
NO
Use the Electrode Status
Diagnostic function with the
SENSITIVITY LLL.

Electrode status diagnostic troubleshooting

Troubleshooting

If a problem occurs during electrode status diagnostic, take appropriate actions in accordance with the following procedure.

Trouble	Check point and troubleshooting
• Electrode status diagnostic mistake when fluid is filled because the unit is used in the place where the flow rate changes swiftly.	When the flow rate swiftly changes due to pulsations from the pump, the function may recognize some of the swinging flow rate signals as those in the empty status or scale on electrode and mistakenly determine it as empty or scale on electrode. In this case, it is recommended to install the unit in the place where no effects from the pulsation can be reached, e.g., by securing a longer upstream straight pipe section. When the unit is installed in a place where swift change of the flow rate may cause misdetection of the empty or scale on electrode status when fluid is filled, set this function to OFF. Please note that increasing the damping time constant does not solve this problem because this function determines the empty or scale on electrode status based on the signals before the damping process.
• Empty not detected when the pipe is empty.	If there is conductivity between electrodes or between the electrode and grounding ring due to the fluid left in the pipe, etc., the empty status may not be detected even when the pipe is empty. In this case, this function is not available. Set it to OFF. If the display and output are not always fixed to zero because, for example, the fluid drops on the electrode, they may become stable at zero by increasing the setting value for low flow cutoff and setting the auto spike cut to ON.
• Electrode status diagnostic operation error after the surrounding noise environment has been changed by expansion of equipment etc., such as changing the installation location or installing the high-current motors or pumps.	Since change of the environment also changes the noise volume, the electrode status diagnostic may not function correctly with the conventional threshold value for it. In this case, reset the threshold value.
• Empty detected with flowing fluid in fluid-filled status (empty not detected with stationary fluid).	The empty status may be detected even when the fluid is filled because of the effects of the flow noises generated from the flowing fluid. In this case, reset the threshold value so that the empty status is not mistakenly detected when the fluid is flowing.

Selecting the Electrode Status Output Mode

Setting the output mode when the Electrode Status Diagnostic function detects the empty or scale on electrode status.

There are the following three electrode status output modes.

- OFF
- ZERO
- HOLD

Default setting: OFF

Details of the “Electrode Status Output mode”

Output/Display	Parameter selection in the “Electrode status output mode”		
	OFF	ZERO	HOLD
Analog 4 – 20mA output	Output values as the meter measures.	Analog output is fixed to 0% (4mA).	Analog output is held at its last good value.
Pulse output	Output values as the meter measures.	Pulse output is fixed to 0 (does not generate pulses).	Pulse output is held at its present state.
Display	Display the value as it measures.	Flashes the message 0% and “Empty or scale on electrode” alternately (when % flow rate is specified for the main display). Flashes the message 0.000 RATE and “Empty or scale on electrode” alternately (when actual flow rate is specified for the main display). Flashes the message XXXXXXXX (totalized value at setup) and “Empty or scale on electrode” alternately (when totalized value is specified for the main display).	Flashes the values at its last good values and a message of “Empty or scale on electrode” alternately.

Set the Electrode status output mode in accordance with the following procedures.

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state).	20.0 % 1.94 m3/h WP0 00069401
2	Press the MODE key. The OPERATOR'S MODE screen appears for approximately two seconds, and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key to display the screen shown on the right.	20.0 % * ELECTRODE_ST OUTPUT MODE OFF
4	Press the → key to move the cursor to the OFF position.	20.0 % * ELECTRODE_ST OUTPUT MODE OFF
5	Press the ↑ key to select ELECTRODE_ST OUTPUT MODE. Press the ↑ or ↓ key to display the ELECTRODE_ST OUTPUT MODE to be set. Select ZERO, HOLD or OFF.	20.0 % * ELECTRODE_ST OUTPUT MODE ZERO 20.0 % * ELECTRODE_ST OUTPUT MODE HOLD
6	Press the MODE key to return to the MEASURING MODE and to save the data.	

5-5-8 : Selecting flow rate to be displayed in the main display

Select the flow rate to be always shown in the main display. The flow rates other than that selected for the main display are shown in the sub displays. Thereby, three flow rates can always be monitored.

Set	Description
%	% flow rate
RATE	Actual flow rate
TOTAL	Totalized value

% (% flow rate): Displays % flow rate

RATE (Actual flow rate)

Setting range: %, RATE, TOTAL

Default: RATE

Select the flow rate to be shown in the main display in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ or ↓ key to display the screen as shown on the right.	20.0 % * DISP SELECT %
4	Press the → key to move the cursor to the position for the flow rate display method (%, RATE, TOTAL). The screen at right shows an example where % flow rate has been set for the main display.	20.0 % * OPERATOR'S MODE
5	Press the ↑ or ↓ key to select a flow rate display to be set. The screen at right shows an example where RATE (actual flow rate) display has been selected.	0.30 RATE * DISP SELECT RATE
6	Press the → key to move the cursor to the position under *. Press the MODE key to return to the MEASURING MODE and to change to the set flow rate display.	0.30 RATE * DISP SELECT RATE

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-9 : Selecting a communication system

Select the communication system (SFC, DE, HART, and communication disable).

Select a communication system to be used. Note that the converter will be rebooted when the MODE key is pressed to switch to the MEASURING MODE after the settings are changed.

HART: HART communication by using the HART Communicator.

SFN.A: SFC in the analog (4-20 mA) output mode.

SFN.D: DE (Digital Enhanced) communication.

NONE: Communication is not used/disable.

By default, SFN.A: SFC communication is set.

Select a communication system in accordance with the following procedure:

Step	Procedure	Screen
1	The screen at right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key three times to display the screen as shown on the right.	20.0 % * COM SELECT SFN. A
4	Press the → key to move the cursor to the position for the communication system (SFN.A, SFN.D, NONE, HART). The screen at right shows an example where SFN.A has been selected for the communication system.	20.0 % * COM SELECT SFN. A
5	Press the ↑ or ↓ key to select a desired communication system to be set. The screen at right shows an example where HART communication has been selected.	20.0 % * COM SELECT HART

Step	Procedure	Screen
6	Press the → key to move the cursor to the position under *. Pressing the MODE key reboots the converter, returns to MEASURING MODE, and the communication system changes and saved.	20.0 % * COM SELECT HART 8.8.8.8.8.8.8.8 % RATE TOTAL SELF CHECK MODE 20.0 % 01.94 m³/h WP0 00069401

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-5-10 : Entering ENGINEERING MODE and MAINTENANCE MODE

Introduction

This section describes how to enter ENGINEERING MODE, in which setup parameters for the electromagnetic flowmeter are to be configured, and MAINTENANCE MODE, in which calibration and check are to be carried out.

~Note *The mode selection screen may not appear, depending on the settings of write protect. Operate the write protect switch on the main board, and then select one from levels 1, 2 and 3 to display the screen for selecting ENGINEERING MODE only. Select write protect level 0 to display the screen for selecting both ENGINEERING MODE and MAINTENANCE MODE. See "5-3-2 : Display of write protect level".*

The procedure for entering ENGINEERING MODE is shown below.

Step	Procedure	Screen
1	The screen shown right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key twice to display the screen as shown.	20.0 % * MODE ENTER ENGINEERING
4	Press the → key once to move the cursor to the position shown on the screen.	20.0 % * MODE ENTER ENGINEERING
5	Press the ↑ key. With the display is changed, ENGINEERING MODE is active. The screen appears in approx. two seconds.	20.0 % # ENGINEERING MODE 20.0 % # ID SET XXXXXXXX

The procedure for entering MAINTENANCE MODE is shown below.

Step	Procedure	Screen
1	The screen shown on the right is a screen display example in MEASURING MODE (measurement state). Press the MODE key.	20.0 % 01.94 m^3/h WP0 00069401
2	The OPERATOR'S MODE screen appears for approx. two seconds and then the damping setting screen appears.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key once to display the screen as shown on the right.	20.0 % * MODE ENTER MAINTENANCE
4	Press the → key once to move the cursor to the position shown on the screen.	20.0 % * MODE ENTER MAINTENANCE
5	Press the ↑ key. With the display changed, MAINTENANCE MODE is active. The screen appears in approx. two seconds.	20.0 % > MAINTENANCE MODE 20.0 % > OUTPUT CHECK MODE OFF

5-6 : Configuration of ENGINEERING MODE

Introduction

ENGINEERING MODE has the following setting and adjustment items:

For details on items, see “5-6-1 : Setting ID” to “5-6-15 : Setting contact output status”.

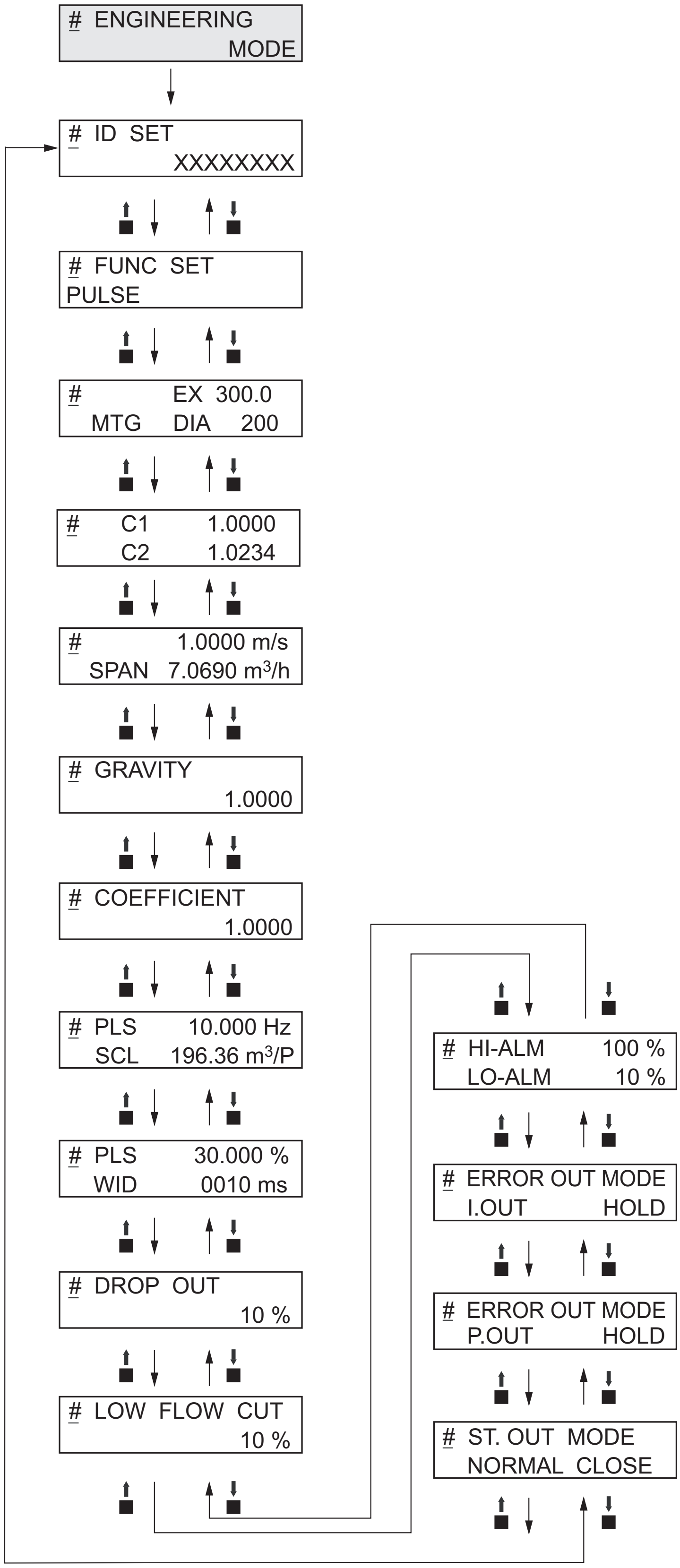
Item	Contents	Screen
ID SET	Sets ID and TAG No.	20.0 % # ID SET XXXXXXXX
FUNC SET	Setting of open collector output, selects pulse output or contact output.	20.0 % # FUNC SET PULSE
EX, TYPE, DIA	Sets the detector information (Ex value, detector type, and bore diameter).	20.0 % # EX 300.0 MTG DIA 200
C1, C2	Sets the detector factor.	20.0 % # C1 1.0000 C2 1.0234
SPAN	Sets the flow rate range.	20.0 % # 1.0000 m/s SPAN 7.0690 m^3/h
GRAVITY	Sets the specific gravity when mass flow rate unit is selected.	20.0 % # GRAVITY 1.0000
COEFFICIENT	Sets a compensation coefficient for flow rate calculation.	20.0 % # COEFFICIENT 1.0000
PLS SCL	Sets flow rate (pulse scale) per pulse.	20.0 % # PLS 10.000 Hz SCL 200.00 l/P

Item	Contents	Screen
PLS WID	Sets the output pulse width.	20.0 % # PLS 10.000 Hz WID 0010 ms
DROP OUT	Sets drop out.	20.0 % # DROPOUT 10 %
LOW FLOW CUT	Sets low flow cut.	20.0 % # LOW FLOW CUT 10 %
HI-ALM/LOW-ALM	Sets upper/lower limit alarm.	20.0 % # HI-AIM 100 % LO-AIM 0 %
ERROR OUT MODE I. OUT	Determines the analog output failsafe direction.	20.0 % # ERROR OUT MODE I.OUT HOLD
ERROR OUT MODE P. OUT	Determines the pulse output failsafe direction.	20.0 % # ERROR OUT MODE P.OUT HOLD
ST. OUT MODE	Sets a contact output status.	20.0 % # ST. OUTMODE NORMAL CLOSE

~Note *After the MODE key is pressed, configured data in the ENGINEERING MODE are saved in non-volatile memory. When configure data, be sure to press the MODE key to save the data.*

LCD display flow

The ENGINEERING MODE display flow is as follows:



5-6-1 : Setting ID

You can enter a unique 8-digit alphanumeric code for the flowmeter.

Up to eight alphanumeric characters using any combination of letters (A to Z), numbers (0 to 9), - (dash), / (slash), space and period.

Set an ID in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE (see section 5-5-10 : on page 5-36) and display the screen where the ID is to be set.	12.3 % # ID SET XXXXXXXX
2	Press the → key to move the cursor to the position under a desired character to be changed.	12.3 % # ID SET XXXXXXXX
3	Press the ↑ or ↓ key to select a desired character.	12.3 % # ID SET FXXXXXXX
4	If a target TAG NO. has been set, press the → key to move the cursor to the position under #. Press the MODE key to return to MEASURING MODE and to save data.	12.3 % # ID SET FIC-0001

5-6-2 : Selecting Pulse Output, Electrode Status Output or High Low Status Output

Pulse output, electrode status output or high low status output are selectable. They are open collector outputs.

When pulse output has been selected:
Set pulse scale, pulse width, drop out, and failsafe mode for the pulse output.

When high low status output has been selected:
As a contact output, self diagnostic output (critical failure) or upper/lower limit alarm is output.
Select % flow rate value for upper/lower alarm or output status (OPEN or CLOSE in normal condition).

When electrode status output has been selected:
As a contact output, empty status output or scale on electrode status alarm is output.
Select output status (OPEN or CLOSE in normal condition).

Setting range: PULSE: Selection of pulse output
HI LO STOUT: Selection of contact output for upper/lower limit alarm or critical failure status
ELECTRODE STOUT: Selection of contact output for empty status or scale on electrode diagnostic

Default: PULSE

Select pulse output, electrode status output or high low status output in accordance with the following procedure.

Step	Procedure	Screen
1	Enter ENGINEERING MODE (see “Entering Engineering Mode and Maintenance Mode” on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	20.0 % # FUNC SET PULSE
2	Press the → key to move the cursor to the position for set function. Press the ↑ or ↓ key to display a function to be set. Select PULSE (pulse output), HI LO STOUT (contact output for upper/lower limit alarm or critical failure status) or ELECTRODE STOUT (contact output for empty status or scale on electrode diagnostic).	20.0 % # FUNC SET PULSE 20.0 % # FUNC SET HI LO STOUT 20.0 % # FUNC SET ELECTRODE STOUT

Step	Procedure	Screen
3	Press the MODE key to return to the MEASURING MODE and to save the data.	20.0 % # FUNC SET PULSE

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-3 : Setting detector information

Set detector information necessary for combination with the converter.

EX value: Each detector has a unique calibration factor (EX value). This value is determined at shipment in accordance with the actual flow rate calibration. DO NOT change this value or the flowmeter output will be incorrect.

Detector type: When measuring the flow rate, select MTG for the detector type. To perform adjustments and loop check, select TST for the detector type.

Bore diameter: Sets the bore diameter (inside diameter) of the detector. The correct bore diameter is set as factory default setting.

Setting range: Detector constant: 200.0 to 699.9
Detector type: MTG/TST
Bore diameter: 2.5 to 200

Set the detector information in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # EX 300.0 MTG DIA 050.0
2	Press the → key to set the detector constant. Using the ↑ or ↓ key, enter the numeric value found in the EX column stamped on the nameplate of the detector to be combined.	12.3 % # EX 320.0 MTG DIA 050.0
3	In addition, press the → key to select the detector type. Using the ↑ or ↓ key, select the detector type. To measure the flow rate, select MTG. To perform adjustments and loop check, select TST.	12.3 % # EX 320.0 MTG DIA 050.0
4	Then press the → key to select the bore diameter. Using the ↑ or ↓ key, select the bore diameter of the detector.	12.3 % # EX 320.0 MTG DIA 100.0
5	Using the → key, move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and save data.	12.3 % # EX 320.0 MTG DIA 100.0

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-4 : Setting detector factor

Set the detector factor. The C1 value is always 1.0000. Set the C2 value to that shown on the detector nameplate under the heading Detector Factor.

Step	Procedure	Screen
1	Enter ENGINEERING MODE (see "Entering Engineering Mode and Maintenance Mode" on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	20.0 % # C1 1.0000 C2 1.0234
2	Press the → key to set the detector factor. C1 is always set to 1.0000. Set the C2 factor to that stamped on the nameplate of the flowmeter.	20.0 % # C1 1.0000 C2 1.0234
3	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save the data.	20.0 % # C1 1.0000 C2 1.0234

5-6-5 : Setting flow rate range

Set the flow rate range. The lower limit of the range is ZERO. The upper limit, which is the value when the output reaches 100%, is entered here along with the selection of engineering and time units. The range has an upper limit value of 10 m/s in flow velocity when it is calculated at the upper stage of the display. It has a lower limit value of 0.3 m/s.

Set the flow rate range so that the regular flow rate to greater than or equal to 50% of the flow rate range.

Pressing the MODE key automatically deletes unnecessary zeros, if any, from the flow rate range.

Example: 07.069 → 7.0690 (Unnecessary zero is deleted.)

Setting range:

- Flow rate range: 0 to 0.0001, 0 to 99999.
- Units of flow rate:
  - Unit of SI volume flow rate: m^3, 1, cm^3
  - Unit of SI mass flow rate: t, kg, g
  - Unit of non-SI volume flow rate: mG, G, kG, B, mIG, IG, kIG
  - Unit of SI mass flow rate: lb
- Unit of time: d, h, min., s

Default: 10.000 m^3/h

Set the flow rate range in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # 1.4147 m/s SPAN 10.000 m^3/h
2	Press the → key to move the cursor to a desired digit to be set.	12.3 % # 1.4147 m/s SPAN 10.000 m^3/h
3	Using the ↑ or ↓ key, change the value to a desired one.	12.3 % # 1.4147 m/s SPAN 20.000 m^3/h
4	In addition, press the → key to move the cursor to the position under a desired flow rate unit. Using the ↑ or ↓ key, select the unit.	12.3 % # 1.4147 m/s SPAN 20.000 l/h
5	Then press the → key to move the cursor to the position under the time unit. Using the ↑ or ↓ key, select the unit.	12.3 % # 1.4147 m/s SPAN 333.33l/ min
6	Press the → key to move the cursor to the position under #. Press MODE key to return to the MEASURING MODE, and to save data.	12.3 % # 1.4147 m/s SPAN 333.33l/ min

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-6 : Setting and changing compensation coefficient

This function is used to set or change the compensation coefficient which is used to multiply the output flow rate as required.

Set range: 0.10000 to 5.9999

Default: 1.0000

Set and change a compensation coefficient in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # COEFFICIENT 1.0000
2	Press the → key to move the cursor to the position under a desired value to be set or changed.	12.3 % # COEFFICIENT 1.0000
3	Using the ↑ or ↓ key, change the value to the desired one to be set.	12.3 % # COEFFICIENT 1.0050
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MDOE and to save data.	12.3 % # COEFFICIENT 1.0050

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-7 : Setting specific gravity

This function is used to set the specific gravity when selecting a weight unit (t, kg, g, lb) in the flow rate range setting.

Set range: 0.1000 to 5.9999

Default: 1.0000

Set the specific gravity in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # GRAVITY 1.0000
2	Press the → key to move the cursor to the position under a desired value to be set or changed.	12.3 % # GRAVITY 1.0000
3	Using the ↑ or ↓ key, change the value to the desired one to be set.	12.3 % # GRAVITY 1.0050
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save data.	12.3 % # GRAVITY 1.0050

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-8 : Setting pulse scale

This function is used to set the flow rate per pulse and associated units for a flowmeter. Pulse scale of the totalization value indicated on the display is equal to the pulse scale set here.

Set range: 0.0001 to 99999.

However, the pulse scale should be set so that the pulse output span frequency fs (shown in the auxiliary display) is between 0.0001 Hz and 200 Hz.

0.0001 Hz ≤ fs ≤ 200 Hz

Units of flow rate:

Unit of SI volume flow rate:	m^3, 1, cm^3
Unit of SI mass flow rate:	t, kg, g
Unit of non-SI volume flow rate:	mG, G, kG, B, mIG, IG, kIG
Unit of SI mass flow rate:	lb
Unit of time:	d, h, min., s

Default: 10.000 m^3/P

~Note ***Select the same unit systems (volume unit or mass unit) for the flow rate range and pulse scale. Selection of different unit systems for them will cause set errors (Err-22 PULSE WEIGHT SETTING ERROR). (See page 5-78.)***

Calculation method of span frequency:

Span frequency fs can be calculated by the following formula:

fs = (Flow rate range)/(Pulse scale)

To calculate fs, pay attention to the following points:

* Convert flow range into the range per second.
* Select the same unit of flow rate for flow rate range and pulse scale.

Example) When flow rate range: 60 l/min., and pulse scale: 10 cm^3/P:

1. Convert the flow rate range into the flow rate range per second.
   60 l/min. → 60/60 l/s
   = 1 l/s
2. Select the same unit of flow rate for flow rate range and pulse scale.
   In this example, the unit of pulse scale is changed.
   10 cm^3/P → 10/1000 l/P
   = 0.01 l/P
3. Calculate the span frequency.
   (1 l/P) / (0.01 l/P)
   = 100 Hz

fs = 100 Hz

Set pulse scale in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # PLS 27.780 Hz SCL 100.00 l/p
2	Press the → key to move the cursor to the position under a desired value to be set or changed.	12.3 % # PLS 27.780 Hz SCL 100.00 l/p
3	Using the ↑ or ↓ key, change the value to a desired pulse scale to be set.	12.3 % # PLS 13.890 Hz SCL 200.00 l/p
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MDOE and to save data.	12.3 % # PLS 13.890 Hz SCL 200.00 l/p

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-9 : Setting pulse width

Set a pulse width. The pulse width should be set in accordance with the specifications of the pulse receiver installed.

Set range

DUTY 50%

Pulse width that is DUTY 50% of the span frequency, and 1,000 ms (1s) maximum. The pulse duty ratio defines the pulse ON time versus the pulse OFF time as a percentage of the total pulse cycle.

NUM (setting of a real value)

0001 to 1,000 ms (1 s)

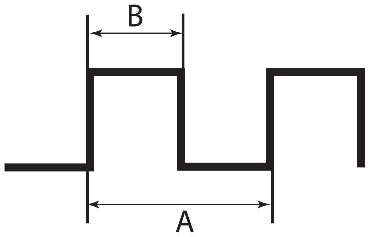
* With DUTY 50%, no setting error appears.
* With NUM (with a real value set), a setting error occurs if the pulse width exceeds the DUTY ratio of 70% in span frequency.

Default:

DUTY 50%

Method of setting pulse width:

The DUTY ratio is B/A (%) in the diagram at right.



1. NUM (when real pulse width is selected)

DUTY ratio < 70%

Set the pulse width as shown above.

Calculation method: When the range is 360 m^3, and pulse scale is 2 l/P,

First convert the unit of range to calculate the span frequency.

Convert the range into the unit of per-second (/s).

360 m^3/s → 0.1 m^3/s

Convert the unit of flow rate range to be same as the unit of pulse scale.

0.1 m^3/s → 0.1*1000 l/s

100 l/s

Calculation of span frequency

(100 l/s) / (2 l/P)

= 50 Hz

50 Hz → 20 ms (= A)

Calculation of pulse width where the DUTY ratio is equivalent to 70%

$B = 0.7 \times A$

$= 0.7 \times 20$ ms

$= 14$ ms

Therefore, set the pulse width to less than 14 ms.

2. DUTY 50% (Automatically set)

   Selecting DUTY 50% automatically sets the pulse width as follows:

   Calculation method 1

   Make calculations to obtain a pulse width that is DUTY 50% of the span frequency. The pulse width is automatically set. In this case, the calculated value of the pulse width does not appear on the display.

   Calculation method 2

   In addition, if the pulse width calculated by the calculation method 1 exceeds 1 second, the pulse width is set to 1 second.

   Calculation method 1: When the range is 360 m^3/h, and pulse scale is 2 l/P,

   First convert the unit of range to calculate the span frequency.

   Convert the range into the unit of per-second (/s).

   360 m^3/h → 0.1 m^3/s

   Convert the unit of flow rate range to be same as the unit of pulse scale.

   0.1 m^3/s → 0.1 × 1000 l/s

   100 l/s

   Calculation of span frequency

   (100 l/s) / (2 l/P)

   = 50 Hz

   50 Hz → 20 ms (= A)

   Calculation of pulse width where the DUTY ratio is equivalent to 50%

   B = 0.5 × A

   = 0.5 × 20 ms

   = 10 ms

   Therefore, the pulse width is 10 ms.

   Calculation method 2: When the range is 36 m^3/h, and pulse scale is 100 l/P,

   First convert the unit of range to calculate the span frequency.

   Convert the range into the unit of per-second (/s).

   36 m^3/h → 0.01 m^3/s

   Convert the unit of flow rate range to be same as unit of pulse scale.

   0.01m^3/s → 0.01 × 1000 l/s

   10 l/s

   Calculation of span frequency

   (10 l/s) / (100 l/p)

   = 0.1 Hz

   0.1 Hz → 10 s (= A)

   Calculation of pulse width where the DUTY ratio is equivalent to 50%

   B = 0.5 × A

   = 0.5 × 10 s

   = 5 s

Because the calculated pulse width exceeds 1 s, it takes 1s.

Set a pulse width in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # PLS 27.778 % WID NUM 010.00ms
2	Press the → key to move the cursor to the position under NUM.	12.3 % # PLS 27.778 % WID NUM 010.00ms
3	Pressing the ↑ key switches a screen for entering a numeric value for pulse width to a screen for fixing the DUTY ratio to 50%.	12.3 % # PLS WID DUTY 50 %
4	To enter a numeric value for pulse width, press the ↑ key to return to the screen for the entry of numeric values. Using the → key, move the cursor to the position under a desired digit to be set.	12.3 % # PLS 27.778 % WID NUM 010.00ms
5	Using the ↑ or ↓ key, change the value to a desired value to be set.	12.3 % # PLS 13.889 % WID NUM 005.00ms
6	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save data.	12.3 % # PLS 13.889 % WID NUM 005.00ms

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-10 : Setting drop out

This function is used to set the drop out value for the pulse output. The pulse output will be cut off at this point to avoid flow pulsation in range values close to zero, thus preventing incorrect totalization of the flow rate.

Pulse counting pauses when the flow rate reaches this preset percentage of the set range.

The low flow cutoff function affects the drop out function of the MagneW Two-wire PLUS+. Please refer to the following table describing how the drop out function of the MagneW Two-wire PLUS+ works.

Drop out function of the MagneW Two-wire PLUS+

LFC: Low flow cutoff, DO: Drop out

Area	LFC setting value ≥ DO setting value	LFC setting value < DO setting value
Pulse output	When the flow rate is less than the LFC setting value, the pulse output is fixed to zero (does not generate pulses).	When the flow rate is less than the DO setting value, the pulse output is fixed to zero (does not generate pulses).
Built-in counter (Totalized value)	When the flow rate is less than the LFC setting value, the totalized value is not counted up.	When the flow rate is less than the DO setting value, the totalized value is not counted up.

Setting range: 0 to 10%

Default: 2%

Set drop out in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # DROPOUT 02 %
2	Press the → key.	12.3 % # DROPOUT 02 %
3	Using the ↑ or ↓ key, change the value to a desired value to be set.	12.3 % # DROPOUT 05 %
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASUREMENT MODE and to save data.	12.3 % # DROPOUT 05 %

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-11 : Setting low flow cutoff

This function is used to set the low flow cutoff value. When the flow rate reaches the entered value, the analog output is cut off and latched to 4 mA (display flow rate of 0%) to avoid errors due to flow pulsation in range value close to zero.

Also, for reverse flow rate the output is latched to 4 mA (display flow rate of 0%)

The lower limit of the low flow cutoff setting is determined by the velocity range.

1. If the velocity range exceeds 3 m/s, the lower limit value is 1%.
2. If the flow velocity range is 3 m/s or less, the lower limit value will be the value that cut the flow velocity of 0.03 m/s or less flow rate.

   Example: If the flow velocity range is set as 2 m/s, the lower limit of the low flow cutoff value is 1.5%. (= 0.03/2 = 0.015 = 1.5%)

Setting range: 1 to 10%

Default: Depends on the velocity range.

Set low flow cut in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # LOW-FLOW CUT 02 %
2	Press the → key. The cursor then moves to the position of the low flow cut value.	12.3 % # LOW-FLOW CUT 02 %
3	Using the ↑ or ↓ key, change the value to a desired value to be set.	12.3 % # LOW-FLOW CUT 05 %
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to MEASURING MODE and to save data.	12.3 % # LOW-FLOW CUT 05 %

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-12 : Setting upper and lower limit alarm

This function is used to set the upper and lower limit alarm set points when the contact output is selected.

An alarm is output when the flow rate exceeds these preset upper and lower limits.

The alarm output status depends on the “Setting contact output status” described later.

Set range:	HI-ALM	0% to +115%
	LO-ALM	0% to +115%
Default:	HI-ALM	+115%
	LO-ALM	0%

Set the upper/lower limit alarm in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # HI-ALM +115% LO-ALM +000%
2	Using the → key, move the cursor to the position under a digit to be set or changed.	12.3 % # HI-ALM +100% LO-ALM -000%
3	Using the ↑ or ↓ key, change the value to the desired value to be set.	12.3 % # HI-ALM +080% LO-ALM -000%
4	Press the → key to move the cursor to the position under #. Press MODE key to return to the MEASURING MODE and to save data.	12.3 % # HI-ALM +080% LO-ALM -000%

However, set as follows: HI-ALM > LO-ALM.

5-6-13 : Selecting failsafe mode for analog outputs

This function is used to determine the analog output direction when the flowmeter detects a critical status condition.

⚠ CAUTION

The failsafe mode is very important for the overall safety of the control process. Choose the failsafe direction carefully, as equipment damage can result from a wrong choice.

Setting range:	LOW	Analog output is driven to low scale	(TYP 3.7 mA)
	HIGH	Analog output is driven to high scale	(TYP 21.8 mA)
	HOLD	Analog output is held at its last good value.	
Default:	LOW		

Set failsafe mode for analog output in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % #̲ ERROR OUT MODE I.OUT LOW
2	Press the → key.	12.3 % # ERROR OUT MODE I.OUT L̲OW
3	Using the ↑ or ↓ key, determine the failsafe mode for analog output.	12.3 % # ERROR OUT MODE I.OUT H̲IGH
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save data.	12.3 % #̲ ERROR OUT MODE I.OUT HIGH

⚠ CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-14 : Selecting failsafe mode for pulse output

This function is used to determine the pulse output direction when the flowmeter detects a critical status condition.

CAUTION

The failsafe mode is very important for the overall safety of the control process. Choose the failsafe direction carefully, as equipment damage can result from a wrong choice.

Set range:	OFF	Outputs no pulse.
	HOLD	Pulse output signal held at its present state
Default:	OFF	

Set failsafe mode for pulse output in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (see section 5-5-10 : on page 5-36). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # ERROR OUT MODE P.OUT OFF
2	Press the → key.	12.3 % # ERROR OUT MODE P.OUT OFF
3	Using the ↑ or ↓ key, determine the failsafe mode for pulse output.	12.3 % # ERROR OUT MODE P.OUT HOLD
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save data.	12.3 % # ERROR OUT MODE P.OUT HOLD

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

5-6-15 : Setting contact output status

This function is used to set contact output status for normal operation.

This function is effective only when contact output has been selected is the function specification.

Set range: CLOSE Sets the open collector output to ON.
OPEN Sets the open collector output to OFF.

Default: OPEN

Set the contact output status in accordance with the following procedure:

Step	Procedure	Screen
1	Enter ENGINEERING MODE in accordance with the entry into ENGINEERING MODE (See “5-5-10 : Entering ENGINEERING MODE and MAINTENANCE MODE” on page 5-36.). Then press the ↑ or ↓ key to display the screen at right.	12.3 % # ST. OUT MODE NORMAL CLOSE
2	Press the → key.	12.3 % # ST. OUT MODE NORMAL CLOSE
3	Using the ↑ key, set the contact output status.	12.3 % # ST. OUT MODE NORMAL OPEN
4	Press the → key to move the cursor to the position under #. Press the MODE key to return to the MEASURING MODE and to save data.	12.3 % # ST. OUT MODE NORMAL OPEN

CAUTION

You have only ten minutes to return to MEASURING MODE to save the new value before the system resets it to the previously saved value.

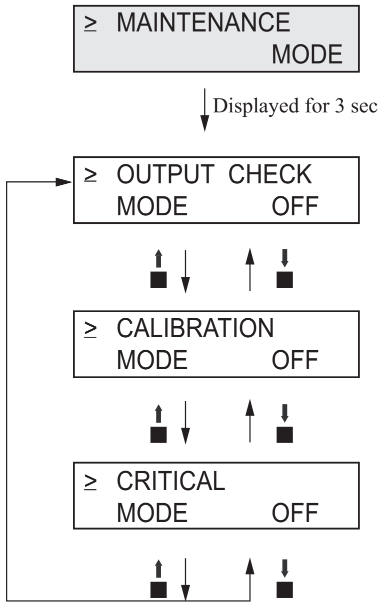
5-7 : Configuration of MAINTENANCE MODE

Introduction

MAINTENANCE MODE consists of the following three types: OUTPUT CHECK MODE, CALIBRATION MODE, and CRITICAL MODE. For details on the modes, see the following pages.

LCD display flow

The LCD display flow of MAINTENACE MODE is as follows:



CAUTION

When using an MGZ, use an Ex adapter. Otherwise, the device may burn out. For details, refer to the user’s manual for the MGZ (document No. CM2-MGZ200-2001).

5-7-1 : Configuration of OUTPUT CHECK MODE

Introduction

OUTPUT CHECK MODE has the following setting and adjustment items.
For details on the function of items, see the following pages.

Item	Content	Screen
OUTPUT CHECK W/CALIBRATOR	Perform loop check by using a calibrator.	20.0 % > OUTPUT CHECK W/CALIBRATOR
OUTPUT CHECK I.OUT	Outputs a fixed value of analog current output to perform loop check.	12.3 % > OUTPUT CHECK I.OUT 100%
OUTPUT CHECK P.OUT	Outputs a fixed value of pulse output to perform loop check.	12.3 % > OUTPUT CHECK P.OUT 100%
OUTPUT CHECK ST.OUT	Switch ST. OUT OPEN/ CLOSE to perform loop check.	12.3 % > OUTPUT CHECK ST.OUT CLOSE
OUTPUT CHECK EX	Outputs a fixed value of excitation current. This value was calibrated in the factory. DO NOT configure this value.	12.3 % > OUTPUT CHECK EX EX1

LCD display flow

The screen flow of OUTPUTCHECK MODE is as follows:

```
≥  OUTPUT  CHECK
   W/CALIBRATOR
```

```
≥  OUTPUT  CHECK
   I.OUT          100%
```

*1
```
≥  OUTPUT  CHECK
   P.OUT          100%
```

*2
```
≥  OUTPUT  CHECK
   ST.OUT         CLOSE
```

```
≥  OUTPUT  CHECK
   EX             EX1
```

```
≥  OUTPUT  CHECK
   MODE           OFF
```

~Note 1 *Displayed only when PULSE is selected by FUNC SET in ENGINEERING MODE.*

~Note 2 *Displayed only when H1 LO STOUT or ELECTRODE STOUT is selected by FUNC SET in ENGINEERING MODE.*

5-7-2 : Performing loop check of analog output by using a calibrator model MGZ/F1X.

Analog Output Check

With the signal input by a calibrator, the electromagnetic flowmeter outputs analog 4 to 20mA to perform the loop check. Other instruments in the analog current output loop, such as recorders and controllers can be checked.

Use an Azbil calibrator, model F1X1000 or MGZ13.

Default setting

Signal input by the calibrator

Setting range

0%, 25% to 100%

(The % flow rate input from 1% to 24% are not available.)

Perform loop check of analog outputs by using a calibrator in accordance with the following procedures.:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE (see “Entering Engineering Mode and Maintenance Mode” on page 5-36). Then the screen at right is displayed.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the → key to move the cursor to the OFF position. Press the ↑ key. With the displays switched from OFF to ON, the output check mode is then active.	20.0 % > OUTPUT CHECK MODE OFF 20.0 % > OUTPUT CHECK MODE ON 20.0 % > OUTPUT CHECK W/CALIBRATOR
3	Input the signal from the calibrator and perform the loop check. For the details of the calibrator operation, refer to the users manual of the calibrator.	20.0 % > OUTPUT CHECK W/CALIBRATOR

5-7-3 : Performing loop check of analog outputs

Analog output check

The electromagnetic flowmeter can be used as a constant current generator to check analog outputs. Other instruments in the analog current output loop, such as recorders and controllers can be checked.

Default setting

Displays the current output value.

Setting range

Range settings are allowed ranging from 0 to 100%.

Perform loop check of analog outputs in accordance with the following procedure:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE in accordance with the entry into MAINTENANCE MODE (See “5-5-10 : Entering ENGINEERING MODE and MAINTENANCE MODE” on page 5-36.). Then display the screen at right.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the → key to move the cursor to the OFF position. Press the ↑ key. With the display switched from OFF to ON, the output check mode is then active.	20.0 % > OUTPUT CHECK MODE OFF 20.0 % > OUTPUT CHECK MODE ON 20.0 % > OUTPUT CHECK W/CALIBRATOR 20.0 % > OUTPUT CHECK I.OUT 000.0%
3	Press the → key to move the cursor to the position under a desired value to be checked.	20.0 % > OUTPUT CHECK I.OUT 000.0%
4	Pressing the ↑ or ↓ key, change the value to the desired value to be checked. As shown on the screen on the right, the output to the range, given as an analog output, is 100% i.e. 20 mA.	20.0 % > OUTPUT CHECK I.OUT 100.0%
5	Press the → key to move the cursor to the position under >. Movement to another screen by using the ↑ or ↓ key returns to an analog output according to the actual flow rate.	20.0 % > OUTPUT CHECK I.OUT 100.0%

5-7-4 : Performing loop check of pulse outputs

Pulse output check

The electromagnetic flowmeter can be used as a pulse generator to check pulse outputs.

This screen appears when pulse output has been selected in FUNC SET of ENGINEERING MODE (see “5-6-2 : Selecting Pulse Output, Electrode Status Output or High Low Status Output”).

Default setting

Displays the current output value.

Setting range

Range settings are allowed ranging from 0 to 100%.

Perform loop check of pulse outputs in accordance with the following procedure:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE in accordance with the entry into MAINTENANCE MODE (see section 5-5-10 : on page 5-36). Then display the screen at right.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the → key to move the cursor to the OFF position. Press the - key. With the display switched from OFF to ON, the output check mode is then active.	20.0 % > OUTPUT CHECK MODE OFF 20.0 % > OUTPUT CHECK MODE ON 20.0 % > OUTPUT CHECK I.OUT 000.0%
3	Press the ↑ key to display the screen at right.	20.0 % > OUTPUT CHECK P.OUT 000.0%
4	Press the → key to move the cursor to the position under a desired value to be checked.	20.0 % > OUTPUT CHECK P.OUT 000.0%
5	Pressing the ↑ or ↓ key, change the value to the desired value to be checked. On the screen at right, a frequency pulse corresponding to flow rate signal 100% is output.	20.0 % > OUTPUT CHECK I.OUT 100.0%
6	Press the → key to move the cursor to the position shown on the screen at right. Movement to another screen by using the ↑ or ↓ key returns to a pulse output according to the actual flow rate.	20.0 % > OUTPUT CHECK I.OUT 100.0%

5-7-5 : Performing loop check of contact outputs

Contact output check

Contact outputs of electromagnetic flowmeter can be turned on and off to perform loop check of contact output signals.

This screen appears when contact output has been selected in FUNC SET of ENGINEERING MODE (see "5-6-2 : Selecting Pulse Output, Electrode Status Output or High Low Status Output").

Default setting

Displays the current contact output status.

Setting range

Set range "CLOSE" and "OPEN"

Perform loop check of contact outputs in accordance with the following procedure:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE in accordance with the entry into MAINTENANCE MODE (see section 5-5-10 : on page 5-36). Then display the screen at right.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the → key to move the cursor to the OFF position. Press the ↑ key. With the display switched from OFF to ON, the output check mode is then active.	20.0 % > OUTPUT CHECK MODE OFF 20.0 % > OUTPUT CHECK MODE ON 20.0 % > OUTPUT CHECK I.OUT 000.0%
3	Press the ↑ key twice to display the screen at right. In this status, a contact output corresponding to the display is output.	20.0 % > OUTPUT CHECK ST.OUT CLOSE
4	Press the → key to move the cursor to the OPEN or CLOSE position that indicates the status of contact output.	20.0 % > OUTPUT CHECK ST.OUT CLOSE
5	Press the → key to move the cursor to the position under >. Movement to another screen by using the ↑ or ↓ key returns the contact output to the output status according to the current status.	12.3 % > OUTPUT CHECK ST.OUT CLOSE

5-7-6 : Configuration of CALIBRATION MODE

Introduction

CALIBRATION MODE has the following setting and adjustment items:

Configuration of CALIBRATION MODE requires a dedicated calibrator.

Wrong operation may hinder accurate measurements of the flow rate. To operate in this mode, contact an Azbil Corp. representative.

Item	Content	Screen
CAL EX LOW 3.5 mA	Adjusts 3.5 mA excitation current.	12.3 % ≥ CAL EX OFF LOW 3.5 mA
CAL EX 4.9 mA	Adjusts 4.9 mA excitation current.	12.3 % ≥ CAL EX OFF 4.9 mA
CAL EX 7.0 mA	Adjusts 7.0 mA excitation current.	12.3 % ≥ CAL EX OFF 7.0 mA
CAL EX 11.9 mA	Adjusts 11.9 mA excitation current.	12.3 % ≥ CAL EX OFF 11.9 mA
CAL EX 14.0 mA	Adjusts 14.0 mA excitation current.	12.3 % ≥ CAL EX OFF 14.0 mA
CAL I.OUT LOW 4.000 mA	Adjusts 4 mA analog current output.	12.3 % ≥ CAL I.OUT OFF LOW 4.000 mA
CAL I.OUT HIGH 20.00 mA	Adjusts 20 mA analog current output.	12.3 % ≥ CAL I.OUT OFF HIGH 20.000 mA
CAL P.OUT FREQ 90 Hz	Adjusts 90 Hz pulse output.	12.3 % ≥ CAL P.OUT OFF FREQ 90 Hz

Item	Content	Screen
CAL GAIN ZERO	Adjusts 0 m/s gain.	12.3 % > CAL GAIN OFF ZERO READY
CAL GAIN 2.5 m/s	Adjusts 2.5 m/s gain.	12.3 % > CAL GAIN OFF 2.5 m/s READY
CAL GAIN 10.0 m/s	Adjusts 10.0 m/s gain.	12.3 % > CAL GAIN OFF 10.0 m/s READY
MANUAL ZERO1	Fine zero tuning for excitation current 4.9mA.	0.1 % > MANUAL ZERO1 READY
MANUAL ZERO2	Fine zero tuning for excitation current 7.0mA.	0.1 % > MANUAL ZERO2 READY
MANUAL ZERO3	Fine zero tuning for excitation current 11.9mA/14.0mA.	0.1 % > MANUAL ZERO3 READY

LCD display flow

The LCD display flow of CALIBRATION MODE is as follows:

```
≥ CAL EX        OFF
  LOW        3.5 mA

≥ CAL EX        OFF
             4.9 mA

≥ CAL EX        OFF
             7.0 mA

≥ CAL EX        OFF
            11.9 mA

≥ CAL EX        OFF
            14.0 mA

≥ CAL I. OUT    OFF
  LOW      4.000 mA

≥ CAL I.OUT     OFF
  HIGH    20.000 mA

≥ CAL P.OUT     OFF
  FREQ        90 Hz

≥ CAL GAIN
  ZERO        READY

≥ CAL GAIN
  2.5 m/s     READY

≥ CAL GAIN
  10.0 m/s    READY

≥ MANUAL      ZERO1
              READY

≥ MANUAL      ZERO2
              READY

≥ MANUAL      ZERO3
              READY

≥ CRITICAL
  MODE          OFF
```

⚠ CAUTION

When calibrate the remote style converterwith the calibrator, short C terminal and ground terminal on the converter housing.
By shorting C terminal and ground terminal on the converter housing, accurate calibration can be done.

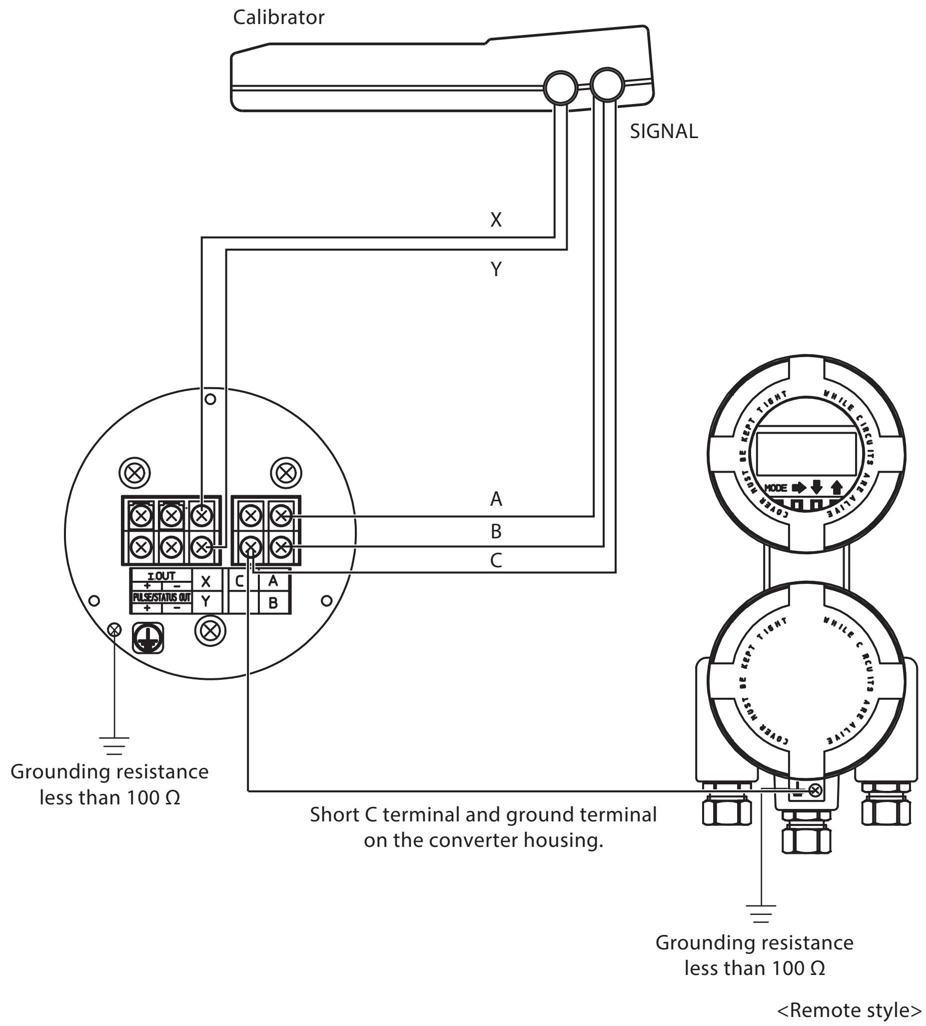


Figure 5-4

5-7-7 : Manual zero

This function is used to improve flow measurement more accurately when the flow rate becomes 25% or less of setting range.

Model MTG has three manual zeroing functions for each excitation current.

MANUAL ZERO1: Zeroing for the excitation current 4.9mA.
MANUAL ZERO2: Zeroing for the excitation current 7.0mA
MANUAL ZERO3: Zeroing for the excitation current 11.9mA/14.0mA.

Make sure the detector is filled with the process fluid and stands still.
Before manual zeroing, execute auto zero.

Step	Procedure	Screen
1	Enter CALIBRATION MODE. Use ↑ or ↓ key to cycle through the screens until the MANUAL ZERO1 screen appears.	0.5 % > MANUAL ZERO1 READY
2	WORKING is flashing for approximately 20 seconds. Wait until READY appears.	0.5 % > MANUAL ZERO1 WORKING
3	Check the value of zero point. If 0.0% is displayed on the main display, MANUAL ZEROING is not necessary for MANUAL ZERO1. If the value of zero point is not 0.0%, adjust the zero point.	0.5 % > MANUAL ZERO1 READY
4	Move the cursor under READY by pushing the → key.	0.5 % > MANUAL ZERO1 READY

~Note • *If the main display shows -2.0%, the zero point value may exceed -2.0%. Execute Auto zero before manual zero.*

Step	Procedure	Screen
5	Adjust zero point by pushing the ↑ or ↓ key so that the main display shows 0.0%. By pushing the ↑ key once, READY changes to UP and the zero point value increases 0.05%. By pushing the ↓ key once, READY changes to DOWN and the zero point value decreases 0.05%. It takes about 20 seconds to change the zero point value. During manual zeroing, the value in the main display flashes. If you push the ↑ or ↓ key again, wait until the value in the main display does not flash. **Note** Do not keep on pushing the ↑ or ↓ key. Manual zeroing does not work.	0.0 % > MANUAL ZERO1 READY 0.0 % > MANUAL ZERO1 UP 0.0 % > MANUAL ZERO1 DOWN
6	Move the cursor to the mode indicator by pushing → key.	0.0 % > MANUAL ZERO1 READY
7	Push the ↓ key and display the MANUAL ZERO2 screen.	0.5 % > MANUAL ZERO2 WORKING
8	Execute MANUAL ZERO2, as well as MANUAL ZERO1. (Refer to the Step 2 to 6.)	0.0 % > MANUAL ZERO2 WORKING
9	Push the ↓ key and display the MANUAL ZERO3 screen.	0.5 % > MANUAL ZERO3 WORKING
10	Execute MANUAL ZERO3, as well as MANUAL ZERO1. (Refer to the Step 2 to 6.)	0.0 % > MANUAL ZERO3 WORKING
11	Push the MODE key and return to the MEASURING MODE.	0.5 % MEASURING MODE

5-7-8 : Configuration of CRITICAL MODE

Introduction

CRITICAL MODE has the following setting and adjustment items:

Item	Content	Screen
ROM VER DATE	Displays the ROM version and date.	20.0 % ≥ ROM VER. □□□ DATE YY-MM-DD
SHIPPING DATA (default value) RECOVERY	You can return the device to factory setting/ default values for pertinent operational and configuration parameters. These parameters are entered before the device is shipped, so they are commonly referred to as “shipping data”. They include factory calibration data and factory settings or initial default settings for customer configuration data.	20.0 % ≥ SHIPPING DATA RECOVERY READY
INITIAL DATA RECOVERY	Initial data recovery eliminates all calibration data and configuration parameters. DO NOT use this function.	20.0 % ≥ INITIAL DATA RECOVERY READY

LCD display flow

The screen flow of CRITICAL MODE is as follows:

≥ ROM VER. 3.00
DATE 02-07-15

≥ SHIPPING DATA
RECOVERY READY

CAUTION ≥ INITIAL DATA
RECOVERY READY

≥ OUTPUT CHECK
MODE OFF

CAUTION

INITIAL DATA RECOVERY function is only for Azbil Corporation service/maintenance specialist.
Please DO NOT use this function.
If this function is turned ON, all calibrated data will be missing. The device needs to be back to the factory to calibrate again.

5-7-9 : Displaying ROM version and date

Displaying ROM version

The ROM version and date of the converter can be displayed on the display screen.

Display the ROM version and data in accordance with the following procedure:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE in accordance with the entry into MAINTENANCE MODE (see section 5-5-10 : on page 5-36). Using the ↑ or ↓ key, display the screen at right.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the ↑ key twice to display the screen at right.	20.0 % > CRITICAL MODE OFF
3	Press the → key to move the cursor to the OFF position. Then press the - key to switch the display from OFF to ON.	20.0 % > CRITICAL MODE ON
4	After the entry into CRITICAL MODE, the screen at right appears. On the screen, the ROM version and date can be checked.	20.0 % > ROM VER. DATE YY-MM-DD

5-7-10 : Returning to settings at shipment

SHIPPING DATA (default value) RECOVERY

Performing SHIPPING DATA RECOVERY returns the internal data settings of the device to the settings at time of shipment.

Note that executing this operation erases the data that was set and changed by the customer.

Perform SHIPPING DATA RECOVERY in accordance with the following procedure:

Step	Procedure	Screen
1	Enter MAINTENANCE MODE in accordance with the entry into MAINTENANCE MODE (see section 5-5-10 : on page 5-36). Using the ↑ or ↓ key, display the screen at right.	20.0 % > OUTPUT CHECK MODE OFF
2	Press the ↑ key twice to display the screen at right.	20.0 % > CRITICAL MODE OFF
3	Press the → key to move the cursor to the OFF position. Then press the ↑ key to switch the display from OFF to ON. After the entry into CRITICAL MODE, the screen at right appears.	20.0 % > CRITICAL MODE ON 20.0 % > ROM VER. DATE YY-MM-DD
4	Press the ↑ key to display the screen at right.	20.0 % > SHIPPING DATA RECOVERY READY
5	Press the → key to move the cursor to the READY position, and then keep pressing the ↑ key for three seconds or more.	20.0 % > SHIPPING DATA RECOVERY READY
6	SHIPPING DATA RECOVER starts. The display will change as shown on the screen at right.	20.0 % > SHIPPING DATA RECOVERY ON 8.8.8.8.8.8.8.8 % RATE TOTAL – SELF CHECK MODE
7	When SHIPPING DATA RECOVERY ends, the data settings return to those at the time of shipping, and then the MEASURING MODE screen reappears.	20.0 % 01.94 m^3/h WP0 00069401

5-8 : Description of Error Messages

Introduction

Errors are classified into critical failure and non-critical failure.

Critical failure

Critical failure may obstruct the electromagnetic flowmeter operation, if not corrected, ultimately damage the flowmeter. When critical failure occurs during operation, an error message will appear on the converter's display and the electromagnetic flowmeter will continue to output the preset value in the abnormality treatment (failsafe) direction. The error message and the self-diagnostic results will be visible on the display.

Perform the proper correction measures, referring to the actions below.

Error code of serious trouble

Error code	Error content	Action	LCD display
Err-02	CPU (ROM, RAM) CHECK SUM ERROR	1. Restore power. 2. Replace ROM. 3. Replace main P/C.	Err - 02 CPU CHECK ERROR
Err-04	NVM READ AFTER WRITE ERROR	1. Restore power. 2. Replace main P/C.	Err - 04 NVM CHECK ERROR

Non-critical error

Non-critical failures will not seriously affect electromagnetic flowmeter operation. When an error occurs during operation and is regarded as a non-critical problem by the converter self-diagnostics, the output will not burn-out and the electromagnetic flowmeter will continue to output the measured value.

If a wrong setting is found, an error message is displayed for a second, and then the screen set wrongly is displayed.

Error code of set errors

Error code	Error content	Action	LCD display
Err-12	Upper/lower limit alarm set error HI < LO is set.	Set HI>LO.	Err - 12 SETTING ERROR HI<LO
Err-21	Span is set to 12 m/s or more.	Check the settings of flow rate range and detector information (bore diameter and detector type).	Err - 21 SPAN ERROR OVER 12 m/s
Err-22	Pulse frequency is too large or too small. The flow rate range unit system is different from the pulse unit system. Example: SPAN m^3/h pulse scale t/h	1. Check pulse scale. 2. Check the setting of pulse frequency. 3. Adopt a unified unit system.	Err - 22 PULSE WEIGHT SETTING ERROR
Err-23	The pulse width is too large. When pulse frequency is output, the duty is 70% or more.	Check the following settings: 1. Pulse width 2. pulse scale 3. Span	Err - 23 PULSE WIDTH OVER DUTY 70%

Chapter 6 : Operation using SFC communicator

6-1 : Structure and functions of SFC

6-1-1 : Structure of SFC

Introduction

CAUTION

- When communication with the converter is started using the SFC in a system with analog output, be sure to change the control loop of the process to “manual” (manual control).
- Be sure to use the SFC with software version 7.0 or later. Using earlier versions may result in problems such as the absence of some setting items or failure in setting correctly.

~Note *Do not overcharge or over discharge (leave with the switch on) the built-in battery of the SFC. This may shorten the battery life.*

Detailed information

The SFC has been developed not only as a converter but also as a communicator to be used in connection with various smart field instruments. If you need explanation for instruments other than the loop powered magnetic flowmeter, see the model SFC160/260 User's Manual of the respective series’.

Structure of Smart Field Communicator (SFC)

Names of components

Figure 1-1 shows the structure and names of components for the Smart Field Communicator (SFC).

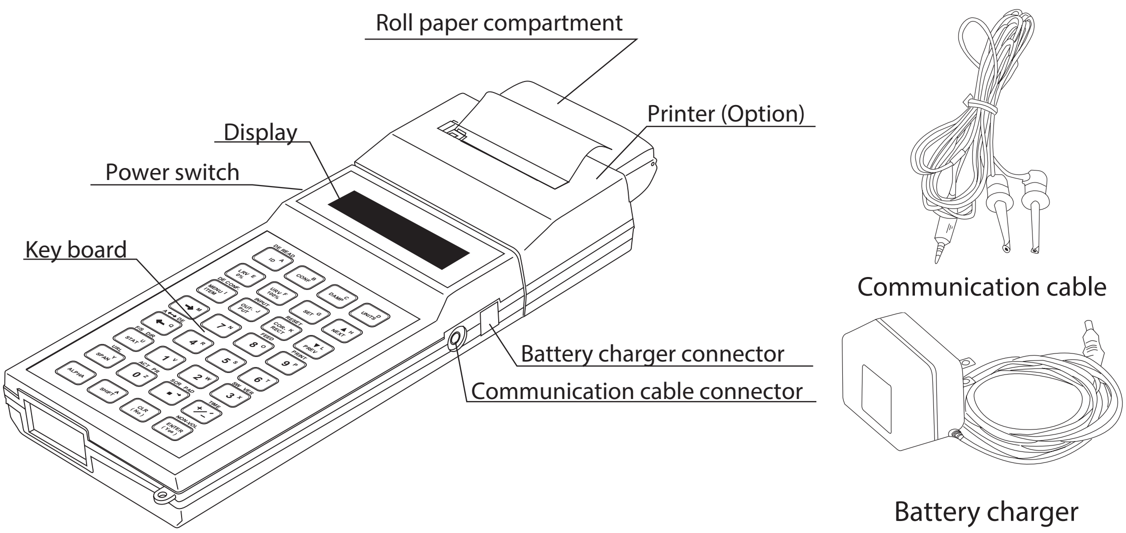
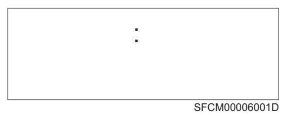


Figure 6-1 Details of SFC

Names of components and descriptions

The following table describes the components of the SFC.

Name	Description
Paper roll compartment	• Stores heat-sensitive paper roll for print out.
Printer section (option)	• This is an optional item. • A 24 characters/line thermal printer. • Prints out internal data of the converter or communication data. • The printer section is combined with the main unit and cannot be separated.
Display window (screen)	• Displays messages or data from the converter in 16 characters x 2 lines. • The data display screen is available in either English or Japanese.
Power switch	• Turning ON the power switch of the SFC automatically starts self-diagnostics.
Keyboard	• There are 32 touch keys. • Each key provides a separate function and other functions are accessed after pressing the SHIFT key. • The keyboard is available in either English or Japanese version.
Communication cable connector	• Connect the plug side of the communication cable.
Communication cable	• Be sure to use the supplied dedicated cables.
Battery charger connector	• Connect the plug side of the battery charger.
Battery charger	• Charge the battery of the SFC using the supplied battery charger. **~Note** *When the battery voltage drops, the following sign appears in the display window.* 

6-1-2 : Functions of SFC

SFC keyboard

Key types

The SFC keyboard has 32 touch keys.

Each key is assigned to up to three types of input functions.

- The alphabet
  To enter a letter of the alphabet press the ALPHA key to display the "□"cursor in the display window first. Then, press the key of the desired letter.

- Function, numeral or symbol at the center of the DE READ ID A key
  To access this function, numeral or symbol, make sure the "_" cursor is displayed in the display window.
  Pressing the ALPHA key toggles the "□"cursor and "_" cursor.

- Function displayed on the key
  To access this function, press the SHIFT ^ key to display SHIFT in the display window first.

```
SHIFT-
```

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Then, press the key you want to enter. If you have pressed the SHIFT ^ key by mistake, press the CLR (No) key.

Key color-coding

The 32 touch keys can be roughly divided into 5 categories according to their function, and are color-coded as follows.

- Green: Mainly used to communicate with the two wired magnetic flowmeter converter or display or change the setting.
- Orange: Mainly used to communicate with the two wired magnetic flowmeter or select the screen or decide the menu.
- Yellow: Mainly used to enter numerals.
- Dark brown: Mainly used for diagnostics or check.
- White: Used to control the keyboard or for auxiliary operation.

Rules of key operations and interaction with screens

General rules for key operations

The following points should be noted when operating the SFC keyboard.

- Press keys firmly and slowly. If the screen does not respond, this means the key input has not been accepted. Press the key slowly once again.
- There are active keys and inactive keys depending on the screen in the display window. When an inactive key is pressed, pressing the CLR (No) key will restore to a state in which key input can be accepted. After this, press an active key.

Interaction rules

The SFC can be operated on an interactive basis. Interact with the SFC according to the following rules:

- To answer "Yes" to a question on the screen, press the NON-VOL ENTER (Yes) key. Answering "Yes" to a question on the screen of the CONFIG functions normally moves to a hierarchy one level lower. However, answering "Yes" to the prompt of "EXIT..." exits the function and returns to a hierarchy one level higher.
- To answer "No" to a question on the screen, press the CLR (No) key. Answering "No" to a question on the screen of the CONFIG functions normally moves to a hierarchy one level higher. However, answering "No" to the prompt of "EXIT..." returns to the start screen of the function.
- To select a different function in the same hierarchy, press ▲H NEXT / ▼L PREV keys.
- To scroll the screen in order to select a different item in the same hierarchy and with the same function, press the DE CONF. MENU I ITEM key. While the CONFIG function is active, pressing the SET G + CLR (No) keys at any hierarchy will show a screen "EXIT CONFIG?". Pressing the NON-VOL ENTER (Yes) key here makes it possible to exit the CONFIG function at a stroke.

Display of # mark

While the SFC is communicating with the converter, a # mark may appear in the last column at the bottom of the screen. The # mark is an alarm which appears under the following circumstances.

- A minor fault has occurred.
- The converter is operating in constant current generation mode or special mode.

When the # mark appears, check the status of the converter with the F/S DIR STAT U key and take appropriate action with reference to "Error messages and remedial action" on page 6-32.

Key names and functions

This section describes the functions assigned to the green keys, which are mainly used to communicate with the two wired magnetic flowmeter converter or to change or display the settings.

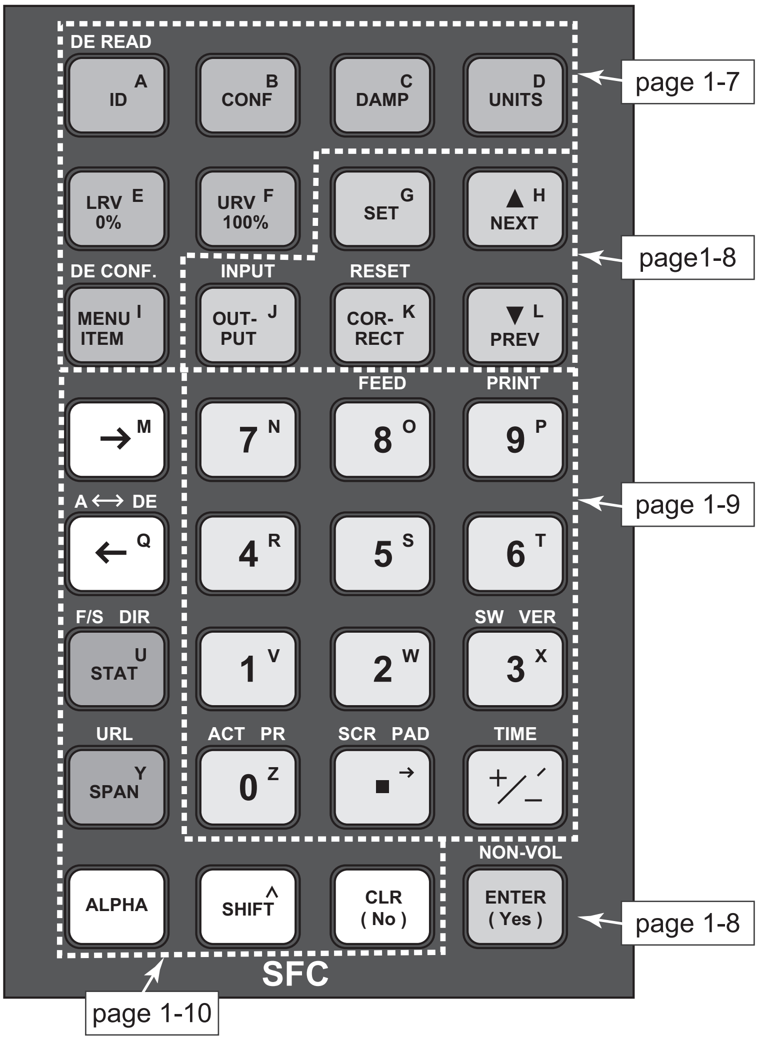


Figure 6-2 SFC keyboard

Key	Description	
	Press key	Press SHIFT + key
DE READ ID A	ID: Starts communication with the converter. The display window shows TAG No. of the converter. It is possible to write or rewrite the TAG No. on this screen.	Used when the communication method is SFN. D. Has the same function as ID.
CONF B	CONF: Used to correct the converter or change the setting of the internal data. This function has a hierarchical structure. See “Hierarchical structure of CONFIG functions” on page 6-17 for details.	No effect
DAMP C	DAMP: Press this key to display or change the damping time constant of the converter.	No effect
UNITS D	UNITS: Press this key to display or set the engineering units of the flow rate measured using the converter.	No effect
LRV 0% E	LRV 0%: Displays the lower range value of the converter output range. Fixed at 0.0% in the converter. The lower range value refers to the flow rate when the converter output becomes 0% (4 mA DC in the case of analog output).	No effect
URV 100% F	URV 100%: Displays the upper range value of the converter output range. The upper range value refers to the flow rate when the converter output becomes 100% (20 mA DC in the case of analog output).	No effect
DE CONF. MENU ITEM I	MENU ITEM: Used to display or select a different item located at the same hierarchy and with the same function.	DE CONF: Used to display or select variables output in digital communication using SFN.D for communication method.

Key names and functions

This section describes the functions assigned to the orange keys, which are mainly used to communicate with the converter or to select a screen or to select from the menu.

Key	Description	
	Press key	**Press SHIFT + key**
SET G	SET: Used for setting correction coefficient in LRV setting.	No effect
▲ H NEXT	NEXT: Scrolls up the screen in the CONFIG function.	No effect
▼ L PREV	PREV: Scrolls down the screen in the CONFIG function.	No effect
INPUT OUT-PUT J	OUTPUT: Displays a value in percentage, which is transmitted by the converter to the control loop.	INPUT: Displays an instantaneous flow rate value detected by the converter in a real flow rate.
RESET COR-RECT K	CORRECT: Press this key to adjust the zero point of the converter. This operation is available while INPUT (input) is being read.	RESET: Resets the internal data of the converter to the factory setting.
NON-VOL ENTER (Yes)	ENTER: Press this key to answer “Yes” to a question on the screen. The screen will move one step up or down or data set by the SFC is written into the database of the converter.	NON-VOL: The data set by the SFC is forcibly written into non-volatile memory of the converter.

Key names and functions

This section describes the functions assigned to the yellow keys which are used to enter numerals.

Key	Description	
	Press key	Press SHIFT + key
PRINT 9 P	9: Enters numeral 9.	PRINT: Prints out internal data of the converter. This printing operation is called “configuration printout”.
FEED 8 O	8: Enters numeral 8.	FEED: Advances printing paper by 1 line. The display window shows “PRINTER FEED”. As long as this prompt is displayed, each pressing of this key advances paper by 1 line. To cancel this operation, press the CLR key.
7 N to 4 R	7 to 4: Enters numeral 7 to 4.	No effect
SW VER 3 X	3: Enters numeral 3.	Displays the software versions of the converter and SFC. If the SFC is not communicating with the converter, only the version of the SFC is shown.
2 W	2: Enters numeral 2.	Displays “KEYBAORD TEST row* column*” and then displays the row and column of the key pressed immediately after. Used to check the keyboard for any problems.
1 V	1: Enters numeral 1.	No effect
ACT PR 0 Z	0: Enters numeral 0.	ACT PR: Prints out a response from the converter every time the key is operated. This operation is called “action printout”.
SCR PAD ■ →	•: Enters a decimal point.	SCR PAD: Writes a memo into the database of the converter.
TIME +/−	Inverts the sign in the case of numerical input.	TIME: Displays the current year, month, day and time.

Key names and functions

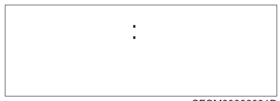
This section describes the functions assigned to the dark brown and white keys which are used to diagnose or check the converter or to control the keyboard, etc.

Key	Description	
	Press key	Press SHIFT + key
→ M	→: Moves the cursor to the right.	No effect
A ↔ DE ← Q	←: Moves the cursor to the left.	A ↔ DE (analog ↔ digital): Switches between analog and digital communications.
F/S DIR STAT U	STAT: Displays self-diagnostics result of the converter.	No effect
URL SPAN Y	SPAN: Displays the span of the range of a value currently displayed.	No effect
ALPHA	ALPHA: Press this key before entering a letter of the alphabet. When the “□“cursor appears on the display section, it is ready to enter. Press this key once again to enter a function or numeral displayed in the center of each key. When the display section shows a cursor, it is ready to enter this function or numeral.	No effect
SHIFT ^	SHIFT: Press this key to enter a function displayed above each key. When the display section shows “SHIFT-”, it is ready for input.	No effect
CLR (No)	CLR: Clears the display in the display window and the SFC waits for input. Or press this key to answer “No” to a question on the screen. The screen moves one level up or down.	When exiting the CONFIG function, pressing this key jumps from a lower level to EXIT CONFIG at a stroke.

Charging SFC

CAUTION

When a ":" mark appears in the 8th column at the top of the SFC screen as shown below, stop using the SFC immediately and charge the SFC. Continuing to use the SFC will over discharge the battery of the SFC and make it impossible to charge it further.



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Procedure

For the procedure for charging the SFC, see the SFC User's Manual (CM2-SFC100-2001).

6-1-3 : SFC Wiring

Wiring between two wired magnetic flowmeter converter and SFC

This section describes the wiring method between the two wired magnetic flowmeter converter and SFC.

Connect the SFC as shown in Figure 6-3.

Connect the SFC red terminal to I.OUT+ and the black terminal to I.OUT-.

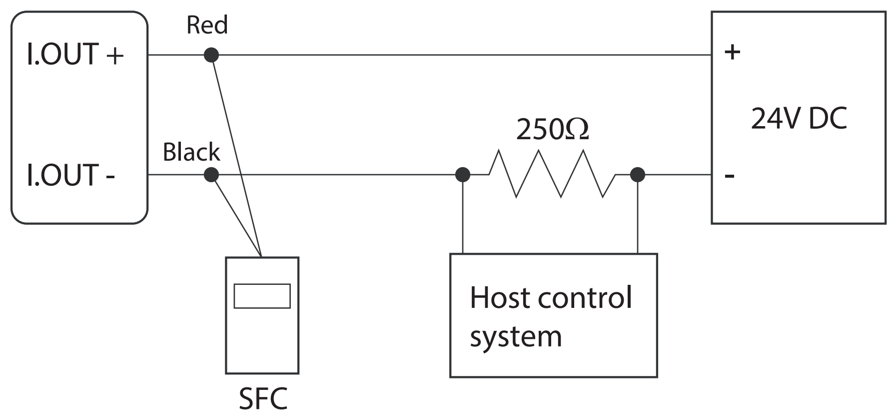


Figure 6-3 SFC wiring connection

6-1-4 : SFC unavailable functions

There are functions which cannot be set or changed from SFC in two wired magnetic flowmeter functions. These function settings or changing can be key operated from the data setting device. To operate these functions, refer to “Chapter 5 : Operation using the data setting device”.

Functions which cannot be set or changed using the SFC are,

- Auto spike cut
- Moving average processing
- Moving average processing time
- Pulse output adjustment
- Excitation current adjustment

6-1-5 : Before operating SFC

Before SFC operation, please read the following:

Status of two wired magnetic flowmeter SFC at SFC communication

Make sure that the two wired magnetic flowmeter is in the Measuring Mode while setting it using the SFC communication.

If communicating with the other mode, SFC will display “IN LOCAL MODE” on the screen and you cannot set or change using SFC communication. In this case, change the two wired magnetic flowmeter in the field to Measuring mode and then, try to communicate again.

Two wired magnetic flowmeter will take this status “LOCAL”, as someone setting or changing by touch sensor in the field. This is to prevent the setting and changing operation from both sides.

Confirm write protect mode

Two wired magnetic flowmeter has a write protect function. Write protect function is to prevent access to unauthorized persons and to prevent performing wrong operation. Write protect can be set by the customer by setting the arbitrary 4 levels.

Please make sure that when write protect level is WP0, reading and writing are available and when write protect level is WP1, 2 or 3, only reading is available.

The protection details are shown by write protect levels.

Write protect level	SW1	SW2	LSC (Key operation)			Communication		
			Operator’s mode	Engineering mode	Maintenance mode	Operator’s mode	Engineering mode	Maintenance mode
0	OFF	OFF	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE	R/W ENABLE
1	ON	OFF	R/W ENABLE	R/W ENABLE	R/W DISABLE	R ONLY	R ONLY	R ONLY
2	OFF	ON	R/W ENABLE	R ONLY	R/W DISABLE	R ONLY	R ONLY	R ONLY
3	ON	ON	R ONLY	R ONLY	R/W DISABLE	R ONLY	R ONLY	R ONLY

R/W: Read and write (Read and write set values)
R: Read
W: Write
ENABLE: Enabled
DISABLE: Disabled
ONLY: Only the indicated operation is enabled.

Writing on non-volatile memory

After downloading the changed setting data using SFC, save the setting data to MangeW Two-wire PLUS non-volatile memory in approx. 30 seconds. Therefore, do not turn the power off during the operation.

If you want to save the data immediately, press the SHIFT ^ key and NON-VOL ENTER (Yes) key, then the data will be written forcibly to non-volatile memory.

Changing communication method

Two wired magnetic flowmeter has the following 4 communication methods:

- SFN.A… SFC communication (Analog)
- SFN.D… SFC communication (Digital)
- HART… HART communication
- NONE… not using any communication function

~Note *SFC communication (Digital) indicates Enhanced DE communication of Honeywell Co.*

For SFC communication, select “SFN.A”.

To change the communication method, operate using the touch keys. From the data setting screen “COM SELECT” of “OPERATOR'S MODE”, it is required to set the communication method to SFN.A. (Figure 6-4)

```
*  COM SELECT
              SFN.A
```

Figure 6-4 Data setting screen

6-2 : Configuration using SFC communicator

Outline of this chapter

This chapter presents how to operate the SFC.

The description proceeds in the following order:

6-2-1 : Before communicating using the SFC
Describes the basic operation method.

6-2-2 : Setting using SFC communication (1) - setting using key assigned functions
Describes the basic function and setting method.
Describes communication start, range setting, damping constant setting, auto zero point adjustment etc. These can be set by using the key assigned functions (Functions that are directly assigned to each of the SFC keys, refer to next page).

6-2-3 : Setting using SFC communication (2) - setting using CONFIG functions
Describes the detailed setting.
Describes the advanced setting for MagneW, screen display, converter information, pulse output/ contact output switching, high low alarm value, burnout direction etc. These can be set by using CONFIG function (entered by pressing the CONF key, refer to page 6-16).

6-2-1 : Before communicating using the SFC

What can be done using the SFC

Introduction

It is possible to communicate with the converter, read data or change settings using the SFC. The functions available with the SFC include functions directly assigned to the respective keys and CONFIG functions that are entered by pressing the CONF key.

CAUTION

- Be sure to use the SFC with software version 7.0 or newer. Using earlier versions may fail to operate the SFC correctly.

Key assigned functions

The following are the functions directly assigned to the SFC keys.

ID/DE READ:	Starts communication	6-19
	Enter the TAG No.	6-21
DAMP:	Sets and changes a damping time constant	6-23
UNITS:	Sets engineering units	6-24
URV:	Sets the output range and correction coefficient	6-26
OUTPUT:	Displays transmitting output	6-27
	Loop check of output signal	6-28
CORRECT:	Making zero adjustment	6-29
INPUT:	Displays flow measured value	6-30
STAT:	Displays self-diagnostics result of the converter	6-31
SW VER:	Displays the software version	6-35
PRINT:	Prints out internal data of the converter	6-36
ACT PRINT:	Continuously prints out response result	6-39
A-DE:	Switches between digital and analog outputs	6-41

CONFIG functions

The CONFIG functions that are entered by pressing the CONF key include the following 17 sub-functions.

UNIT KEY:	Select unit system and setting of specific gravity	6-42
CUT OFF:	Sets and changes low flow	6-44
DISP:	Changes flow rate display	6-46
EX (mA):	Sets detector constant	6-48
TYPE:	Sets detector type	6-50
DIAMETER:	Sets detector diameter	6-52
ALARM CONFIG:	Sets high alarm and low alarm values	6-54
F/S SETUP:	Sets fail-safe direction	6-56
DIGITAL I/O:	Select pulse output and contact output	6-60
	Sets contact output status	6-62
DI/DO CHECK:	Output check of contact output	6-64
CORRECT DAC:	Analog output calibration	6-66
GAIN CAL:	Gain calibration	6-68
SHIP DATA RECOV:	Resets internal data setting to factory setting	6-70
READ TOTAL:	Reads flow rate counter value	6-71
PULSE OUTPUT:	Checks pulse output value	6-72
PULSE CONFIGURE:	Sets pulse scale and pulse scale unit	6-74
	Sets pulse width	6-76
	Sets dropout	6-78
RESET TOTALIZE:	Resets flow rate counter	6-80

CAUTION

- Do not operate the following screen from the calibration menu. Operating this screen will erase all data entered in the electromagnetic flow meter.

```
CALIBRATION MENU
INIT DATA RECOV ?
```

SFCM00006003D

Hierarchical structure of CONFIG functions

Hierarchic structure chart

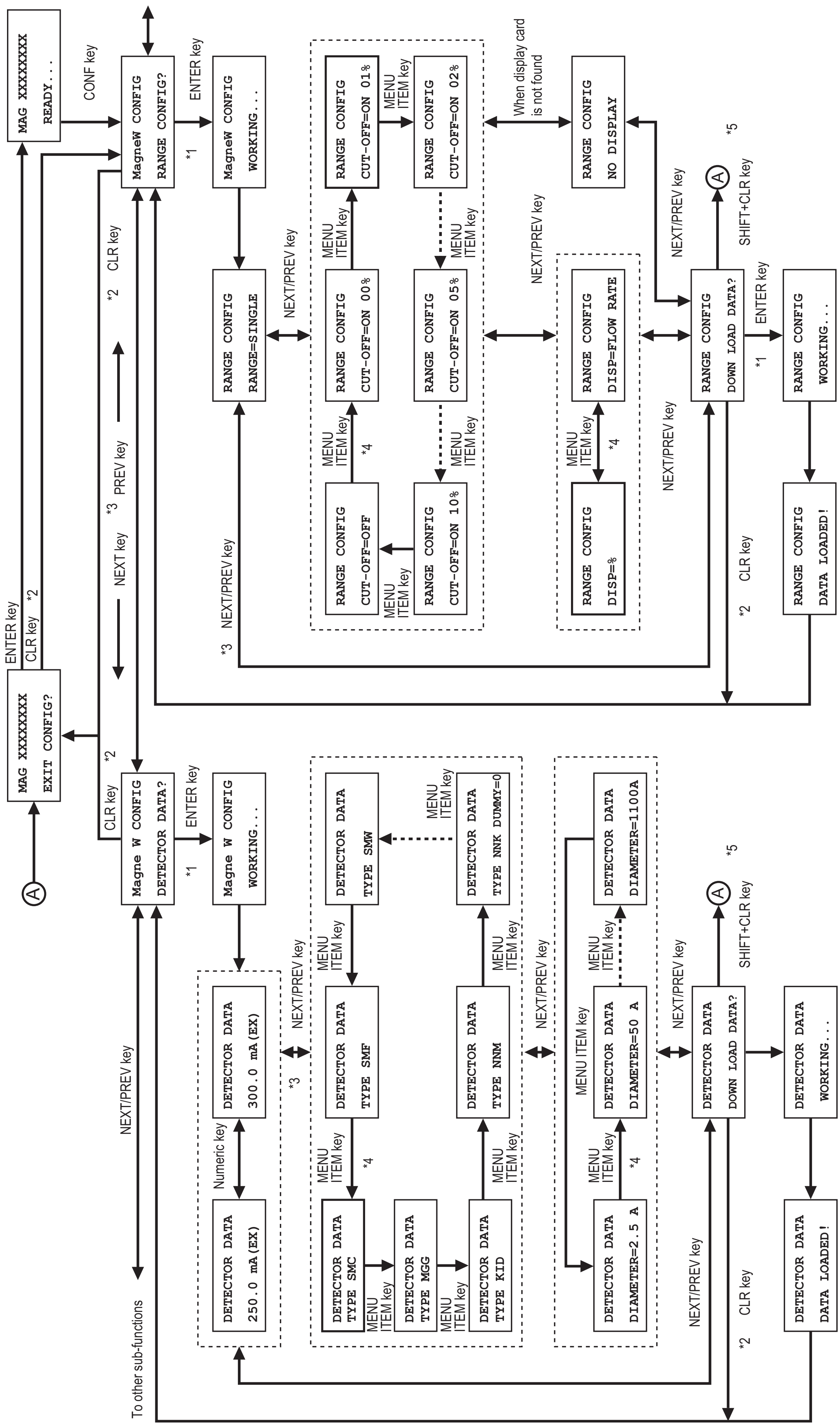
Each functions of SFC form a hierarchical structure. Before setting using the SFC, check the positions of the respective sub-functions with the supplied hierarchical structure chart.

The SFC screen displays only two lines, and so if it is not clear which hierarchy is shown, see the hierarchy chart on page 6-17.

SFC hierarchical structure chart

Key	Commands	Commands	Commands	
ID				Starts communication / Set tag no.
DAMP				Sets damping time
UNIT				Sets unit
URV (100%) →	URV			Sets range
	COEFF			Sets correction coefficient
OUTPUT				Outputs 4-20 mA
INPUT →	ZERO			Auto-zero calibration
CONF →	UNIT KEY →	UNIT		Set system of units
		___. ___Spec Gra		Sets specific gravity
	RANGE CONFIG →	RANGE		N/A
		HYSTERESIS		N/A
		CUT-OFF		Sets low flow
		DISP		Selects display cutoff
	DETECTOR DATA →	___. __mA (Ex)		Sets detector constant
		TYPE		Sets detector type
		DIAMETER		Sets detector diameter
	ALARM CONFIG →	HI ALARM		Sets HIGH alarm
		LOW ALARM		Sets LOW alarm
	FAILSAFE CONFIG →	4-20 F/S		Burnout (4-20 mA)
		PULSE OUT		Burnout (pulse output)
	DIGITAL I/O →	DI		N/A
		DO		Switches contact and pulse
		DO1 NORM		Sets contact output
		DO2 NORM		N/A
	CALIBRATE MENU →	EXCIT CUR CHECK		N/A
		EXCIT CUR CAL		N/A
		GAIN CAL		Gain calibration
		INIT DATA RECOV		Initial data recovery (Please do not use this function)
		SHIP DATA RECOV		Initializing data to factory setting
	CORRECT DAC			Corrects output
	TOTALIZE MENU →	READ TOTAL		Read total value
		PULSE OUTPUT		Outputs pulse output
		SET TRIPVALUE		Sets preset value
		PULSE CONFIGURE →	UNIT	Pulse weight and unit
			P-WIDTH	Sets pulse width
			P-DROP OUT	Sets dropout
		RESET TOTALIZE		Counter reset

Example of a key sequence



Rules of interaction with screen
*1: ENTER key to answer "Yes" to a question on the screen and move to one level lower in the hierarchy.
*2: CLR key to answer "No" to a question on the screen and move to one level higher in the hierarchy.
*3: NEXT/PREV key to select a different function in the same hierarchy.
*4: MENU ITEM key to select a different item in the same hierarchy and with the same function.
*5: SHIFT + CLR keys to exit the CONFIG functions from any level.

6-2-2 : Setting using SFC communication (1) - setting using key assigned functions

Starting communication: ID/DE READ key

> **CAUTION**
>
> Before starting communication between the SFC in a system with analog output and the converter, be sure to change the control loop to "manual control". This is to prevent fluctuation in analog output of the converter, which is caused by starting the SFC and communicating with the converter, from directly affecting the control loop.

Procedure

Use the following procedure to start the SFC. The key operations of the SFC and display of the display window slightly vary depending on whether the system has digital output or analog output.

Step	Procedure	SFC screen
1	Check that the converter has been started. If not started yet, start the converter with reference to "Chapter 4 : Operation" in this manual.	
2	Make sure the wiring between the converter signal line and SFC is correct.	
3	Turn the SFC on. **Result:** • The SFC executes self-diagnostics and the screen as shown on the right appears. **CAUTION** This display is intended to prompt the user to take appropriate action to prevent fluctuation in the output of the converter caused by the SFC communicating with the converter from directly affecting the control loop. Before pressing the [DE READ ID A] key, take appropriate action to change the control device to "manual". A system with analog output requires special care.	SELF CHECK... SFCM00006004D LOOP IN MANUAL ? PRESS ID SFCM00006005D

<table>
<tr><th>Step</th><th>Key</th><th colspan="2">Procedure</th></tr>
<tr><td rowspan="2">4</td><td rowspan="2">SHIFT ^

DE READ
ID A</td><td>• In the case of a system with digital output, press the [SHIFT ^] key here.

SHIFT-
SFCM00006002D

Press the [DE READ ID A] key.

DE XMTR
WORKING...
SFCM00006006D

MAG DE TAG No.
MAG SR XXXXXXXX
SFCM00006072D</td><td>• In the case of a system with analog output, press the [DE READ ID A] key here.

TAG No.
WORKING...
SFCM00006008

MAG TAG No.
MAG SR XXXXXXXX
SFCM00006007D</td></tr>
<tr><td colspan="2"><u>Result and branch:</u>
• The following screen appears and a communication between the SFC and converter can be started. Go to step 6.
• If the TAG No. has not been entered in the converter, the TAG No. displays as XXXXXXXX. Go to step 5.</td></tr>
<tr><td>5</td><td></td><td colspan="2">Here, TAG No. can be entered. For a detailed procedure, see “Entering TAG No.: ID key” on page 6-21.
If there is no need to enter a TAG No., go to step 6.</td></tr>
<tr><td>6</td><td>CLR
(No)</td><td colspan="2">Press the [CLR (No)] key. The following screen appears.
This screen is the basic standby screen. When starting operation, confirm that the following screen has appeared.

MAG XXXXXXXX
READY...
SFCM00006009D</td></tr>
</table>

Entering TAG No.: ID key

Introduction

To facilitate concentrated control by the control system of the control loop over two or more converters, a TAG No. can be assigned to each converter. Up to 8 alphanumeric characters can be entered as a TAG No.

Procedure

Use the following procedure to enter TAG No.

Step	Key	Procedure	SFC screen
1		Check that the display of the SFC appears as shown to the right. If a different display appears, refer to “Setting using SFC communication (1) - setting using key assigned functions” on page 6-19.	LOOP IN MANUAL ? PRESS ID SFCM00006005D
2	DE READ ID A SHIFT ^ + DE READ ID A	Carry out the following operation according to the output format of the SFC used. • For SFN.A analog output communication method, press the DE READ ID A key. • For SFN.D digital output communication method, press the SHIFT ^ + DE READ ID A keys.	MAG DE TAG No. MAG SR XXXXXXXX SFCM00006072D (For SFN.A) MAG TAG No. MAG SR XXXXXXXX SFCM00006007D (For SFN.D)
3	ALPHA A ⟷ DE ← Q → M ALPHA ALPHA	-Use the ALPHA key and numeric keys to enter up to 8 alphanumeric characters for a TAG No. **~Note** • *On this screen, the* ALPHA *key and numeric keys and* A⟷DE ← Q *key and* → M *key are active. Even if other keys are pressed, there will be no response.* • *To enter letters, press the* ALPHA *key and display the “□“cursor.* • *To enter numerals, press the* ALPHA *key again and display “_” cursor.*	MAG DE TAG No. MAG SR FIC-123 SFCM00006030D

Step	Key	Procedure	SFC screen
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • After “WORKING...” appears on the screen, the TAG No. just entered appears. Hereafter, this name becomes the TAG No. of this converter.	MAG DE TAG No. MAG SR FIC-123 SFCM00006030D (For SFN.A) MAG DE TAG No. MAG SR FIC-123 SFCM00006030D (For SFN.D)

Setting/changing damping time constant: DAMP key

Introduction

Damping time constant is a response time of the primary delay (65.2% response) for a step response of the flow rate. When the output fluctuations are large increase the damping. A large damping value stabilizes the output but lowers the response performance. The damping time constant can be set to 0.5 up to 199.9 sec. using numeric keys.

Procedure

Use the following procedure to set the damping time constant.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	C DAMP	Press the C DAMP key. **Result:** • The currently set damping time constant appears as shown here.	DAMPING XXXXXXXX 3.0 SECONDS SFCM00006056D
3		Use numeric keys to set the damping time constant. (Input range: 0.5 to 199.9) **Result:** • The changed setting is written into the database of the converter and displayed on the screen.	DAMPING XXXXXXXX WORKING... SFCM00006057D DAMPING XXXXXXXX 5.0 SECONDS SFCM00006058D
4	CLR (No)	Press the CLR (No) key to return to the screen in step 1.	

Setting engineering units: UNITS key

Introduction

The instantaneous flow rate value measured by the converter can be set so that it is displayed in engineering units according to the control process used.

This setting is applied to both display screens of the display panel of the converter and the SFC.

The engineering units that can be set are as follows.

Volume flow rate units	Mass flow rate units
m^3/h, GPH, l/h, cc/h, m^3/min, GPM, l/min, cc/min, m^3/d, GPD, kGPD, BPD, m^3/s GPH=gals/h, GPM=gals/min, GPD=gals/d, kGPD=1000XGPD, BPD=barrels/d	kg/h, lb/h, kg/min, lb/min, kg/s, lb/s, t/s, t/min, t/s, g/h, g/min, g/s

When mass flow rate units are set, the specific gravity can be set.

Procedure

Use the following procedure to set engineering units.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY"	MAG XXXXXXXX READY... SFCM00006009D
2	D UNITS	Press the D UNITS key. **Result:** • The currently set engineering unit appears as shown on the right.	UNIT XXXXXXXX t/h SFCM00006039D

Step	Key	Procedure	SFC screen
3	▲ H NEXT or ▼ L PREV D UNITS CLR (No)	Use the [▲ H NEXT] key and [▼ L PREV] key to display the engineering unit to be set. Pressing the [D UNITS] key instead of the [▲ H NEXT] key can also change the screen. **Branch:** • To exit this function, press the [CLR (No)] key.	UNIT XXXXXXXX kg/s SFCM00006040D
4	NON-VOL ENTER (Yes) CLR (No)	Press the [NON-VOL ENTER (Yes)] key. **Result and branch:** • The engineering unit to be set is written into the database. Setting is completed when the screen returns to step 2. Press the [CLR (No)] key to return to step 1. • When the engineering unit to be set is mass flow rate, the setting content is written into the database. Go to step 5.	UNIT XXXXXXXX WORKING... SFCM00006041D
5		Press numeric keys to set specific gravity.	UNIT XXXXXXXX 1.5000 Spec Gra SFCM00006042D
6	NON-VOL ENTER (Yes) CLR (No)	Press the [NON-VOL ENTER (Yes)] key. When the screen as shown on the right appears, press the [NON-VOL ENTER (Yes)] key once again. The setting is completed when the screen returns to the screen as in step 2. Press the [CLR (No)] key to return to step 1.	UNIT XXXXXXXX WORKING... SFCM00006041D

Setting output range and correction coefficient: URV key

Introduction

The output range of the converter is set at the factory according to the ordered specifications. This setting can be displayed on the screen of the SFC or changed.

Definition

- URV (Upper Range Value) refers to a measured value of flow rate when the output of the converter becomes 100% (20 mA DC in the case of analog output) and means an upper range value of the output range of the converter. Pressing the [URV F 100%] key displays the set URV (e.g., 10,000 m^3/h) on the screen. URV setting range is 0.3 to 10 m/s in flow rate conversion.

Procedure

Use the following procedure to display or change the set output range.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the [CLR (No)] key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	URV F 100%	Press the [URV F 100%] key. **<u>Result:</u>** • The set URV appears as shown to the right.	URV XXXXXXXX 100.00 m^3/h SFCM00006036D
3	A ⟷ DE ← Q	Use numeric keys and [A ⟷ DE ← Q] key to enter the URV to be set.	URV XXXXXXXX 25.00 m^3/h SFCM00006037D
4	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key.	URV XXXXXXXX 25.00 m^3/h SFCM00006037D
5	G SET	When pressing the [G SET] key, correction coefficient will be set. Set if necessary.	COEF XXXXXXXX 1.0000 SFCM00006074D
6	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key.	
7	CLR (No)	Press the [CLR (No)] key to return to step 1.	

Displaying transmitting output: OUTPUT key

Procedure

Use the following procedure to be able to read the current output value from the converter to the SFC.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to “READY”. If it is not, press the CLR (No) key to set it to “READY”.	MAG XXXXXXXX READY... SFCM00006009D
2	INPUT OUT- J PUT	Press the INPUT OUT- J PUT key. **Result:** • The current output value appears as shown on the right.	OUTPUT XXXXXXXX 25.00 % SFCM00006011D
3	CLR (No)	After checking the current output value, press the CLR (No) key to return to step 1.	

Loop check of output signal

Introduction

The converter is provided with a function of a constant current generator. As the magnitude of a current that can be generated, an arbitrary value of 0 to 100% of the flow rate signal can be set. A loop check can be made using this function.

Used when

Use this function to check the connection status or the operation of devices connected to the converter in the measured loop.

Operation

This function is operated from the SFC. Use the following procedure.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If a screen other than the one as shown on the right is displayed, press the CLR (No) key.	MAG XXXXXXXX READY... SFCM00006009D
2	INPUT OUT- J PUT	Press the INPUT OUT- J PUT key.	OUTPUT XXXXXXXX WORKING... SFCM00006068D
3		Press numeric keys to enter the value of a signal current to be generated in percentage. The example to the right shows a case where a current equivalent to 25% flow rate is generated.	OUTPUT XXXXXXXX 25.00 % SFCM00006011D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. This generates a constant current output from the converter. A "#" mark is displayed on the screen during the output.	OUTPUT XXXXXXXX 25.00 % # SFCM00006069D
5	INPUT OUT- J PUT CLR (No)	To cancel the constant current output, press INPUT OUT- J PUT and then press the CLR (No) key. When the constant current output is canceled, the "#" mark on the screen disappears. Be sure to perform this operation at the end of the loop check. However, even if the instrument is left without performing this operation, the current output is automatically canceled after 10 minutes.	MAG XXXXXXXX READY... SFCM00006009D

Making zero adjustment: CORRECT key

Use the following procedure to do the auto zero adjustment from the SFC.
When adjusting auto zero point, stop and make static the fluid in the flow meter.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If a screen other than the one here to the right is displayed, press the CLR (No) key.	MAG XXXXXXXX READY... SFCM00006009D
2	SHIFT ^ INPUT OUT- PUT J	Press the SHIFT ^ key, and then press the INPUT OUT- PUT J key, **Result:** The actual measured value appears as shown on the right.	INPUT XXXXXXXX 0.00 m^3/h SFCM00006075D
3	RESET COR- RECT K	Press the RESET COR- RECT K key. 'Zero INPUT?' will be displayed. Confirm that the actual flow rate equals to zero.	INPUT XXXXXXXX ZEROINPUT? SFCM00006076D
4	NON-VOL ENTER (Yes)	After checking the flow rate, press the NON-VOL ENTER (Yes) key. **Result:** Auto zero point adjustment is initiated. It takes approx. 2 min. When the screen returns to the previous screen, auto zero adjustment is completed.	INPUT XXXXXXXX WORKING... SFCM00006077D INPUT XXXXXXXX 0.00 m^3/h SFCM00006075D
5	CLR (No)	Press the CLR (No) key to return to at step 1.	INPUT XXXXXXXX READY... SFCM00006078D

Displaying flow rate measured value: INPUT key

Procedure

Use the following procedure to be able to read the instantaneous flow rate value measured by the converter from the SFC.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	SHIFT ^	Press the SHIFT ^ key.	SHIFT- SFCM00006002D
3	INPUT OUT- J PUT	Press the INPUT OUT- J PUT key. **Result:** • The instantaneous flow rate value appears as shown on the right.	INPUT XXXXXXXX 100.0 ton/hr SFCM00006010D
4	CLR (No)	After checking the instantaneous flow rate value, press the CLR (No) key to return to at step 1.	

Displaying self-diagnostics result: STAT key

Introduction

It is possible to display the self-diagnostics results of the converter sequentially from the SFC. This key is useful when used in combination with Action printout (page 6-39).

Procedure

Use the following procedure to be able to display the self-diagnostics results.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	F/S DIR U STAT	Press the F/S DIR U STAT key. **Result:** • When no error has occurred, the message shown here to the right appears. • If a minor fault has occurred, "#"appears at the end of the bottom line of the SFC display window.	MAG XXXXXXXX WORKING... SFCM00006006D MAG XXXXXXXX STATUS CHECK=OK SFCM00006013D MAG XXXXXXXX OUTPUT MODE # SFCM00006014D
3	CLR (No)	After checking the self-diagnostics results, press the CLR (No) key to return to step 1.	

Error messages and remedial action

Troubleshooting

Whenever problem occurs while the electromagnetic flow meter is in operation, use the STAT key of the SFC to read the error message and self-diagnostics result (see previous page) and take action according to the table below.

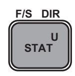
Stopping converter

If an error message with bold letter in the table below appears, turn OFF the power to the converter to stop the electromagnetic flow meter.

In case of critical failure, burnout function (see page 6-56) and high/low alarm (see page 6-54) will operate.

No.	Error message	Checkpoint and action
1	BAD CONFIG DATA	• Configuration data is incorrect. • Check the setting with the display function of each setting or configuration printout.
2	CORRECTS RESET	• Re-correction is required to keep precision. • Set the CONFIG data. • Perform correction and zero point adjustment.
3	ENTRY > SENS RNG	• The flow rate measured value may exceed the upper range value. • Reset the output range.
4	ENTRY HEIGHT	• The set value of constant current generation exceeds the allowable range. • Reset the set value.
5	EXCIT CHECK MODE	• The excitation current is being checked. **~Note** • *The electromagnetic flow meter cannot set the flow direction of the excitation current. The flow direction is fixed at either "X->Y" or "Y->X" independently of the flow direction specified by the SFC.*
6	FAILED COMM CHK	• Communication failure with the electromagnetic flow meter. • Check the SFC and communication loop.
7	HI RES / LO VOLT	• The load resistance of the loop is too large or the power supply voltage is too low.

No.	Error message	Checkpoint and action
8	ILLEGAL RESPONSE	• Abnormal communication with the electromagnetic flowmeter. • Check the communication cable and load resistance.
9	IN LOCAL MODE	• The converter is currently being operated from the display panel. • At this time, it is not possible to communicate from the SFC.
10	IN OUTPUT MODE	• The converter is in constant current generation mode. • Press the [INPUT OUT-PUT J] key and then press the [CLR (No)] key to cancel the mode.
11	**INVALID DATABASE**	• **A critical failure. Stop the electromagnetic flow meter.** • This error occurs because the converter database has not been set correctly when the power to the converter is turned ON. • Re-enter the CONF data.
12	INVALID REQUEST	• The requested function cannot be performed. • Check the operation procedure of the SFC and press the [F/S DIR STAT U] key.
13	LOCAL MODE	• The converter is being operated. • At this time, it is not possible to communicate from the SFC.
14	NO XMTR. RESPONSE	• There is no response from the electromagnetic flow meter. • Check the communication cable and measurement loop.
15	**NVM FAULT**	• **A critical failure. Stop the electromagnetic flow meter.** • The non-volatile memory of the converter is abnormal. Turn OFF the power and then turn it ON again and check the operation. • If the same message still appears after taking the action above, contact an Azbil Corp. representative.
16	PRINTER FAIL!	• The printer does not operate.

No.	Error message	Checkpoint and action
17	**RAM FAULT**	• **A critical failure. Stop the electromagnetic flow meter.** • The RAM of the converter is abnormal. Turn OFF the power and then turn it ON again and check the operation. • If the same message still appears after taking the action above, contact an Azbil Corp. representative.
18	**ROM FAULT**	• **A critical failure. Stop the electromagnetic flow meter.** • The ROM of the converter is abnormal. Turn OFF the power and then turn it ON again and check the operation. • If the same message still appears after taking the action above, contact an Azbil Corp. representative.
19	SFC FAULT	• An SFC error. • Replace the SFC.
20	SPAN OVER ERROR	• As a result of setting the span, the maximum measurable flow rate has exceeded 12 m/s. • Check the span, diameter or type of the detector.
21	>RANGE	• The calculation result of the SFC has exceeded the display range. • Restart the SFC. • The SFC battery is running low.
22	:	• Charge the SFC. • A minor fault.
23	#	• Press the  key and check the self-diagnostics result of the SFC.

Displaying software version: SW VER key

Procedure

Use the following procedure to confirm the software version of the SFC and the converter connected to the SFC used.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	SHIFT	Press the SHIFT key.	SHIFT- SFCM00006002D
3	SW VER 3 X	Press the 3 X (SW VER) key. **Result:** • The software version is displayed.	S/W VER. XXXXXXXX SFC= . XMTR= . SFCM00006066D
4	CLR (No)	After confirming the software version, press the CLR (No) key to return to the screen in step 1.	

Data printing

Introduction

To carry out correct flow rate measurement, it is important to check the internal setting or response from the converter before starting to operate the converter or while the converter is in operation. At this time, it is convenient if you use the SFC with a printer to communicate with the converter and print out data. The SFC with a printer has two types of printing functions as defined below.

Definition

Configuration printout (data printout):

The SFC printer can print out internal data of the converter such as the converter tag number (TAG No.), damping time constant, low flow cutoff. This printing function is called “configuration printout” or “data printout”.

Action printout (continuous printout):

The SFC is provided with a function that continuously prints out results of responses to key operations of the SFC from the converter. This printing function is called “action printout” or “continuous printout”.

Printer

The optional SFC printer is a 24 characters/line thermal printer. When the power switch to the SFC is turned ON, the printer automatically starts to move and stops after moving back-and-forth once. At this time, the recording paper will advance a little (approximately 5 mm).

Advancing recording paper

To advance recording paper, press [SHIFT] + [FEED 8].

The screen will display “PRINTER FEED” and the recording paper is advanced by one line. While this prompt is displayed, the recording paper is advanced by one line every time the [FEED 8] key is pressed.

To cancel the feed function, press the [CLR (No)] key.

Feeding recording paper

When the printer is running short of recording paper, feed the paper roll compartment with a paper roll. For a detailed procedure, see the SFC User's Manual (CM2-SFC100-2001).

Printing internal data: PRINT key

Used when

Configuration printout (data printout) is used to print out internal data of the converter such as a damping time constant, low flow cutoff, etc.

Procedure

Use the following procedure to carry out configuration printout.

Step	Key	Procedure	SFC screen
1		Start communication between the SFC and converter. For a detailed procedure, see "Starting communication: ID/DE READ key" on page 6-19.	
2	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
3	SHIFT	Press the SHIFT key.	SHIFT- SFCM00006002D
4	PRINT 9 P	Press the PRINT 9 P key. **Result:** • Configuration printout starts.	WORKING... SFCM00006015D PRINTING... SFCM00006016D
5	CLR (No)	When printing is completed, press the CLR (No) key to return step 2.	

Printing example

The following shows an example of an actual configuration printout accompanied by line-by-line descriptions.

Printing example	Meaning
‘02-01-01 00:00	Time when printed
TAG No. XXXXXXXX	Tag no.
Detector	Detector information
DIA : 50 A	Diameter
TYPE : MGG	Type
EX : 300.0 mA	Detector constant
RANGE : SINGLE	Range
ANA/DE : ANALOG XMTR	Communication mode
D1 : D1 NOT USED	Setting of contact input
DO : DO NOT USED	Setting of contact output
SW VER : 3.1	Software version
DAMP : 3.00	Damping constant
SPAN1 : 70.69 m3	Span
GRAVITY : 1.0000	Specific gravity
COEFF : 1.0000	Correction coefficient
LOFCUT : ON 0.6 %	Low flow cutoff
F/S I : UP	Burnout (4-20 mA output)
DO : OPEN	Burnout (Contact output)
P : HOLD	Burnout (Pulse output)
PULSE	Pulse information
CONF : ADD	Setting of built-in counter
RESET : 0000000000	Reset value
WEIGHT : 110 cc/p	Pulse scale
WIDTH : DUTY 50%	Pulse width
DROP : 0.5%	Dropout value
INPUT : 70.69 m3	Input value
OUTPUT : 100.02 %	Output value
STATUS CHECK= OK	Status

Continuously printing response result: ACT PRINT key

Used when

Action printout (continuous printout) is used to continuously print out the results of responses from the converter to key operations from the SFC and to keep the data.

Procedure

Use the following procedure to carry out action printout.

Step	Key	Procedure	SFC screen
1		Start communication between the SFC and converter. For the detailed procedure, see "Starting communication: ID/DE READ key" on page 6-19.	
2	CLR (No)	Make sure that the SFC is set to "READY" If it is not, press the [CLR (No)] key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
3	SHIFT ^	Press the [SHIFT ^] key.	SHIFT- SFCM00006002D
4	ACT PR 0 Z	Press the [0 Z] (ACT PR) key.	MAG XXXXXXXX ACTION PRINT ? SFCM00006017D
5	NON-VOL ENTER (Yes)	Press the [ENTER (Yes)] key. **Result:** Action printout starts by printing: * ACTION PRINT * START TAG No. FIC-123 '02-06-05 15:30 Hereafter, the operation content and results of response from the converter are printed out every time the key is operated.	
6	SHIFT ^	Press the [SHIFT ^] key to stop the action printout operation.	SHIFT- SFCM00006002D

Step	Key	Procedure	SFC screen
7	ACT PR 0 Z	Press the [ACT PR 0 Z] key.	MAG XXXXXXXX ACTION PRINT ? SFCM00006017D
8	CLR (No)	Press the [CLR (No)] key. **Result:** The action printout operation ends by printing: * ACTION PRINT * END Then, the screen returns to step 2.	

Printing example

An example of an action printout corresponding to actual key operation will be explained.

Key operation

[SHIFT] + [ACT PR 0 Z] (ACT PR) + [NON-VOL ENTER (Yes)] keys

[DAMP C] key

[▲ NEXT H] key

[SHIFT] + [0] (ACT PR) + [CLR (No)] keys

Printing example of corresponding action printout

```
* ACTION PRINT * START
  TAG. No.    FIC-123
       '02-06-05 15:35

DAMP      XXXXXXXX
3.0       S

DAMPING   XXXXXXXX
4.0       S


* ACTION PRINT * END
```

Switching between digital output and analog output: A ↔ DE key

Introduction

Allows the signal line output of the converter to be switched between analog and digital. Communication method can be displayed on the two wired magnetic flowmeter main body's data setting screen. However, analog communication will be displayed as an SFN.A, and digital as an SFN.D.

⚠CAUTION

Before switching the output, adjust the higher devices according to the output (analog or digital) of the converter. This is to prevent the output coming from the converter from affecting the control loop.

Procedure

Use the following procedure to change the output of the converter.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	SHIFT A↔DE ← Q	Press the SHIFT key, and then press the A↔DE ← Q key. **Result:** • If digital output is currently set, the screen to the upper right appears. • If analog output is currently set, the screen do shown on the lower right appears.	MAG XXXXXXXX CHNG TO ANALOG ? SFCM00006031D (For digital output) MAG XXXXXXXX CHNG TO DIGITAL ? SFCM00006032D (For analog output)
3	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. • To stop switching of the output format, press the CLR (No) key. The screen at step 1 appears.	MAG XXXXXXXX ARE YOU SURE ? SFCM00006033D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key again, and the communication will be switched. Automatically, the screen returns to step 1.	MAG XXXXXXXX WORKING... SFCM00006006D MAG XXXXXXXX ANALOG XMTR SFCM00006034D or MAG XXXXXXXX DE XMTR SFCM00006035D

6-2-3 : Setting using SFC communication (2) - setting using CONFIG functions

Selecting unit system and setting specific gravity [UNIT KEY] function

It is possible to select unit system (Mass flow rate and volume flow rate) which is set by two wired magnetic flowmeter converter, and set the specific value (in case of selecting mass flow rate for system units). Use the following procedure to select unit system and to set specific gravity.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the [CLR (No)] key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the [B CONF] key to access the CONFIG functions. Confirm that the screen on the right appears.	MAG NEW CONFIG WORKING... SFCM00006079D MAG NEW CONFIG UNIT KEY? SFCM00006080D
3	NON-VOL ENTER (Yes) DE CONF. MENU I ITEM	Press the [NON-VOL ENTER (Yes)] key. The screen, which system of units can be selected, appears as shown to the right. Mass flow rate = MASS FLOW Volume flow rate = VOLUME FLOW Press the [DE CONF. MENU I ITEM] key, and select MASS FLOW or VOLUME FLOW.	UNIT KEY MASS FLOW SFCM00006081D
4	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. The screen as shown on the right appears and the changed setting is saved to the SFC.	UNIT KEY ENTERED IN SFC SFCM00006082D
5	▲ H NEXT or ▼ L PREV	Only when MASS FLOW is selected, a screen for setting the specific gravity appears. Press the [▲ H NEXT] key or [▼ L PREV] key to show this screen. Press numeric keys to set specific gravity. Available range of specific gravity is from 0.1000 to 5.9999.	UNIT KEY 1.000 Spec Gra SFCM00006083D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Changed setting is saved to SFC.	UNIT KEY ENTERED IN SFC SFCM00006082D
7	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen.	UNIT KEY DOWNLOAD DATA? SFCM00006084D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is written into the database of the converter and the setting is completed.	UNIT KEY DATA LOADED! SFCM00006085D
9	CLR (No)	Press the CLR (No) key, and return to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting or changing low flow cutoff: [CUT-OFF] function

Introduction

When a fluid in the detector is flowing extremely slowly, the converter judges that the fluid is stationary and outputs a signal (4 mA DC in case of analog output) equivalent to a flow rate of zero. The value, which becomes the threshold of this judgment is called "low flow cutoff".

The low flow cutoff is set using a percentage over the upper range value of the flow rate measurement range set by the URV.

> **CAUTION**
>
> The low flow cutoff is a factor of extreme importance that affects the operation of the entire control process. Define the range to be controlled and start the setting carefully.

Procedure

Use the following procedure to set low flow cutoff.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the B CONF key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAGNEW CONFIG WORKING... SFCM00006020D
4	▲ H NEXT	Press the ▲ H NEXT key.	
5	DE CONF. MENU I ITEM DE CONF. MENU I ITEM	Pressing the DE CONF. MENU I ITEM key changes a numeric value to the right of CUT OFF=ON displayed on the screen from 0% up to 10% in 1 point increments. Continuing to press the DE CONF. MENU I ITEM key further sets CUT OFF=OFF and displays CUT OFF=ON 0% again. Display the low flow cutoff to be set in the range of 1- to 10% on the screen.	RANGE CONFIG CUT OFF = ON 1% SFCM00006059D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the set low flow cutoff is confirmed.	RANGE CONFIG ENTERED IN SFC SFCM00006051D
7	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen (DOWN LOAD).	RANGE CONFIG DOWN LOAD DATA ? SFCM00006053D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the changed setting is written into the database of the converter. The screen returns to step 2. **~Note** • *In step 5, if you try to set displaying "CUT OFF = OFF" or "CUT OFF = ON 00%", "INVALID REQUEST" will appear on the screen. Converter will reject the database to be written in.*	RANGE CONFIG WORKING... SFCM00006054D RANGE CONFIG DATA LOADED ! SFCM00006055D
9	SHIFT ^ + CLR (No)	To exit this setting function, press the SHIFT ^ + CLR (No) keys.	
10	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • Exiting the low flow cutoff setting function, the screen returns to the screen in step 1.	

Changing flow rate display: [DISP] function

Introduction

It is possible to set whether an instantaneous flow rate displayed on the display panel of the converter should be expressed as real flow rate or percentage.

Percent display refers to a percentage (%) over the maximum flow rate set by the URV.

Procedure

Use the following procedure to set or change flow rate display.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm the SFC is set to “READY”. If it is not, press the [CLR (No)] key to set it to “READY”.	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the [B CONF] key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key.	MAGNEW CONFIG WORKING... SFCM00006020D
4	▲ H NEXT or ▼ L PREV	Press the [▲ H NEXT] key or [▼ L PREV] key to display this screen.	RANGE CONFIG DISP = FLOW RATE SFCM00006050D
5	NON-VOL ENTER (Yes)	Press the [ENTER] key. **Result:** • The screen as shown on the right appears and the set flow rate display is confirmed.	RANGE CONFIG ENTERED IN SFC SFCM00006051D
6	DE CONF. MENU I ITEM	Pressing the [DE CONF. MENU I ITEM] key displays DISP=%, DISP=FLOW RATE and DISP=TOTAL by turns. Display the screen that you want to set.	RANGE CONFIG DISP = % SFCM00006052D

Step	Key	Procedure	SFC screen
7	DE CONF. [MENU I ITEM]	Press the [NON-VOL ENTER (Yes)] key. **Result:** • The screen as shown on the right appears and the set flow rate display is confirmed.	RANGE CONFIG ENTERED IN SFC SFCM00006051D
8	[▲ H NEXT] or [▼ L PREV]	Press the [▲ H NEXT] key or [▼ L PREV] key to show this screen (DOWN LOAD).	RANGE CONFIG DOWN LOAD DATA ? SFCM00006053D
9	NON-VOL [ENTER (Yes)]	Press the [NON-VOL ENTER (Yes)] key. **Result:** • The screen to the right appears and the changed setting is written into the database of the converter. The screen returns to step 2.	RANGE CONFIG WORKING... SFCM00006054D RANGE CONFIG DATA LOADED ! SFCM00006055D
10	[SHIFT ^] + [CLR (No)]	To exit this setting function, press the [SHIFT ^] + [CLR (No)] keys.	
11	NON-VOL [ENTER (Yes)]	Press the [NON-VOL ENTER (Yes)] key. **Result:** • Exiting the flow rate display setting function, the screen returns to the screen in step 1.	

Setting detector constant: [EX(mA)] function

Introduction

The detector constant of the converter is set at the factory according to the ordered specifications. This constant can be changed.

Used when

When a combination between the detector and converter has been changed, the detector constant set by the converter needs to be changed.

Procedure

Use the following procedure to set detector constant.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the [CLR (No)] key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the [B CONF] key to access the CONFIG functions.	MAG XXXXXXXX WORKING... SFCM00006006D MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	▲ H NEXT or ▼ L PREV	Press the [▲ H NEXT] key or [▼ L PREV] key to display the screen as shown on the right.	MagneW CONFIG DETECTOR DATA ? SFCM00006019D
4	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. **Result:** • The currently set detector constant appears as shown on the right.	MAGNEW CONFIG WORKING... SFCM00006020D DETECTOR DATA 300.0 mA (EX) SFCM00006021D
5		Press numeric keys to set the detector constant. Setting range is 200 to 699.9.	DETECTOR DATA 250.0 mA (EX) SFCM00006022D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the set detector constant is confirmed.	DETECTOR DATA ENTERED IN SFC SFCM00006023D
7	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the changed setting is written into the database of the converter. The screen returns to step 3.	DETECTOR DATA WORKING... SFCM00006025D DETECTOR DATA DATA LOADED ! SFCM00006026D
9	SHIFT ^ + CLR (No)	To exit this setting function, press the SHIFT ^ + CLR (No) keys.	
10	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen exits the detector constant setting function and returns to the screen in step 1.	

Setting detector type: [TYPE] function

Introduction

The type of the detector of the converter is set at the factory according to the ordered specifications. The settings of this type can be changed. When using two wired magnetic flowmeter, it is necessary to select "MGG" (refer to step 6) for detector type.

Procedure

Use the following procedure to set the type of the detector.

Step	Key	Procedure	SFC screen
1	CLR (No)	Make sure that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the B CONF key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MagneW CONFIG DETECTOR DATA ? SFCM00006019D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAGNEW CONFIG WORKING... SFCM00006020D
5	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	DETECTOR DATA TYPE MGG SFCM00006027D
6	DE CONF. MENU I ITEM	Pressing the DE CONF. MENU I ITEM key changes the sign to the right of TYPE displayed on the screen from MGG → KID → NNM → NNK DUMMY=0... NNK DUMMY=9→SMW→SMF→SMC, sequentially. Display the detector type to be set on the screen.	

Step	Key	Procedure	SFC screen
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the set detector type is confirmed.	DETECTOR DATA ENTERED IN SFC SFCM00006023D
8	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen (DOWN LOAD) as shown on the right.	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
9	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the changed setting is written into the database of the converter. The screen returns to step 3.	DETECTOR DATA WORKING... SFCM00006025D DETECTOR DATA DATA LOADED ! SFCM00006026D
10	SHIFT ^ + CLR (No)	To exit this setting function, press the SHIFT ^ + CLR (No) keys.	
11		**Result:** • The screen exits the detector type setting function and returns to step 1.	

Setting diameter of detector: [DIAMETER=] function

Introduction

The diameter of the detector of the converter is set at the factory according to the ordered specifications. The setting of this diameter can be changed.

Used when

When only the detector is replaced with one of a different diameter, this function is used to reset the diameter.

Procedure

Use the following procedure to set the diameter of the detector.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the B CONF key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on at the right.	MagneW CONFIG DETECTOR DATA ? SFCM00006019D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAGNEW CONFIG WORKING... SFCM00006020D
5	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	DETECTOR DATA DIAMETER = 2.5 A SFCM00006028D

Step	Key	Procedure	SFC screen
6	DE CONF. MENU I ITEM	Pressing the [DE CONF. MENU I ITEM] key changes the numerical value to the right of DIAMETER= shown on the screen from 2.5 mm up to 1100 mm. Range of two wired magnetic flowmeter detector diameter is 2.5 to 200 mm.	DETECTOR DATA DIAMETER = 40 A SFCM00006029D
7	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. **Result:** • The screen as shown on the right appears and the set detector type is confirmed.	DETECTOR DATA ENTERED IN SFC SFCM00006023D
8	▲ H NEXT or ▼ L PREV	Press the [▲ H NEXT] key or [▼ L PREV] key to display the screen (DOWN LOAD) as shown on the right.	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
9	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. **Result:** • The screen as shown on the right appears and the changed setting is written into the database of the converter. The screen returns to step 3.	DETECTOR DATA WORKING... SFCM00006025D DETECTOR DATA DATA LOADED ! SFCM00006026D
10	SHIFT ^ + CLR (No)	To exit this setting function, press the [SHIFT ^] + [CLR (No)] keys.	
11		**Result:** • The screen exits the detector diameter setting function and returns to step 1.	

Setting high/low alarm values [ALARM CONFIG] function

Use the following procedure to set the high and low alarm values. High and low alarm values can be used only when contact output is selected. (Refer to “Select pulse output / contact output [DIGITAL I/O] function” on page 6-60)

Setting range of the both high and low alarm values are 0 up to 115%. Set the values as to be HI > LO.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to “READY”. If it is not, press the CLR (No) key to set it to “READY”.	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲H NEXT or ▼L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲H NEXT key or ▼L PREV key to display the screen as shown on the right.	MAGNEW CONFIG ALARM CONFIG? SFCM00006086D
3	NON-VOL ENTER (Yes) ▲H NEXT or ▼L PREV	Press the NON-VOL ENTER (Yes) key and press the ▲H NEXT key or ▼L PREV key to display the screen as shown on the right. Actual high alarm value appears.	ALARM CONFIG 100% HI ALM SFCM00006087D
4		Press numeric keys and enter the high alarm value to be set.	ALARM CONFIG 105% HI ALM SFCM00006088D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved to the SFC.	ALARM CONFIG ENTERED IN SFC SFCM00006089D

Step	Key	Procedure	SFC screen
6	▲H NEXT or ▼L PREV	Continue to set the low alarm value. Press the ▲H NEXT key or ▼L PREV key to display this screen. Actual low alarm value appears.	ALARM CONFIG 20% LOW ALM SFCM00006090D
7		Press numeric keys and enter the low alarm value to be set.	ALARM CONFIG 15% LOW ALM SFCM00006091D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved to the SFC.	ALARM CONFIG ENTERED IN SFC SFCM00006089D
9	▲H NEXT or ▼L PREV	Press the ▲H NEXT key or ▼L PREV key to show this screen.	ALARM CONFIG DOWNLOAD DATA? SFCM00006092D
10	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is written into the database of the converter.	ALARM CONFIG DATA LOADED! SFCM00006093D
11	CLR (No)	Setting is completed. Press the CLR (No) key, and return to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Deciding fail-safe direction: [F/S SET UP] function

Introduction

"Deciding fail-safe direction" refers to deciding the direction of output burnout if an error causes the converter to fail to measure the flow rate. For error, refer to "Error messages and remedial action" on page 6-32. There are three directions as shown below.

Analog output

- Burnout up (UP) .... Causes the readout of a signal from the converter to swing fully in the direction of a maximum value (21.8 mA TYP).
- Burnout down (DWN) .. Causes the readout of a signal from the converter to swing fully in the direction of a minimum value (3.7 mA TYP).
- Hold (HLD) .... Holds the output immediately to a value before the error occurrence.

Pulse output

- Stop (STOP).................. Stops the pulse output
- Hold (HLD) .... Keeps the output immediately to value before the error occurrence.

CAUTION

The fail-safe direction is a factor of extreme importance in securing the safety of the entire control process. Decide the fail-safe direction considering what would be the safer output when the output of the converter becomes abnormal in the entire control process.

Procedure

Use the following procedure to display or set the fail-safe direction of analog output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the B CONF key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D

Step	Key	Procedure	SFC screen
3	▲H NEXT or ▼L PREV	Press the ▲H NEXT key or ▼L PREV key to show this screen.	MagneW CONFIG FAILSAFE CONFIG SFCM00006094D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAGNEW CONFIG WORKING... SFCM00006020D
5	DE CONF. MENU I ITEM CLR (No)	Pressing the DE CONF. MENU I ITEM key changes the screen sequentially from DWN → HLD → UP → DWN. Display the fail-safe direction to be set on the screen. **Branch:** • To stop the fail-safe direction, setting press the CLR (No) key. The screen will return to the one in step 3.	F/S SETUP 4-20mA F/S=DWN SFCM00006061D
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen to the right appears and the set fail-safe direction is confirmed.	F/S SETUP ENTERED IN SFC SFCM00006062D
7	▲H NEXT or ▼L PREV	Press the ▲H NEXT key or ▼L PREV key to show this screen (DOWN LOAD).	F/S SETUP DOWN LOAD DATA ? SFCM00006063D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen as shown on the right appears and the changed setting is written into the database of the converter. The screen returns to step 3.	F/S SETUP WORKING... SFCM00006064D F/S SETUP DATA LOADED ! SFCM00006065D

Step	Key	Procedure	SFC screen
10	SHIFT + CLR (No)	To exit the F/S SET UP function, press SHIFT + CLR (No) keys.	
11	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen exits the F/S SET UP function and returns to the screen as in step 1	

Setting burnout direction of pulse output: [F/S SETUP] function

Use the following procedure to display and to set the fail-safe direction of pulse output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF	Press the B CONF key to access the CONFIG functions.	MagneW CONFIG RANGE CONFIG ? SFCM00006018D
3	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen.	MagneW CONFIG FAILSAFE CONFIG SFCM00006094D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAGNEW CONFIG WORKING... SFCM00006020D

Step	Key	Procedure	SFC screen
5	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen. Present burnout direction appears.	F/S SETUP PULSE OUT=HOLD SFCM00006095D
6	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and select the output status to be set. You can select HOLD or STOP.	F/S SETUP PULSE OUT=HOLD SFCM00006095D
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Fail-safe direction, which is set, is confirmed.	F/S SETUP SFCM00006096D
8	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen.	F/S SETUP DOWNLOAD DATA? SFCM00006097D
9	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The screen shown to the right appears and the changed setting is written into the database of the converter.	F/S SETUP WORKING... SFCM00006098D F/S SETUP DATA LOADED! SFCM00006099D
10	CLR (No)	Setting is completed. Press the CLR (No) key, and return to the screen as in step 1.	

Select pulse output / contact output [DIGITAL I/O] function

Two wired magnetic flowmeter can be configured for pulse output or contact output other than the analog current output (4-20 mA).

Use the following procedure to configure the pulse output and contact output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MAGNEW CONFIG DIGITAL I/O? SFCM00006100D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the DIGITAL I/O function, press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right. Present setting function appears. DO NOT USED ....Pulse output HI-LO ALARM ....Contact output * Following function will appear on the screen but are not available for two wired magnetic flowmeter. ALARM DIAG EMPTY H1-L1/H2-L2 ALM	DIGITAL I/O DO NOT USED SFCM00006101D or DIGITAL I/O HI-LO ALARM SFCM00006102D
4	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and specify the function to be set.	DIGITAL I/O HI-LO ALARM SFCM00006102D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved to the SFC.	DIGITAL I/O ENTERED IN SFC SFCM00006103D

Step	Key	Procedure	SFC screen
6	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen.	RANGE CONFIG DOWN LOAD DATA ? SFCM00006053D
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is written into the database of the converter.	DIGITAL I/O WORKING... SFCM00006104D DIGITAL I/O DATA LOADED! SFCM00006105D
8	CLR (No)	Setting is completed. Press the CLR (No) key, and return to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting contact output status [DIGITAL I/O] function

When contact output (HI-LO ALARM) is selected in the previous page, use the following procedure to set the contact output status (OPEN/CLOSE) in NORMAL status.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MAGNEW CONFIG DIGITAL I/O? SFCM00006100D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the DIGITAL I/O function, press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right. The screen displays the setting of the contact output status (OPEN/CLOSE) in the actual NORMAL status.	DIGITAL I/O DO1 NORM = OPEN SFCM00006106D or DIGITAL I/O DO1 NORM = CLOSE SFCM00006107D
4	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and select the status to be set. You can select OPEN or CLOSE.	DIGITAL I/O DO1 NORM = CLOSE SFCM00006107D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved to the SFC.	DIGITAL I/O ENTERED IN SFC SFCM00006103D
6	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show this screen.	DIGITAL I/O DOWN LOAD DATA ? SFCM00006053D

Step	Key	Procedure	SFC screen
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is written into the database of the converter.	DIGITAL I/O WORKING... SFCM00006104D DIGITAL I/O DATA LOADED! SFCM00006105D
8	CLR (No)	Setting is completed. Press the CLR (No) key, and return to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Checking output of contact output: [DI/DO CHECK] function

Output of the contact output can be checked from SFC.

Use the following procedure to check the output of the contact output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to show the screen here to the right.	MAGNEW CONFIG CALIBRATE MENU? SFCM00006108D
3	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CALIBRATE function, press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	CALIBRATE MENU DI/DO CHECK? SFCM00006109D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The screen shown as shown on the right appears and you will be asked whether you want to check the contact output.	DI/DO CHECK ARE YOU SURE!? SFCM00006110D
5	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the DI/DO CHECK function. Press the ▲ H NEXT key or ▼ L PREV key to show the screen here to the right. Present contact output status appears.	DI/DO CHECK D1 = DO/CLOSE SFCM00006111D

Step	Key	Procedure	SFC screen
6	DE CONF. MENU I ITEM	Press the [DE CONF. MENU I ITEM] key and select the status to be set. You can select OPEN or CLOSE.	DI/DO CHECK D1 = DO/OPEN SFCM00006112D
7	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. The changed setting is saved to the SFC.	DI/DO CHECK ENTERED IN SFC SFCM00006113D
8	▲ H NEXT or ▼ L PREV	Press the [▲ H NEXT] key or [▼ L PREV] key to show this screen.	DI/DO CHECK SET DI/DI MODE? SFCM00006114D
9	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key. The screen as shown on the right will appear. # mark will be displayed to the bottom right, and contact outputs according to the output status.	DI/DO CHECK SET DI/DI MODE? # SFCM00006115D
10	CLR (No)	After confirming, press the [CLR (No)] key. The screen as shown on the right appears. Press the [NON-VOL ENTER (Yes)] key. The screen exists the contact output function	DI/DO CHECK SET DI/DO MODE? # SFCM00006163D
11	CLR (No)	Press the [CLR (No)] key, and return to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Adjusting analog current output [CORRECT DAC] function

Analog current output can be adjusted from converter by changing it into constant current generation mode by SFC. Use the following procedure to adjust the analog current output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to “READY”. If it is not, press the [CLR (No)] key to set it to “READY”.	MAG XXXXXXXX READY... SFCM00006009D
2	INPUT OUT- J PUT	Press the [INPUT OUT- J PUT] key. Actual output value will be displayed.	OUTPUT XXXXXXXX WORKING... SFCM00006068D OUTPUT XXXXXXXX 50.00 % SFCM00006116D
3	NON-VOL ENTER (Yes)	Press the numeric keys to enter the output value to be adjusted. For example, in case of adjusting 0%, enter “0%”, and press the [NON-VOL ENTER (Yes)] key, the display as shown on the right appears. This display confirms constant current generation mode. Output value is fixed to 0% (4 mA) * “#” mark shown in the bottom right presents the constant current generation mode.	OUTPUT XXXXXXXX 0.00 % # SFCM00006117D
4	CLR (No)	Press the [CLR (No)] key. Display returns back to the screen as in step 1. Output value is still fixed at 0%.	MAG XXXXXXXX READY... # SFCM00006119D
5	NON-VOL ENTER (Yes)	Press the [NON-VOL ENTER (Yes)] key to access the [CONFIG] function. Press the [▲ H NEXT] key or [▼ L PREV] key. Display as shown on the right appears.	MAG CONFIG WORKING... # SFCM00006118D MAG CONFIG CORRECT DAC ? SFCM00006120D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes) DE CONF. MENU I ITEM ▲ H NEXT or ▼ L PREV	Press the [NON-VOL ENTER (Yes)] key and enter into the CORRECT DAC screen. Current value shown in the bottom right screen presents the adjustment variation. By pressing the [DE CONF. MENU I ITEM] key, you can change from 0.002, 0.01, 0.05 to 0.25 mA. Adjust by pressing the [▲ H NEXT] key or [▼ L PREV] key.	CORRECT DC ZERO INC/DEC 0.002 mA SFCM00006121D
7	CLR (No)	Press the [CLR (No)] key. Display return back to the screen shown to the right. # will be shown in the bottom right screen. This shows that it is still in constant current generation mode. You need to clear this mode.	MAG XXXXXXXX READY... # SFCM00006119D
8	INPUT OUT- J PUT	Press the [INPUT OUT- J PUT] key again.	OUTPUT XXXXXXXX 0.00 % # SFCM00006117D
9	CLR (No)	Press the [CLR (No)] key. Confirm that the “#” mark has been deleted.	MAG XXXXXXXX READY... SFCM00006009D
10		Adjust to 100% (20 mA) by following the same procedure as for adjusting 0% (4 mA).	

Calibrating gain constant [GAIN CAL] function

Gain constant of amplifier which is set inside the converter can be calibrated by using SFC. To do this, Azbil Corporation's smart calibrator will be required.

Use the following procedure to calibrate the gain constant.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG CALIBRATE CONFIG? SFCM00006122D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	CALIBRATE CONFIG? GAIN CAL? SFCM00006123D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. For gain calibration press the NON-VOL ENTER (Yes) key, again. Connect the smart calibrator to the converter. (For connecting and operating the smart calibrator, refer to its user's manual).	GAIN CAL? ARE YOU SURE !? SFCM00006124D

Step	Key	Procedure	SFC screen
5	DE CONF. MENU I ITEM	Display shown to the right appears. Press the DE CONF. MENU I ITEM key and select the value to be calibrated. The value to gain calibrate for two wired magnetic flowmeter are the following three: 0 m/s, 2.5 m/s, and 10 m/s. Value 2.5 m/s for two wired magnetic flowmeter will be shown 1.2 m/s in SFC. When calibrating to 2.5 m/s select 1.2 m/s.	GAIN CAL GAIN CAL = 0.0 m/s? SFCM00006125D GAIN CAL GAIN CAL = 1.2 m/s? SFCM00006126D
6	NON-VOL ENTER (Yes)	For example, when calibrating 2.5 m/s, displays screen as shown to the right. For the smart calibrator, enter 2.5 m/s. Then, press NON-VOL ENTER (Yes) key. Gain calibration starts. When gain calibration completes, display will return back to the screen to select the gain calibration value.	GAIN CAL GAIN CAL = 1.2 m/s? SFCM00006126D GAIN CAL WORKING... SFCM00006128D GAIN CAL GAIN CAL = 1.2 m/s? SFCM00006126D
7		Follow the same procedure for calibrating 0 m/s and 10 m/s.	
8	DE CONF. MENU I ITEM	When gain calibration is completed, press the DE CONF. MENU I ITEM key and the display as shown on the right appears.	GAIN CAL CLR GAIN MODE ? SFCM00006127D
9	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Exits from gain calibration function.	GAIN CAL WORKING... SFCM00006128D CALIBRATE MENU GAIN CAL ? SFCM00006129D
11	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Resetting the internal data to factory setting (default) [SHIP DATA RECOV] function

By executing shipping data recovery, you can reset the two wired magnetic flowmeter to the default factory setting. (Please note that all the data will be reset when executing the [SHIP DATA RECOV] function.) Use the following procedure to execute the shipping data recovery.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG CALIBRATE MENU? SFCM00006108D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	CALIBRATE MENU SHIP DATA RECOV? SFCM00006130D
4	NON-VOL ENTER (Yes)	For [SHIPPING DATA RECOVERY], press the NON-VOL ENTER (Yes) key. Shipping data recovery function starts.	SHIP DATA RECOV ARE YOU SURE !? SFCM00006131D SHIP DATA RECOV WORKING... SFCM00006132D
5		When shipping data recovery completes, the display as shown on the right appears.	MAG Tag No. MAG SR TEST3333 SFCM00006133D
6	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Displaying totalized value [READ TOTAL] function

Use the following procedure to display the actual totalized value on the SFC screen.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MAGNEW CONFIG WORKING... SFCM00006020D TOTALIZE MENU READ TOTAL ? SFCM00006134D
3	INPUT OUT- J PUT	Press the NON-VOL ENTER (Yes) key. Actual totalized value will be displayed as shown on the right.	READ TOTAL 0123456789 CNTS SFCM00006135D
4	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Checking pulse output [PULSE OUTPUT] function

Pulse output can be checked by fixing the pulse output from the converter main body by using SFC.

Use the following procedure to check the pulse output.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG TOTALIZER MENU ? SFCM00006136D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the [TOTALIZER] functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	TOTALIZER MENU PULSE OUTPUT ? SFCM00006137D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key to display the screen as shown on the right.	PULSE OUTPUT KEY = PULSE SFCM00006138D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key, again. The actual pulse output will be displayed as shown on the right.	PULSE OUTPUT 28.50 % PLS SFCM00006139D
6		Enter the output value to be checked into the screen as shown on the right using numeric key.	PULSE OUTPUT 50 % PLS SFCM00006140D

Step	Key	Procedure	SFC screen
7	NON-VOL ENTER (Yes)	After entering the value, press the NON-VOL ENTER (Yes) key. Pulse output as a fixed value according to the entered value.	PULSE OUTPUT 50.00 % PLS # SFCM00006141D
8	CLR (No)	After checking the pulse output, press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting pulse scale and pulse scale unit [PULSE CONFIGURE] function

Use the following procedure to set the pulse scale and the pulse scale unit using SFC. However, set the span frequency range: 0.001 Hz to 200 Hz. (Span frequency is a pulse frequency when the maximum range (100%) of flow rate flows.)

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG TOTALIZER MENU ? SFCM00006136D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the TOTALIZER functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	TOTALIZER MENU PULSE CONFIGURE ? SFCM00006142D
4	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to enter into PULSE setting function and press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right. Displays the actual pulse scale unit.	PULSE CONFIGURE UNIT = mG/p SFCM00006143D
5	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and select the unit to be set. Available units are in the actual unit system.	PULSE CONFIGURE UNIT = G/p SFCM00006144D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved on the SFC.	PULSE CONFIGURE ENTERED IN SFC SFCM00006145D
7	▲H NEXT or ▼L PREV	Next, set pulse width. Press the ▲H NEXT key or ▼L PREV key to display the screen as shown on the right. Actual pulse scale will be displayed. Enter the pulse scale you want to set by pressing the numeric keys.	PULSE CONFIGURE 1.000 G/p SFCM00006146D PULSE CONFIGURE 1.2 G/p SFCM00006147D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved on the SFC.	PULSE OUTPUT ENTERED IN SFC SFCM00006164D
9	▲H NEXT or ▼L PREV	Press the ▲H NEXT key or ▼L PREV key to display the screen as shown on the right.	PULSE OUTPUT DOWNLOAD DATA? SFCM00006148D
10	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Changed setting data is written into the database of the converter.	PULSE OUTPUT DATA LOADED! SFCM00006149D
11	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting pulse width [PULSE CONFIGURE] function

Use the following procedure to set the pulse width. Available setting range of pulse width is DUTY rate < 70%

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG TOTALIZER MENU ? SFCM00006136D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the TOTALIZER functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	TOTALIZER MENU PULSE CONFIGURE ? SFCM00006142D
4	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to enter into [PULSE] setting function and press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right. Displays the actual pulse width.	PULSE CONFIGURE P-WIDTH = 1.0 ms SFCM00006150D

Step	Key	Procedure	SFC screen
5	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and select the pulse width to be set. (Select from duty 50, 1/7/10/15/30/50/100/200 ms) You can enter it directly by pressing the numeric keys. Range of two wired magnetic flowmeter is 1 to 1000 ms, however, SFC can only set up to 999.9 ms.	PULSE CONFIGURE P-WIDTH = 7.0 ms SFCM00006151D
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved on the SFC.	PULSE CONFIGURE ENTERED IN SFC SFCM00006145D
7	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	PULSE CONFIG DOWNLOAD DATA ? SFCM00006152D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Changed setting data is written into the database of the converter.	PULSE OUTPUT DATA LOADED! SFCM00006149D
9	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting dropout [PULSE CONFIGURE] function

Dropout function is to fix the pulse output, which is caused by the output fluctuation near 0% of flow rate and is unrelated to the flow rate. Use the following procedure to set the dropout using SFC.

Range of the dropout setting is 0 to 10%.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG TOTALIZER MENU ? SFCM00006136D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the TOTALIZER functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right	TOTALIZER MENU PULSE CONFIGURE ? SFCM00006142D
4	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to enter into PULSE setting function and press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right. Displays the actual dropout setting.	PULSE CONFIGURE P-DROP OUT = 02% SFCM00006153D

Step	Key	Procedure	SFC screen
5	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key and select the dropout to be set.	PULSE CONFIGURE P-DROP OUT = 05% SFCM00006154D
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved on the SFC.	PULSE CONFIGURE ENTERED IN SFC SFCM00006145D
7	▲ H NEXT or ▼ L PREV	Next, set pulse width. press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	PULSE CONFIG DOWNLOAD DATA ? SFCM00006152D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Changed setting data is written into the database of the converter.	PULSE OUTPUT DATA LOADED! SFCM00006149D
9	CLR (No)	Press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

Setting counter reset function [RESET TOTALZE] function

Resetting the totalized value and setting reset value are possible using the SFC. When resetting the totalized value, two wired magnetic flowmeter internal counter will be reset and start resetting from the reset value which has been set. You can enter the reset value maximum of 10 figures to SFC, however for two wired magnetic flowmeter only 8 figures are effective. Use the following procedure to reset the totalized value and to set the reset value.

Step	Key	Procedure	SFC screen
1	CLR (No)	Confirm that the SFC is set to "READY". If it is not, press the CLR (No) key to set it to "READY".	MAG XXXXXXXX READY... SFCM00006009D
2	B CONF ▲ H NEXT or ▼ L PREV	Press the B CONF key to access the CONFIG functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	MAGNEW CONFIG WORKING... SFCM00006020D MAGNEW CONFIG TOTALIZER MENU ? SFCM00006136D
3	NON-VOL ENTER (Yes) ▲ H NEXT or ▼ L PREV	Press the NON-VOL ENTER (Yes) key to access the TOTALIZER functions. Press the ▲ H NEXT key or ▼ L PREV key to display the screen as shown on the right.	TOTALIZER MENU RESET TOTALIZE ? SFCM00006155D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. Display the actual reset value.	RESET TOTALIZE 0012345678 CNTS SFCM00006156D
5		Enter the reset value to be set pressing the numeric keys.	RESET TOTALIZE 0033333333 CNTS SFCM00006157D

Step	Key	Procedure	SFC screen
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. The changed setting is saved on the SFC.	RESET TOTALIZE ENTERED IN SFC SFCM00006158D
7	▲H NEXT NON-VOL ENTER (Yes)	Press the ▲H NEXT key. The screen as shown on the right appears. To reset press the NON-VOL ENTER (Yes) key. Totalized value is reset.	RESET TOTALIZE 0000111111 RST ? SFCM00006159D RESET TOTALIZE WORKING... SFCM00006160D RESET TOTALIZE TOTAL RESET! SFCM00006161D
8	CLR (No)	After checking the pulse output, press the CLR (No) key and the screen returns to the screen as in step 1.	MAG XXXXXXXX READY... SFCM00006009D

MEMO

Chapter 7 : Operation using HART communicator

7-1 : Preparation for communication, verification and cautions on use

This section describes the preparation necessary for communication between a device and a HART Communicator. This section also covers the procedure to verify communication. The first step for preparation is to perform wiring between the converter and the HART Communicator. After wiring has been completed, turn the power on and verify that communications are functioning properly.

7-1-1 : Wiring between converter and HART Communicator

The following describes the methods of wiring between converter and HART Communicator.

Connect the HART Communicator as shown in Figure 7-1. A 250Ω resistor must be installed on the receiving end of the output current. There is no polarity on the HART Communicator terminal.

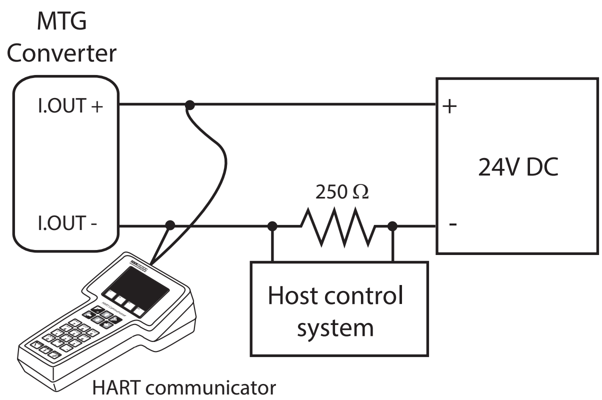


Figure 7-1 HART Communicator wiring

7-1-2 : Two wired magflow meter converter setting

Communication method selection

Set the converter's communication method to HART to communicate with HART Communicator.

Note that after changing the setting, when moving to the measuring mode by pressing the MODE key, converter will reboot.

HART: Set when executing the HART communication using HART Communicator.

SFN.A: Set when using the SFC with analog (4 to 20 mA) output mode

SFN.D: Set when DE (Digital Enhancement) communication is used.

NONE: Set when communication is not used.

Default setting is SFN.A: SFC analog output.

Follow the procedures described below to select the communication method.

Step	Procedure	Screen
1	The screen on the right is an example in the MEASURING MODE. Press the MODE key	20.0 % 01.94 m^3/h WP0 00069401
2	Operator's mode will be displayed approx.2 sec. And the damping setting display will appear.	20.0 % * OPERATOR'S MODE 20.0 % * DAMPING 005.0 s
3	Press the ↑ key 3 times. The screen as shown on the right will appear.	20.0 % * COM SELECT SFN. A
4	Move the cursor to the communication method (SFN.A, SFN.D, NONE, HART) by pressing the → key. The screen as shown on the right is an example of when SFN.A is selected for communication method.	20.0 % * COM SELECT SFN. A
5	Press the ↑ key or ↓ key, and select the HART communication method.	20.0 % * COM SELECT HART

Step	Procedure	Screen
6	Press the → key and move the cursor to the bottom of the *. After rebooting the converter by pressing the MODE key, display will return to the MEASURING MODE and the communication method will be changed.	20.0 % * COM SELECT HART 8.8.8.8.8.8.8.8 % RATE TOTAL – SELF CHECK MODE 20.0 % 01.94 m^3/h WP0 00069401

7-1-3 : Verifying communication

After the HART Communicator has been properly interconnected, turn the device's power on. For the external power supply model, turn on the external power supply before turning the device power on.

Once the setting and wiring connections are correct, the HART Communicator's display shows an online menu as shown below and a HART mark will flicker in the upper right hand corner of the display.

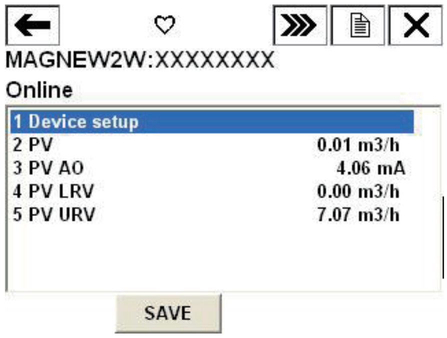


Figure 7-2 Online menu

If the display is not as shown in Figure 7-2 but as shown in Figure 7-3 below, no communications are being made. Recheck the HART Communicator connections and the setting of converter. (The setting of the converter is described page 7-2.)

Figure 7-3 Communication not available

7-1-4 : Cautions

⚠CAUTION

Do not remove the HART Communicator cable from the converter while executing communication. If the cable is disconnected during data setting transmission there will be no data transfer to the converter.

7-2 : Setting and calibrating devices using the HART Communicator

The HART Communicator enables the user to set a two wired magnetic flowmeter device as well as allowing them to adjust and check the output of the device and to inspect the device. The following values can be set using the HART Communicator:

- Flow unit
- Range
- Specific gravity
- Damping time constant
- Display selection
- Function selection
- Correction coefficient
- Communication method
- Detector diameter
- Detector constant
- Auto spike cut
- Average processing selection
- Average processing time
- Low flow cut
- Drop out
- Pulse scale unit
- Pulse scale
- Pulse width
- Totalized value of integral counter display
- Reset value of integral counter
- Integral counter reset
- High alarm value setting
- Low alarm value setting
- Setting output status setting
- Burnout (Analog output) setting
- Burnout (Pulse output) setting
- Electrode status diagnostic function

Also, the following calibrations and inspection can be made:

- Zero point adjustment
- Current output calibration at 4 mA and 20 mA
- Gain adjustment
- Pulse output adjustment
- Excitation current output adjustment
- Analog output check
- Pulse output check
- Contact output check
- Converter status check
- Tag setting
- Shipping data recovery
- Equipment information check

For a detailed list of all the menus, see the HART Communicator's menu table for the two wired magnetic flowmeter at the back of this manual.

7-2-1 : Setting procedures

The procedures to set various device values are described in this section.

Flow units

The unit for the flow is to be set as follows:

1. Select “1. Device setup” from online menu 1 (Figure 7-4). The device setup menu will then be displayed. (Figure 7-4)

Figure 7-4 Device setup menu

2. Select “3. Basic setup” from the menu and then the basic setup menu will be displayed. (Figure 7-5)

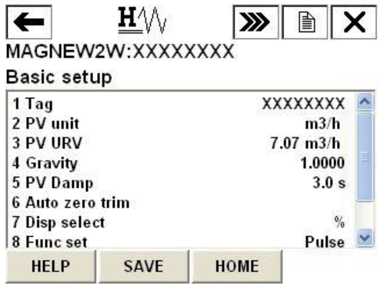


Figure 7-5 Basic setup menu

3. Select “2. PV unit” from the basic setup menu.

4. Once the display as shown in Figure 7-6 appears, move the arrow key up or down to select a flow unit. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the basic menu.

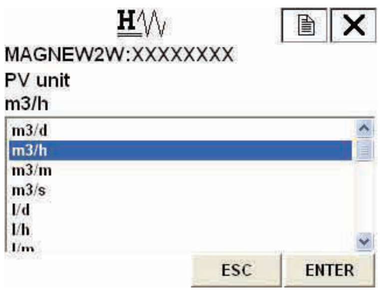


Figure 7-6 Selection of flow rate unit

5. After pressing F4 (ENTER) and returning to the basic menu, press F2 (SEND). The HART mark will appear in the upper right hand corner while HART is communicating with the device. (Figure 7-7)
   Once communication is complete, the HART mark will disappear.

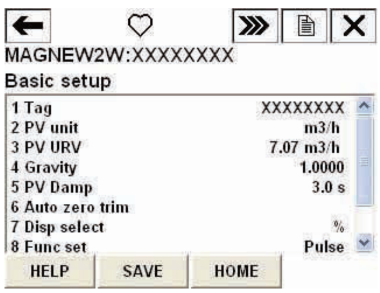


Figure 7-7 Transmitting the setting

Range

The upper limit of the flow range is set as follows:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 3. PV URV
   Figure 7-8 will then be displayed.

Figure 7-8

2. Use the numeric keys to enter a new range value in the value input display. Up to six digits including a decimal point can be entered. Setting range of the flow range is 0.3 m/s to 10 m/s in flow rate.
3. Once a new value is entered, press F4 (ENTER) to return to the basic setup menu. When the value is outside the range, error will be displayed. Input the value again.
4. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Specific gravity

The specific gravity, when selecting the unit of weight is set as follows:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 4. Gravity
   Figure 7-9 will then be displayed.

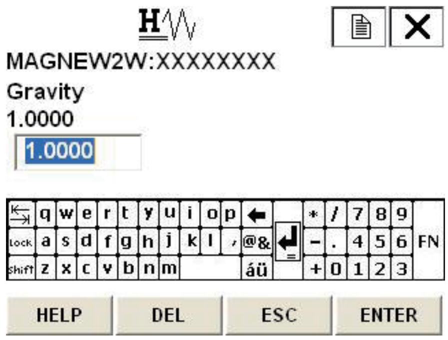


Figure 7-9

2. Use the numeric keys to enter a specific gravity value in the value input display. Up to six digits including a decimal point can be entered. Setting range of the specific gravity is 0.1000 to 5.9999.
3. Once a new value is entered, press F4 (ENTER) to return to the basic setup menu. When the entered value is outside the range, error will be displayed. Input the value again.
4. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Damping time constant

The damping time constant is set as follows:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 5. PV Damp
   Figure 7-10 will then be displayed.

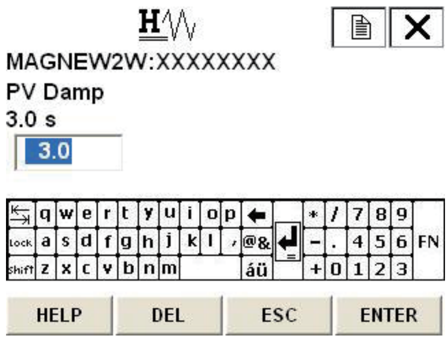


Figure 7-10

2. Use the numeric keys to enter a damping time constant value in the value input display. Up to five digits including a decimal point can be entered. Setting range of the damping constant is 0.5 to 199.9.

3. Once a new value is entered, press F4 (ENTER) to return to the basic setup menu. When the value is outside the range, error will be displayed. Input the value again.

4. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Zero adjustment

Follow the steps described below to set the momentarily flow of static pressure to zero.

1. Stop and make sure that the fluid to be calibrated inside the flowmeter is static.

2. From online menu,
Select:
1. Device setup
→ 3. Basic setup
→ 6. Auto zero trim
Figure 7-11 will then be displayed. To adjust the zero point, press F4 (OK). It will take approx. 120 sec. to adjust the zero point.

Figure 7-11

3. When F4 (OK) is pressed, Figure 7-12 will be displayed and starts adjusting the zero point. By pressing F3 (ABORT) the procedure is canceled.

Figure 7-12

4. Once zero point adjustment is completed, Figure 7-13 is displayed. Press F4 (OK) and return to the online menu.

Figure 7-13

Selecting display

The display selection is set as follows:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 7. Display select
   Figure 7-14 will then be displayed.

Figure 7-14

2. Once the display as shown in Figure 7-14 appears, move the arrow key up or down to select a display. After making a selection, press F4 (ENTER). % / Rate / TOTAL can be selected. If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the basic menu.
3. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Selecting function

Pulse output and contact output can be selected.

Follow the procedures described below to select pulse output or contact output.

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 8. Func set
   Figure 7-15 will then be displayed.

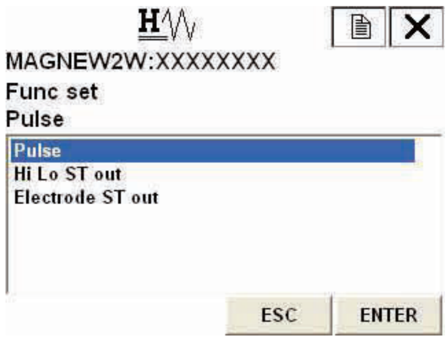


Figure 7-15

2. Once the display as shown in Figure 7-15 appears, move the arrow key up or down to select a display. After making a selection, press F4 (ENTER). Pulse (Pulse output), Hi Lo ST out (contact output), or Electrode ST out (contact output) can be selected. If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the basic menu.
3. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Correction coefficient setting

Correction coefficient can be set in case multiplying the correction coefficient to the output flow rate according to its need.

The correction coefficient is set as follows:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 9. Coefficient
   Figure 7-16 will then be displayed.

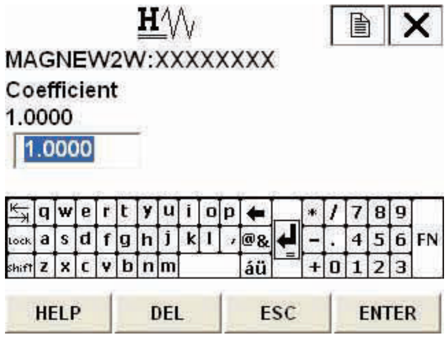


Figure 7-16

2. Use the numeric keys to enter a correction coefficient value in the value input display. Up to six digits including a decimal point can be entered. Setting range of correction coefficient is 0.1000 to 5.9999.

3. Once a new value is entered, press F4 (ENTER) to return to the basic setup menu. When the value is outside the range, error will be displayed. Input the value again.

4. After returning to the basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART Communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Changing communication method

This function is used when changing the communication method from HART communication to SFN communication or without communication. This function is not used normally. If changing the communication method other than the HART, HART communication cannot be used. Therefore, if changing the communication other than the HART, see 7-1-2 : “Two wired magflow meter converter setting” and set the communication method to HART.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 6. COMM output
   Figure 7-17 will then be displayed.

Figure 7-17

2. Once the display as shown in Figure 7-17 appears, move the arrow key up or down to select communication method. After making a selection, press F4 (ENTER). If F3 (ABORT) is pressed here, the selection will be canceled and the display will return to the COMM output menu.

3. When F4 (ENTER) is pressed, Figure 7-18 will be displayed for confirmation. If communication method is correct select “Yes” and press F4 (ENTER). If “No” selected or F3 (ABORT) is pressed here, selection will be canceled and the display will return to selecting menu display.

Figure 7-18

7-2-2 : Setting converter data

Detector diameter

Follow the procedures described below to set the detector diameter.

Set the diameter size printed on the nameplate.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 1. Detector config
   → 1. Tube size
   Figure 7-19 will then be displayed.

Figure 7-19

2. Once the display as shown in Figure 7-19 appears, move the arrow key up or down to select a detector diameter. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Detector config menu.
3. After returning to the Detector config menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Detector type

Follow the procedures described below to set the detector type.

Use MTG at normal measurement.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 1. Detector config
   → 2. Detector type
   Figure 7-20 will then be displayed.

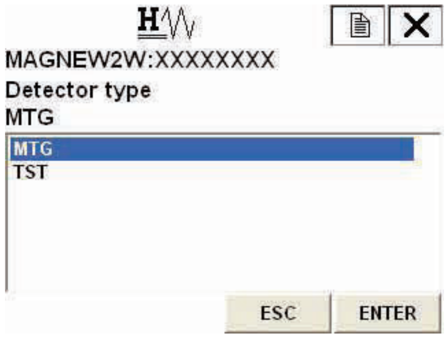


Figure 7-20

2. Once the display as shown in Figure 7-20 appears, move the arrow key up or down to select a detector type. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Detector config menu.
3. After returning to the Detector config menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Detector constant

Follow the procedures described below to set the detector constant.

Set the detector constants (Ex value and C2 value) printed on the nameplate.

Ex value

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 1. Detector config
   → 3. Ex value
   Figure 7-21 will then be displayed.

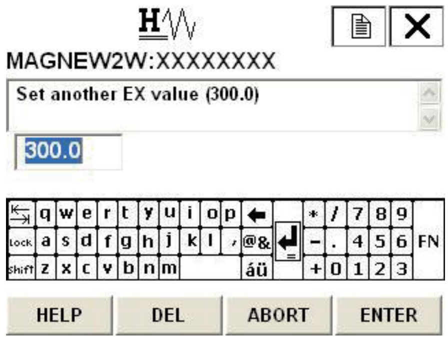


Figure 7-21

2. Use the numeric keys to enter a detector constant in the value input display. Up to 5 digits including a decimal point can be entered. Setting range of the detector constant is 200.0 to 699.9.
3. Once a new value is entered, press F4 (ENTER) to return to the Detector config menu. When the value is outside the range, error will be displayed. Input the value again.
4. After returning to the Detector config menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper side while HART is communicating with the device. The mark will disappear once communication has properly completed.

C2 value

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 1. Detector config
   → 4. C2 value R/W
   Figure 7-22 is then displayed.

Figure 7-22

2. Use the numeric keys to enter a detector constant in the value input display. Up to 6 digit including a decimal point can be entered. Setting range of the detector constant C2 is 0.5000 to 1.5000.
3. Once a new value is entered, press F4 (ENTER) to return to the detector config menu. When the value is outside the range, an error message is displayed. Input the value again.
4. After returning to the detector config menu, press F2 (SEND). The changed setting is sent to the transmitter. The HART communicator mark appears on the upper side while HART is communicating with the device. Once communication is completed, the HART mark disappears.

7-2-3 : Signal processing

Auto spike cut

To set On/OFF for auto spike cut, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 2. Auto spike cut
   Figure 7-23 will then be displayed.

Figure 7-23

2. Once the display as shown in Figure 7-23 appears, move the arrow key up or down to select On or OFF. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Setting average processing

To set ON/OFF for average processing, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 3. Moving average
   Figure 7-24 will then be displayed.

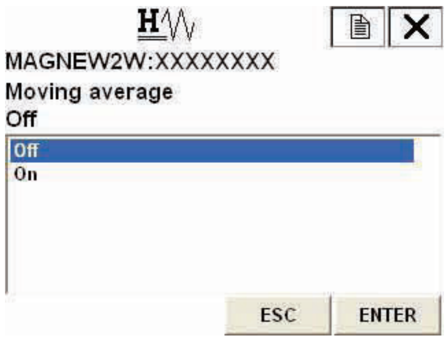


Figure 7-24

2. Once the display as shown in Figure 7-24 appears, move the arrow key up or down to select On or OFF. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Setting the average processing time

To set the value of the average processing time, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 4. Mvng av time
   Figure 7-25 will then be displayed.

Figure 7-25

2. Use the numeric keys to enter an average processing time in the value input display. Setting range of average processing time 1.0s to 30.0s.

3. Once a new value is entered, press F4 (ENTER) to return to the Noise immunity menu. When the value is outside the range, error will be displayed. Input the value again.

4. After returning to the Noise immunity menu, press F2(SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Low flow cutoff

To set the low flow cutoff, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 5. Lo flow cut
   Figure 7-26 will then be displayed.

Figure 7-26

2. Once the display as shown in Figure 7-26 appears, move the arrow key up or down to select low flow cut value. Value can be specified from 1% to 10%. After making a selection, press F4(ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2(SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Drop-out

When the drop-out is set to prevent the wrong integration of integrated flow rate, it will not count the pulse when it is within the flow rate of setting against the setting range.

To set the drop-out, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 6. Drop out
   Figure 7-27 will then be displayed.

Figure 7-27

2. Once the display as shown in Figure 7-27 appears, move the arrow key up or down to select drop-out value. Value can be specified from 0% to 10%. After making a selection, press F4(ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2(SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Electrode status sensitivity

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 7. Electrode status sensitivity
   Figure 7-28 is then displayed.

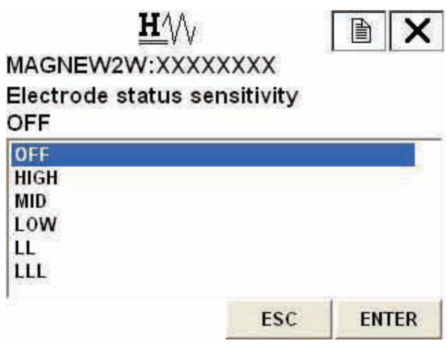


Figure 7-28

2. Once the display as shown Figure 7-28 appears, move the arrow key up or down to select a sensitivity. After marking a selection, press F4 (ENTER). OFF, HIGH, MID, LOW, LL, or LLL can be selected. If F3 (ESC) is pressed here, the selection is canceled and the display returns to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2 (SEND). The changed setting is sent to the transmitter. The HART communicator mark appears on the upper side while HART is communicating with the device. Once communication is completed, the HART mark disappears.

4. To select an appropriate sensitivity level, refer to the flow chart on page 5-28.

Electrode status output mode

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 3. Noise immunity
   → 8. Electrode status output mode
   Figure 7-29 is then displayed.

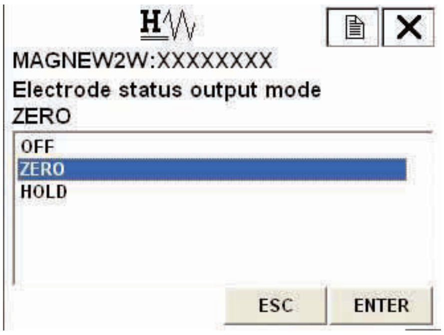


Figure 7-29

2. Once the display as shown Figure 7-29 appears, move the arrow key up or down to select an Electrode status output mode. After marking a selection, press F4 (ENTER). OFF, ZERO, or HOLD can be selected. If F3 (ESC) is pressed here, the selection is canceled and the display returns to the Noise immunity menu.

3. After returning to the Noise immunity menu, press F2 (SEND). The changed setting is sent to the transmitter. The HART communicator mark appears on the upper side while HART is communicating with the device. Once communication is completed, the HART mark disappears.

7-2-4 : Pulse setting

Pulse scale unit

To set the pulse scale unit, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 2. Pulse output
   → 1. Puls out unit
   Figure 7-30 will then be displayed.

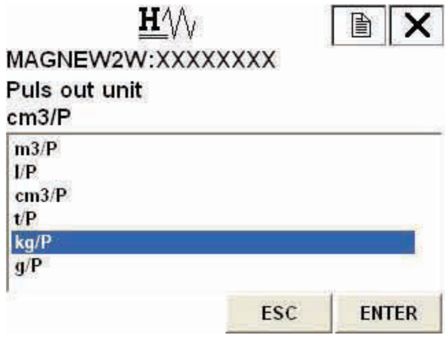


Figure 7-30

2. Once the display as shown in Figure 7-30 appears, move the arrow key up or down to select pulse scale unit. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Pulse output menu.
3. After returning to the Pulse output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Pulse scale

To set the pulse scale, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 2. Pulse output
   → 2. Puls scaling
   Figure 7-31 will then be displayed.

Figure 7-31

2. Use the numeric keys to enter a pulse scale in the value input display. Setting range of pulse scale is span frequency of 0.0001 Hz to 200 Hz.
3. Once a new value is entered, press F4 (ENTER) to return to the Noise immunity menu. When the value is outside the range, error will be displayed. Input the value again.
4. After returning to the Noise immunity menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Pulse width

To set the pulse width value, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 2. Pulse output
   → 3. Pulse width
   Figure 7-32 will then be displayed.

Figure 7-32

2. Duty ratio is set 50%. If setting the value arbitrarily, select YES, and press F4 (ENTER). If duty ratio of 50% is fine, select NO.

3. Use the numeric keys to enter a pulse width in the value input display. Setting range of pulse width is duty ratio of 70% or less.

Figure 7-33

4. Once a new value is entered, press F4 (ENTER). Data will be transmitted. When the value is outside the range, error will be displayed. Input the value again.

7-2-5 : Totalized value setting

Displaying totalized value

Follow the procedures described below to display the actual totalized value.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 3. Totalizer
   → 1. Totalizer display
   Figure 7-34 will then be displayed.

Figure 7-34

2. Press F4 (EXIT) to return to the previous display.

Integrated reset value

Follow the procedure described below to set the integrated reset value.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 3. Totalizer
   → 2. Totalizer restart val
   Figure 7-35 will then be displayed.

Figure 7-35

2. Use the numeric keys to input a integrated reset value.
   Integrated reset value is span frequency of 00000000 to 99999999.

3. Once a new value has been inputted, press F4 (ENTER).

4. After pressing F4 (ENTER) and returning to the Totalizer menu, press F2 (SEND) to transmit the change to the converter. The HART communication will appear in the upper right hand corner while HART is communicating with the device. The mark will disappear once communication is properly completed.

Resetting the totalized value

Follow the procedure described below to reset the totalized value.

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 3. Totalizer
   → 3. Reset totalizer
   Figure 7-36 will then be displayed.

Figure 7-36

2. If resetting the totalized value, select Yes, and press F4.

3. After pressing F4 (ENTER), Figure 7-37 will then be displayed. Figure 7-37 shows that the totalized value has been reset. After resetting, display will automatically return back to the previous display in 3 sec.

Figure 7-37

7-2-6 : Contact output setting

High alarm value setting

To set the high alarm value of contact output, proceeds as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 4. Digital output
   → 1. Hi alarm
   Figure 7-38 will then be displayed.

Figure 7-38

2. Use the numeric keys to enter a high alarm value in the value input display. Setting range of high alarm value is 0% to +115%. Do not set the value to be High alarm value < Low alarm value.

3. Once a new value is entered, press F4 (ENTER) to return to the Digital output menu. When the value is outside the range, error will be displayed. Input the value again.

4. After returning to the Digital output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Low alarm value setting

To set the low alarm value of contact output, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 4. Digital output
   → 2. Low alarm
   Figure 7-39 will then be displayed.

Figure 7-39

2. Use the numeric keys to enter a high alarm value in the value input display. Setting range of high alarm value is 0% to +115%. Do not set the value to be High alarm value < Low alarm value.

3. Once a new value is entered, press F4 (ENTER) to return to the Digital output menu. When the value is outside the range, error will be displayed. Input the value again.

4. After returning to the Digital output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Contact output status setting

To select OPEN/CLOSE of contact output in normal status, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 4. Digital output
   → 3. Burn out DO
   Figure 7-40 will then be displayed.

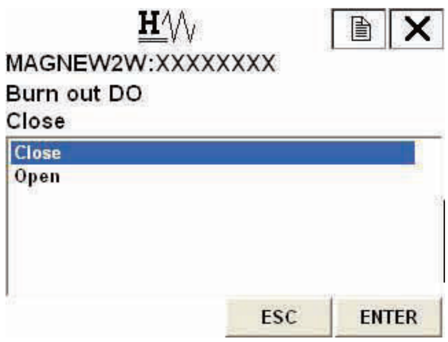


Figure 7-40

2. Once the display as shown in Figure 7-40 appears, move the arrow key up or down to select OPEN or CLOSE. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Digital output menu.

3. After returning to the Digital output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

7-2-7 : Burnout setting

Analog output burnout setting

To set the output direction of analog current output at critical failure, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 1. Analog output
   → 5. Burn out AO
   Figure 7-41 will then be displayed.

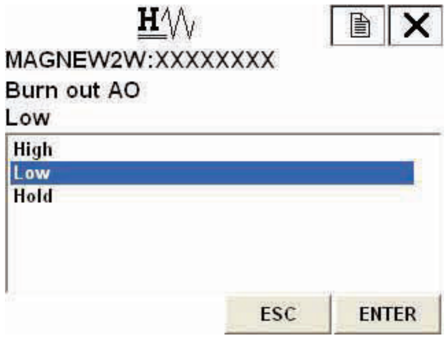


Figure 7-41

2. Once the display as shown in Figure 7-41 appears, move the arrow key up or down to select HIGH, LOW, or HOLD. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Analog output menu.
3. After returning to the Analog output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

Pulse output burnout setting

To set the output direction of pulse output at critical failure, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 4. Detailed setup
   → 2. Conf output
   → 2. Pulse output
   → 5. Burn out pls
   Figure 7-42 will then be displayed.

Figure 7-42

2. Once the display as shown in Figure 7-42 appears, move the arrow key up or down to select Off or Hold. After making a selection, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Pulse output menu.
3. After returning to the Pulse output menu, press F2 (SEND). Changed setting will be transmitted to the converter. The HART communicator mark will appear on the upper right hand corner while HART is communicating with the device. The mark will disappear once communication has properly completed.

7-3 : Calibrating and Inspecting the device by HART Communicator and other functions

7-3-1 : Device adjustment

Analog current output adjustment

To adjust analog output (4 mA and 20 mA) adjustment, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 1. D/O trim
   Figure 7-43 will then be displayed.
   If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-43

2. Once the display as shown in Figure 7-44 appears, move the arrow key up or down to select a current output to adjust, and then press F4 (ENTER). This time, select 4 mA.

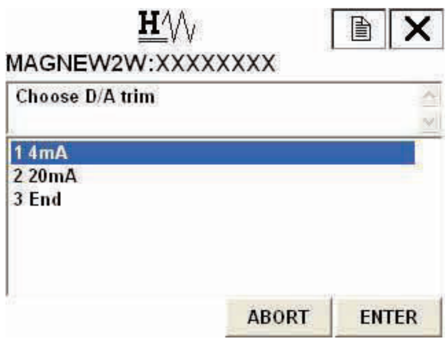


Figure 7-44

3. Figure 7-45 will then appears. Connect the device to measure the current output, and then press F4 (OK).

Figure 7-45

4. Figure 7-46 will then appear. By pressing F4 (OK), current adjustment will start and the converter will output a current corresponding to 0% of the flow range. If it is fine, press F4(OK)

Figure 7-46

5. Figure 7-47 will then appear. When executing the adjustment, select "SET", and then press F4 (ENTER).

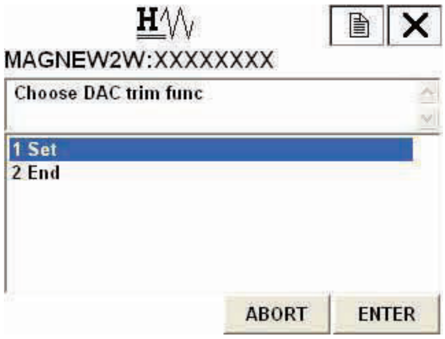


Figure 7-47

6. A numerical value input display (Figure 7-48) will then appear. Measure the output current from the converter and enter the current value by the mA into the device. Once the input has been completed press F4 (ENTER). The converter will start adjusting to 4mA automatically, and return back to the display as shown in Figure 7-48. Verify that the current output value is 4 mA, and terminate the adjustment.

Figure 7-48

7. For 20 mA current output adjustment, follow the same procedures as shown in above.

Manual Zero

This function is used to improve flow measurement more accurately when the flow rate becomes 25% or less of setting range. The MTG Flowmeter has three manual zeroing functions for each excitation current. To execute the manual zero, proceed as follows.

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 3. Manual zero
   Figure 7-49 is then displayed.

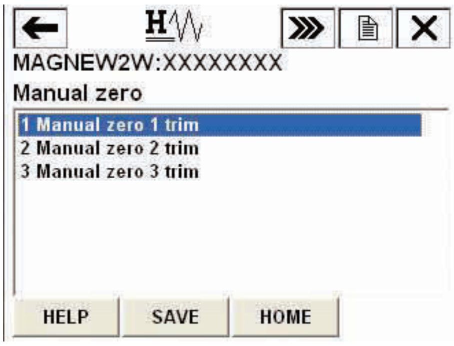


Figure 7-49

2. Once the display as shown Figure 7-49 appears, move the arrow key up or down to select a manual zero to be adjusted.

3. Select the manual zero, then the screen as shown in Figure 7-50 appears.

Figure 7-50

4. To continue the manual zero, press OK. Then the screen as shown in Figure 7-51 appears. Press OK to continue. The notice as shown in Figure 7-52 appears.

Figure 7-51

Figure 7-52

5. Once the display as shown Figure 7-53 appears, confirm the value appears on the screen and select an appropriate command by moving the arrow key up or down. After marking a selection, press F4 (ENTER). Check the adjustment value by selecting “3 Refresh %” command. If you finish the manual zero, select “4 Quit(Manual zero end) command and press F4 (ENTER). Then screen as shown in Figure 7-54 appears. Press OK and then return to the Manual zero menu.

Figure 7-53

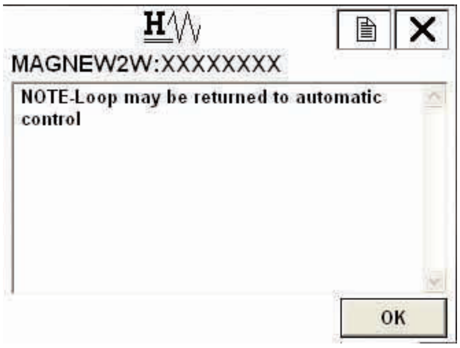


Figure 7-54

6. Execute the same procedures for the other two manual zero adjustments.

Gain adjustment

To adjust gain, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 4. Gain trim
   Figure 7-55 will then be displayed.
   If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-55

2. Figure 7-56 will then appears. Connect the calibrator, and then press F4 (OK).

Figure 7-56

3. Once the display as shown in Figure 7-57 appears, move the arrow key up or down to select a gain to adjust, and then press F4 (ENTER). This time, select 0 m/s.

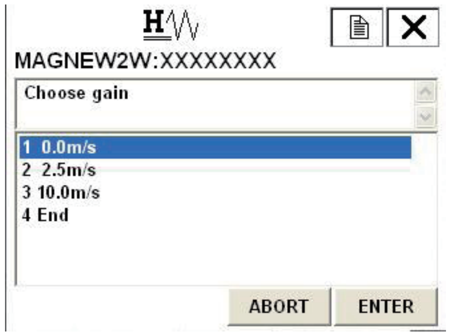


Figure 7-57

4. Figure 7-58 will then appear. Set the connected calibrator value to 0.0 m/s and then press F4 (OK).

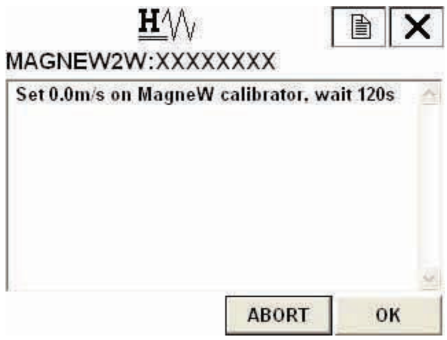


Figure 7-58

5. Figure 7-59 will then appear. When executing the adjustment, press F4 (ENTER) to start the adjustment.

Figure 7-59

6. Figure 7-60 will then appear. Please wait until the adjustment completes.

Figure 7-60

7. After the gain adjustment has been completed, display shown in Figure 7-61 appears. Gain adjustment of 0.0 m/s is now completed. For gain adjustment of 2.5 m/s and 10 m/s, follow the same procedures as shown in above.

Figure 7-61

Pulse output adjustment

To adjust the pulse output, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 5. Pulse trim
   Figure 7-62 will then be displayed. If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-62

2. Figure 7-63 will then appears. Connect the device to measure the pulse output, and then press F4 (OK).

Figure 7-63

3. Figure 7-64 will then appear. By pressing F4 (OK), the pulse output adjustment will start and the converter will output a pulse of 90 Hz. If it is fine, press F4 (OK).

Figure 7-64

4. Figure 7-65 will then appear. When executing the adjustment, select “SET”, and then press F4 (ENTER).

Figure 7-65

5. A numerical value input display (Figure 7-66) will then appear. Measure the pulse frequency from the converter and enter the frequency by the Hz into the device. Once the input has been completed press F4 (ENTER). The converter will start adjusting to 90 Hz automatically, and return back to the display as shown in Figure 7-65. Verify that the pulse output is 90Hz, and terminate the adjustment.

Figure 7-66

Excitation current adjustment

To adjust the excitation current adjustment, proceed as follow:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 6. Ex current trim
   Figure 7-67 will then be displayed.
   If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-67

2. Once the display as shown in Figure 7-68 appears, move the arrow key up or down to select an excitation current to adjust, and then press F4 (ENTER). This time, select 3.5 mA.

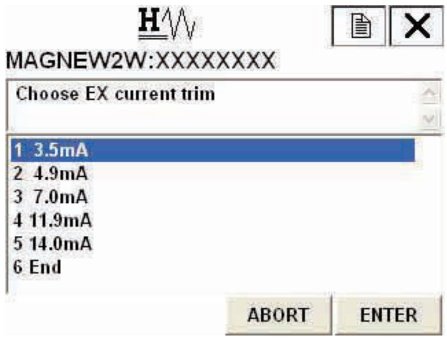


Figure 7-68

3. Figure 7-69 will then appears. Connect the device to measure excitation current to the both ends of the excitation check pin and then press F4 (OK).

Figure 7-69

4. Figure 7-70 will then appear. By pressing F4 (OK), excitation current adjustment starts, and the converter will adjust the excitation current to 3.5 mA. If it is fine, press F4 (OK).

Figure 7-70

5. Figure 7-71 will appear. When executing the adjustment, choose “SET” and press F4 (ENTER).

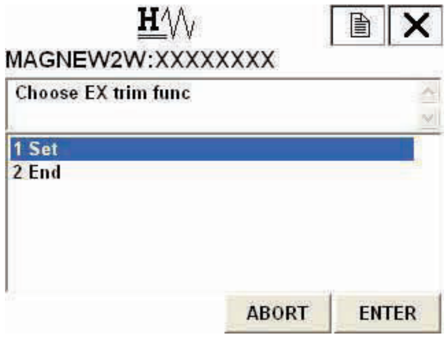


Figure 7-71

6. A numerical value input display (Figure 7-72) will then appear. Resistance of 10ohm is in between the check pin. Therefore, when the excitation current is 3.5 mA, approx. 35 mV will be output. Measure this value, and input the value by the mV directly. Press F4 (ENTER). The converter will start adjusting to 3.5 mA automatically, and return back to the display as shown in Figure 7-71. Verify that the excitation current value is 3.5 mA, and terminate the adjustment.

Figure 7-72

7. For the other excitation current adjustment, follow the same procedure as shown in above.

7-3-2 : Output check

Analog output check with a calibrator

This function is used for the loop check using a calibrator. 0%, or 25% to 100% of setting range can be selected for the analog output check with the calibrator.

To output fixed value of analog current by using the calibrator, proceed as follows.

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 2. Loop test
   → 1. Loop check mode
   Figure 7-73 is then displayed.

Figure 7-73

2. Once the display as shown Figure 7-73 appears, make sure that the loop is removed from the automatic control. Then press “OK” to execute the output check with the calibrator.
   Then Figure 7-74 is displayed.

   Move the arrow key up or down and select “1 Start” to execute the loop check.

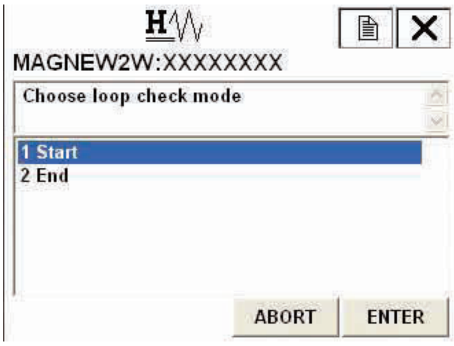


Figure 7-74

3. During the loop check, Figure 7-75 is displayed. If the loop check is finished, move the arrow key up or down and select “1 End” to select other analog output value for the loop check. If you finish the loop check, move the arrow key up or down and select “2 Abort” to abort. Then Figure 7-76 is displayed.

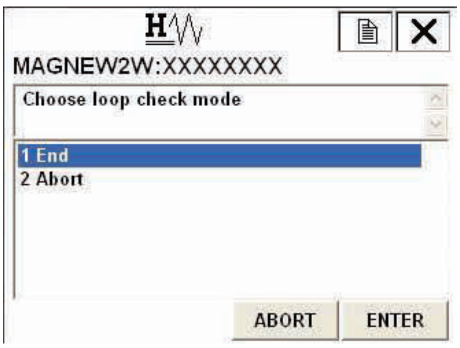


Figure 7-75

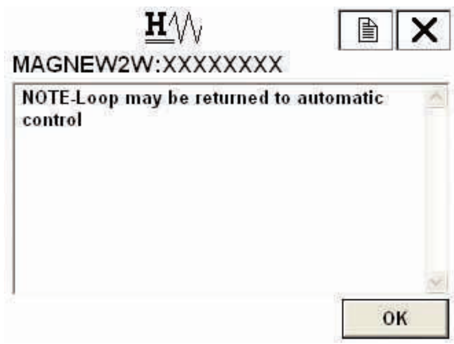


Figure 7-76

4. Once the display as shown Figure 7-76 appears, press “OK” to abort. Then Figure 7-77 is displayed. Press “OK” and then the screen returns to the loop test menu as shown in Figure 7-78.

Figure 7-77

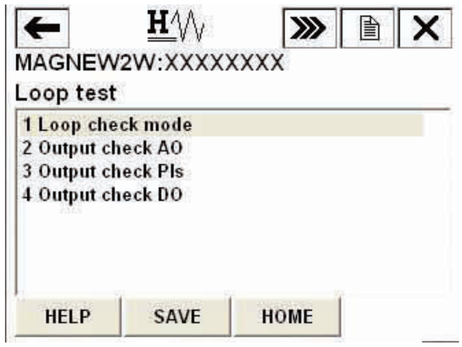


Figure 7-78

Analog output check

To output fixed value of analog current, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 2. Loop test
   → 2. Out put check AO
   Figure 7-79 will then be displayed. If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-79

2. Figure 7-80 will then appear. Choose START to start fixed value of analog current output, and then press F4 (ENTER)

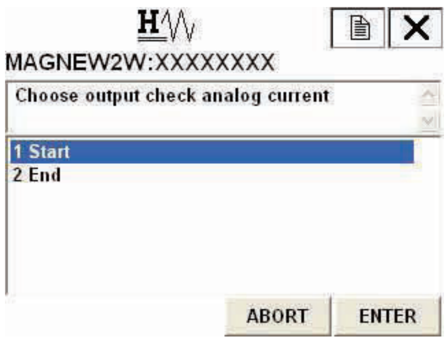


Figure 7-80

3. Note of caution will appear as shown in Figure 7-81. To proceed, press F4 (OK).

Figure 7-81

4. Use the numeric keys to enter a fixed value to be output in the value input display. Setting range is duty ratio of 0% to +100%. When value is entered, press F4 (ENTER). Analog current corresponding to its output will be output. Press F3 (ABORT) to return to the previous menu.

Figure 7-82

Pulse output check

To output pulse fixed value, proceed as follow:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 2. Loop test
   → 3. Out put check Pls
   Figure 7-83 will then be displayed. If the control system is not affected by the forcible change of the current signal, press F4(OK). By pressing F3(ABORT), the procedure is canceled.

Figure 7-83

2. Figure 7-84 will then appear. Choose START to start fixed value of pulse output, and then press F4(ENTER)

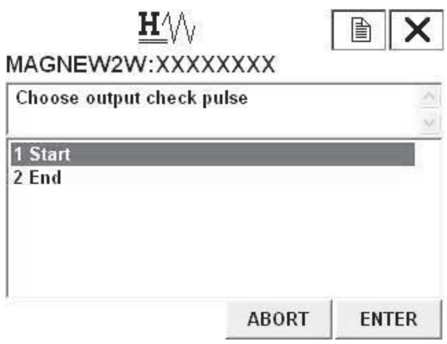


Figure 7-84

3. Note of caution will appear as shown in Figure 7-85. To proceed, press F4(OK).

Figure 7-85

4. Use the numeric keys to enter a fixed value to be output in the value input display. Setting range is duty ratio of 0% to +100%. When value is entered, press F4 (ENTER). Pulse corresponding to its output will be output. Press F3 (ABORT) to return to the previous menu.

Figure 7-86

Contact output check

To output contact fixed value, proceed as follows:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 2. Loop test
   → 4. Out put check Do
   Figure 7-87 will then be displayed. If the control system is not affected by the forcible change of the current signal, press F4 (OK). By pressing F3 (ABORT), the procedure is canceled.

Figure 7-87

2. Figure 7-88 will then appear. Choose START to start fixed value of contact output, and then press F4 (ENTER)

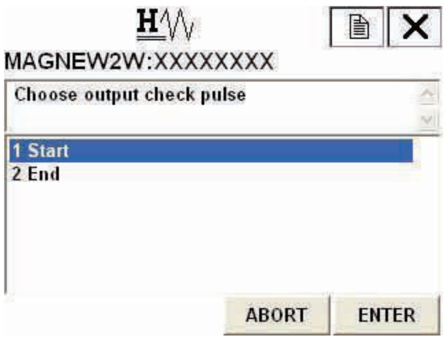


Figure 7-88

3. Figure 7-89 will appear. Move the arrow key up or down to select an OPEN or CLOSE. After making a selection, press F4 (ENTER). Selected contact will be output. Press F3 (ABORT) to return to the previous menu.

Figure 7-89

7-3-3 : Other functions

Verifying status of converter

To verify the status and setting of the device, proceed as follow:

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 1. Device Status
   Figure 7-90 will then be displayed.

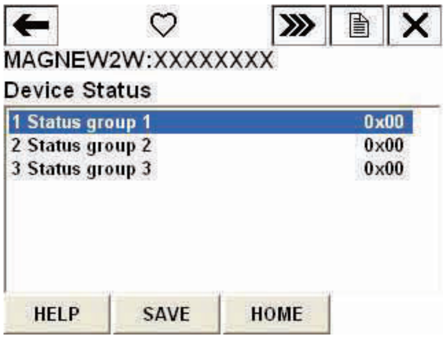


Figure 7-90

2. There are 3 groups. Each group has different items to be verified. Figure 7-91 shows an example of "status group 1".

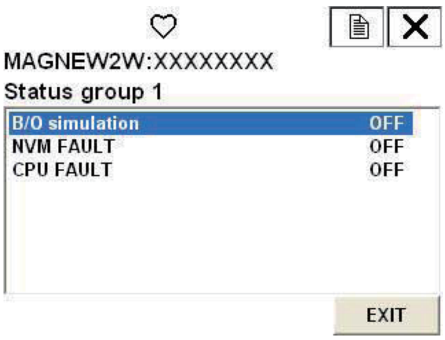


Figure 7-91

3. Table 7-1 shows the items to be verified in each group.

Table 7-1 Items in each group

Group	Item	Description
Group 1	B/O simulation	Burn out status
	NVM FAULT	Abnormal non-volatile memory
	CPU FAULT	Abnormal CPU
Group 2	IN LOCAL MODE OFF	Changing the setting from display
	DO OUTPUT MODE OFF	Checking the contact output
	PLS OUTPUT MODE OFF	Checking the pulse output
	AO OUTPUT MODE	Checking the analog output
	IN CALIB MODE	Adjusting
	NOT CALIBRATED	Non adjusted
	EX OUTPUT MODE	Checking the excitation current

Table 7-1 Items in each group

Group	Item	Description
Group 3	EMPTY OR SCALE ERROR	Empty or scale appears on electrode
	IN OUTPUT CHECK MODE W/CALIB	Checking the analog output using calibrator
	HI<LO ALM ERROR	Abnormal high/Low alarm setting
	SPAN OVER ERROR	Span gone beyond its high limit
	PLS SCALE ERROR	Pulse scale setting error
	PLS WIDTH ERROR	Pulse width setting error

Tag setting

To set the tag, proceed as follow:

1. From online menu,
   Select:
   1. Device setup
   → 3. Basic setup
   → 1. Tag
   Figure 7-92 will then be displayed.

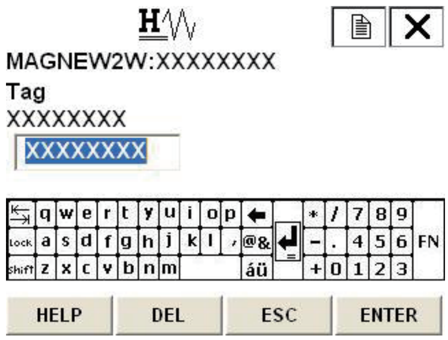


Figure 7-92

2. Once the display as shown in Figure 7-92 appears, use the arrow key up, down, right or left and numerical keys to enter the number. After entering, press F4 (ENTER). If F3 (ESC) is pressed here, the selection will be canceled and the display will return to the Basic setup menu.

3. After returning to the Basic setup menu, press F2 (SEND). Changed setting will be transmitted to the converter.

Shipping data recovery

Follow the procedure described below to execute the shipping data recovery. Please make sure that when it is executed, the internal data will return to the factory setting.

1. From online menu,
   Select:
   1. Device setup
   → 2. Diag/Service
   → 3. Calibration
   → 6. Shipping RCVR
   Figure 7-93 will then be displayed.

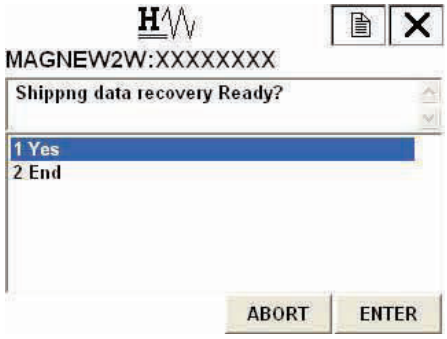


Figure 7-93

2. When executing shipping data recovery, select “YES” and press F4 (ENTER). Shipping data recovery will execute, and the display will return to Figure 7-93. Press F3(ABORT) to return to the previous menu.

Review

1. From online menu,
   Select:
   1. Device setup → 5. Review
   Then, the status of the device can be confirmed (see Figure 7-94). Use F2 (PREV) and F3 (NEXT) to move the confirming items.

Review	
Model	MTGFLOW
Distributor	Azbil Corporation
PV unit	m3/h
PV URV	m3/h
PV LRV	0.00 m3/h
PV USL	84.82 m3/h
PV LSL	0.00 m3/h
PV Min span	0.00000 m3/h
Xfer fnctn	Linear
Lo flo cutoff	2 %
Tube size	50 A
Pulse scaling	27.77637 cm3/P
Pulse Width	30 ms
PV Damp	3.0 s
AO Alrm typ	Lo
Write protect	No
Manufacturer	Azbil Corporation
Dev id	0
Tag	SPL-MODE
Descriptor	XXXXXXXXXXXXXXXX
Message	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Universal rev	5
Fld dev rev	1
Software rev	3.0
Poll addr	0
Num req preams	5
Final asmbly num	0

Figure 7-94

7-4 : Short cut commands and menus for HART communicator

7-4-1 : Short cut keys

Select the item to set from the table below, and press the item number from the online menu. You can move to the item, which you want to set quickly.

Basic setting	
Flow unit	132
Range	133
Specific gravity	134
Damping time constant	135
Auto zero	136
Display selection	137
Function selection	138
Correction coefficient	139
Communication method	1426

Detector setting	
Detector diameter	1411
Detector type	1412
Detector constant	1413
Detector constant C2	1414

Signal processing	
Auto spike cut	1432
Moving average processing	1433
Moving average processing time	1434
Low flow cut	1435
Drop-out	1436
Electrode status sensitivity	1437
Electrode status output mode	1438

Pulse setting	
Pulse scale unit	14221
Pulse scale	14222
Pulse width	14223

Totalized value setting	
Totalized value display	14231
Totalized reset value	14232
Totalized value reset	14233

Emergency setting	
High alarm value setting	14241
Low alarm value setting	14242
Contact output status setting	14243
Burnout (Analog output)	14215
Burnout (Pulse output)	14225

Device adjustment	
Analog current output adjustment	1231
Manual zero	1233
Gain adjustment	1234
Pulse output adjustment	1235
Excitation current adjustment	1236

Output inspection	
Analog output check W/calibrator	1221
Analog output check	1222
Pulse output check	1223
Contact output check	1224

Others	
Converter status	121
ID setting	131
Shipping data recovery	1236
Review	15

7-4-2 : Menu tree

- 1. Device setup →
  - 1. Process variables →
    - 1. PV
    - 2. PV % range
    - 3. AO
    - 4. Totalizer display
    - 5. Pulse scaling
  - 2. Diag/Service →
    - 1. Device status →
      - 1. Status group 1
      - 2. Status group 2
      - 3. Status group 3
    - 2. Loop test →
      - 1. Loop check mode
      - 2. Output check AO
      - 3. Output check Pls
      - 4. Output check DO
    - 3. Calibration →
      - 1. D/A trim
      - 2. Auto zero trim
      - 3. Manual zero
      - 4. Gain trim
      - 5. Pulse trim
      - 6. Ex current trim
      - 7. Shipping RCVR
  - 3. Basic setup →
    - 1. Tag
    - 2. PV unit
    - 3. PV URV
    - 4. Gravity
    - 5. PV Damp
    - 6. Auto zero trim
    - 7. Display select
    - 8. Func set
    - 9. Coefficient
  - 4. Detailed setup →
    - 1. Detector config →
      - 1. Tube size
      - 2. Detector type
      - 3. Ex value
      - 4. C2 value R/W
    - 2. Conf outputs →
      - 1. Analog output →
        - 1. PV unit
        - 2. PV URV
        - 3. PV LRV
        - 4. Lo flow cutoff
        - 5. Burn out AO
        - 6. Output check AO
      - 2. Pulse output →
        - 1. Puls out unit
        - 2. Puls scaling
        - 3. Pulse width
        - 4. Drop out
        - 5. Burn out Pls
        - 6. Output check Pls
      - 3. Totalizer →
        - 1. Totalizer display
        - 2. Total restart val
        - 3. Reset totalizer
      - 4. Digital output →
        - 1. Hi alarm
        - 2. Low alarm
        - 3. Burn out DO
        - 4. Output check DO
      - 5. Hart output →
        - 1. Poll addr
        - 2. Num req preams
      - 6. Communication output →
        - 1. HART
        - 2. SFN analog
        - 3. SFN digital
        - 4. None
        - 5. End
    - 3. Noise immunity →
      - 1. PV Damp
      - 2. Auto spike cut
      - 3. Moving average
      - 4. Mvng av time
      - 5. Lo flo cut
      - 6. Drop out
      - 7. Electrode status sensitivity
      - 8. Electrode status output mode
    - 4. Device info →
      - 1. Manufacturer
      - 2. Model
      - 3. Tag
      - 4. Descriptor
      - 5. Message
      - 6. PV Snsr S/n
      - 7. Final asmbly num
      - 8. Write protect
      - 9. Revision No. →
        - 1. Universal rev
        - 2. Fld dev rev
        - 3. Software rev
  - 5. Review
- 2. PV
- 3. PV AO
- 4. PV LRV
- 5. PV URV

MEMO

Chapter 8 : Maintenance and troubleshooting

Outline of this chapter

This chapter presents the instrument maintenance and maintenance procedure and information to be referred for troubleshooting. Ensure the procedure for maintenance based on the trouble.

8-1 : Maintenance and inspection of parts

8-1-1 : Replacement of indicator / data setting device

Procedure

Replacement procedure is as follows.

Step	Procedure
1	Power off the converter by circuit breaker etc.
2	The converter front cover is fixed by hexagon socket head screws (M3). Loosen these screws with an Allen wrench (1.5).
3	Remove the converter front cover by turning it counterclockwise with the dedicated tool. **~Note** ***Remove the front cover straight and with care.***
4	Remove the 3 fixing screws.
5	Remove by pulling out.
6	Align the new card's connector to the converter connector. **~Note** ***Ensure the correct panel direction. The panel attaching direction can be chosen from two options according to the attaching position of this instrument.***
7	Fix the card again with the 3 screws. **~Note** ***The connector is connected firmly by tightening the screws.***
8	Attach the front cover. **~Note** ***Take care not to injure your fingers on the cover edge or the thread in the case.***

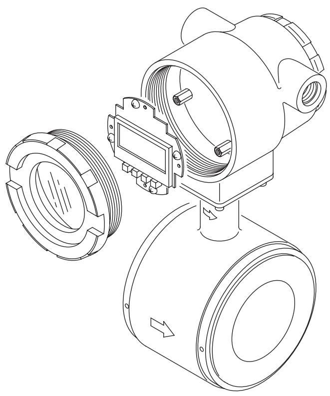


Figure 8-1 Replacement of indicator/data setting device (with the cover removed)

~Note ***When unpacking the detector, do not open the packing in the location with high temperature and humidity, many dust and corrosive gas atmosphere.***

8-1-2 : Replacement of the electronic unit for the ATEX Ex dmbia or NEPSI Ex dmia model

CAUTION

The following instructions must be followed carefully, when the MTG18A ATEX Ex dmbia or NEPSI Ex dmia model converter housing has to be opened respectively closed again!

(1) Overview

Model MTG18A flowmeter has fuses to secure the explosion proof capability.

If the fuse break occurs, the analog output remains in 0% of flow rate.

If the analog output remains in 0% flow rate, please check whether the fuse break appears or not by following the procedures mentioned blow.

(2) Before Opening

Make sure that there is no explosion hazard.

If necessary, provide a "Gas-free certificate".

Make sure that all connections must be voltage free.

(3) How to check the fuse break

Turn the power off.

↓

Unscrew the display cover and loosen the three screws of the display board.
Keep the three screws for the reassembly of the display board.
Turn the display board carefully aside to access the check pins on the main board. (Fig. 8-2)

↓

Measure the resistance between CP12 and CP20. (Fig. 8-3)

↓

(A)

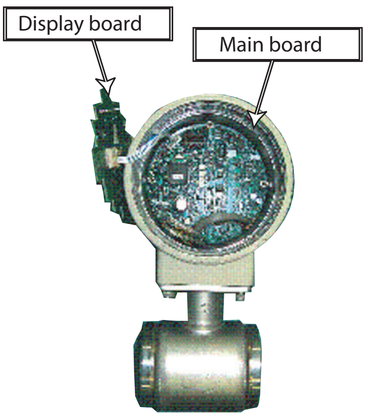


Figure 8-2

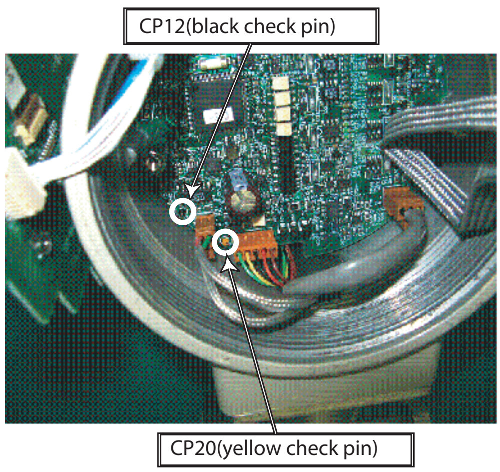


Figure 8-3

(A)

Resistance: Greater than 500 Ω

No → Fuse is not broken.
Check and look for the other causes for the problem.

Yes ↓

Fuse may blow.
Remove the XY cable from the connector CN2. (Fig.8-4)

↓

Measure the resistance between No. 1 pin of CN2 and CP20. (Fig.8-5)

↓

(B)

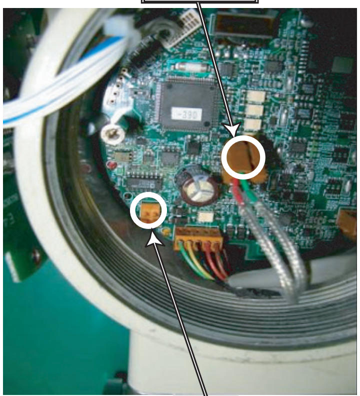


Figure 8-4

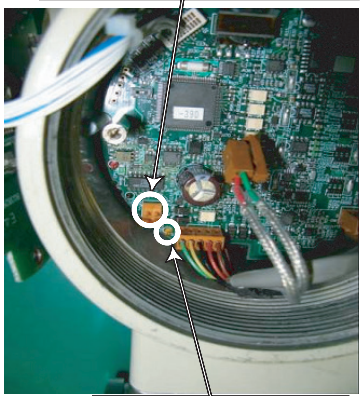
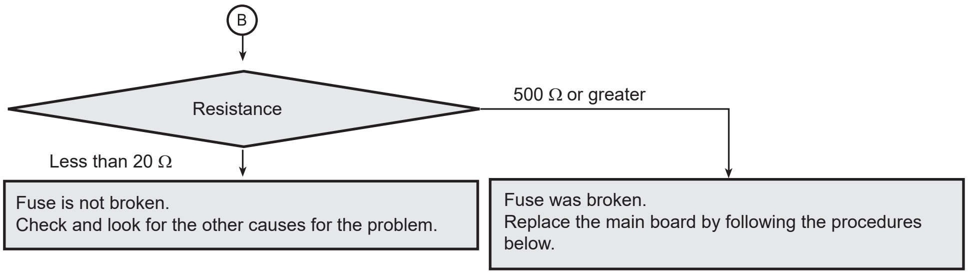


Figure 8-5



(4) How to Replace the main board

Step	Procedure	Fig. no.
1	Unscrew three spacers which fix the main board. Keep unscrewed three spacers.	Figure 8-6
2	Carefully disconnect the four connectors on the main board.	Figure 8-7
3	Replace the main board (Part No.: 80383080-002) with a new one.	
4	Carefully connect the four connectors respectively to the replaced main board.	Figure 8-7
5	Reassemble the replaced main board with the three spacers.	Figure 8-6
6	Mount the display board and tighten the three screws.	
7	Before the cover is screwed back into the housing, the thread must be clean and well greased.	
8	Screw the display cover as tight as possible into the housing to secure the required Ingress Protection (IP) degree.	
9	Tighten the hexagon socket head cap screw of the interlocking device.	

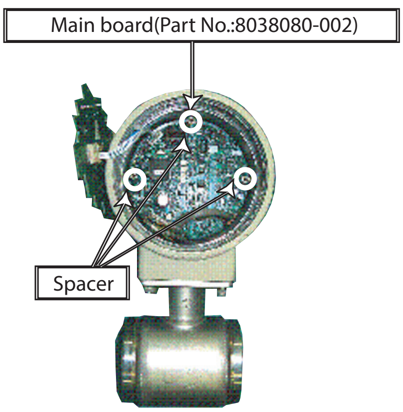


Figure 8-6

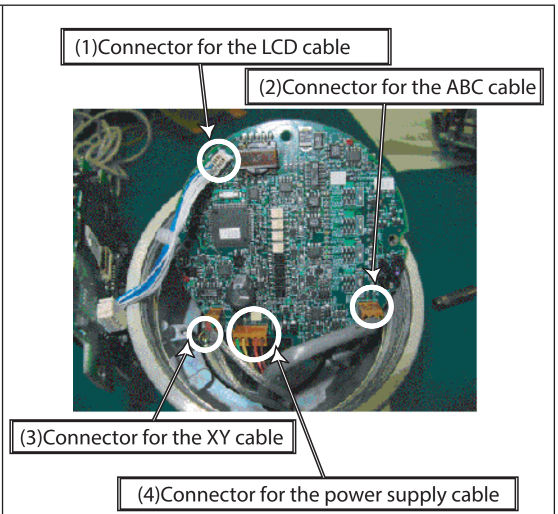


Figure 8-7

8-2 : Troubleshooting

Types of troubles

Introduction

If a problem occurs at the instrument start-up and operation, the following three causes should be considered.

- Inconsistency between the specifications and actual operating conditions.
- Missetting or misoperation.
- Instrument malfunction.

If a problem occurs during operation, the device's self-diagnostic function will classify it as critical or non-critical. It will indicate this and respond accordingly.

Critical failure

Critical problems may obstruct electromagnetic flowmeter operation, if not corrected, ultimately damage the flowmeter. When critical problem occurs during operation, an error message will appear on the converter's display panel and the output continues to output the value set in the direction of abnormality processing. The error message and self-diagnosis results can be read through communication (SFC, HART communicator).

Non-critical failure

Non-critical problems will not seriously affect electromagnetic flowmeter operation. When an error occurs during operation and is regarded as a non-critical problem by the converter self-diagnostics, the output will not burn-out and the flowmeter will continue to output the measured value.

Troubles at startup

Troubleshooting

When a problem occurs at start-up, perform the following procedures. If the problem remains, it is possible that the device has been damaged. Contact an Azbil Copr. representative.

Trouble	Check point and troubleshooting
No indication on display panel when powered on.	• Check the specifications of the power source. • Check the wiring. • Check if the ambient temperature is not under -4°F (-20°C).
No output when powered on.	• Check the signal line for correct connection.
Communication failure.	• Check the signal line for correct connection. A load resistance of 250 Ω or more is required (SFC). • Check the communicator for correct connection. (SFC has polarity.) • SFC of Version 7.0 or later is used. Operation is impossible with a lower version. • Is model MTG DD (device description) downloaded on the HART Communicator? The DD for the model MTG should be downloaded from HCF DD Library Host DD Distribution (HCF-KIT-III) Release 2002 Number 3 or later.
No pulse output	• Check the counter type, input specifications and contact capacity. • Check the pulse setting of the flowmeter.

Troubles during operation

Troubleshooting

When a problem occurs during operation, perform the following procedures.

1. Search for the symptom of the trouble in the table on this page. If found, perform the steps indicated in the table.
2. If communication is possible, read the error message and self-diagnosis results. Perform referring to “Error messages and troubleshooting”.
3. If the problem can not be solved, it is possible that the device has been damaged. Contact an Azbil Corp. representative.

Trouble	Check point and troubleshooting
Output fluctuates excessively beyond the estimated flow rate range	• Check if the instrument is grounded correctly. • Check if the damping time constant is set correctly. • Clean the electrodes. • The analog output may fluctuate due to flow noise, which is generated by the process fluid flow. In such a case, connect the upstream grounding ring to the downstream grounding ring by a wire. The output fluctuation may be reduced. • A circuit in some PLC may affect the flow measurement and the analog output may fluctuate. In this case, make sure that the both PLC and the MTG flowmeter are properly grounded. Proper grounding solves the fluctuation problem.
Output exceeds 100%.	• Check if the range is set correctly. • Check if zero is adjusted correctly.
Output remains 0%	• Check if the signal line is connected correctly. • Check the upstream and downstream valves. • Check if the range is set correctly. • Check whether the instrument is set to the constant current mode. • Press the CLR (clear) key on SFC to cancel this mode. • Check if the flow rate is not within the set range of low-flow cutoff. • Check if the flow rate is not reversed (negative flow rate). • Check the detector for unfilled condition, too low conductivity, excessive noise, etc.
Output has burnt out	• Take measures referring to “Error messages and measures”.
Pulse output is too large or too small for the calorific value	• Is the pulse setting (weight and width) correct? • Is the output from the main unit correct? • Is a pulse counter of appropriate specifications used? • Is the dropout value correctly set between 0 and 10%.

8-3 : Spare parts

8-3-1 : Spare parts for integral type

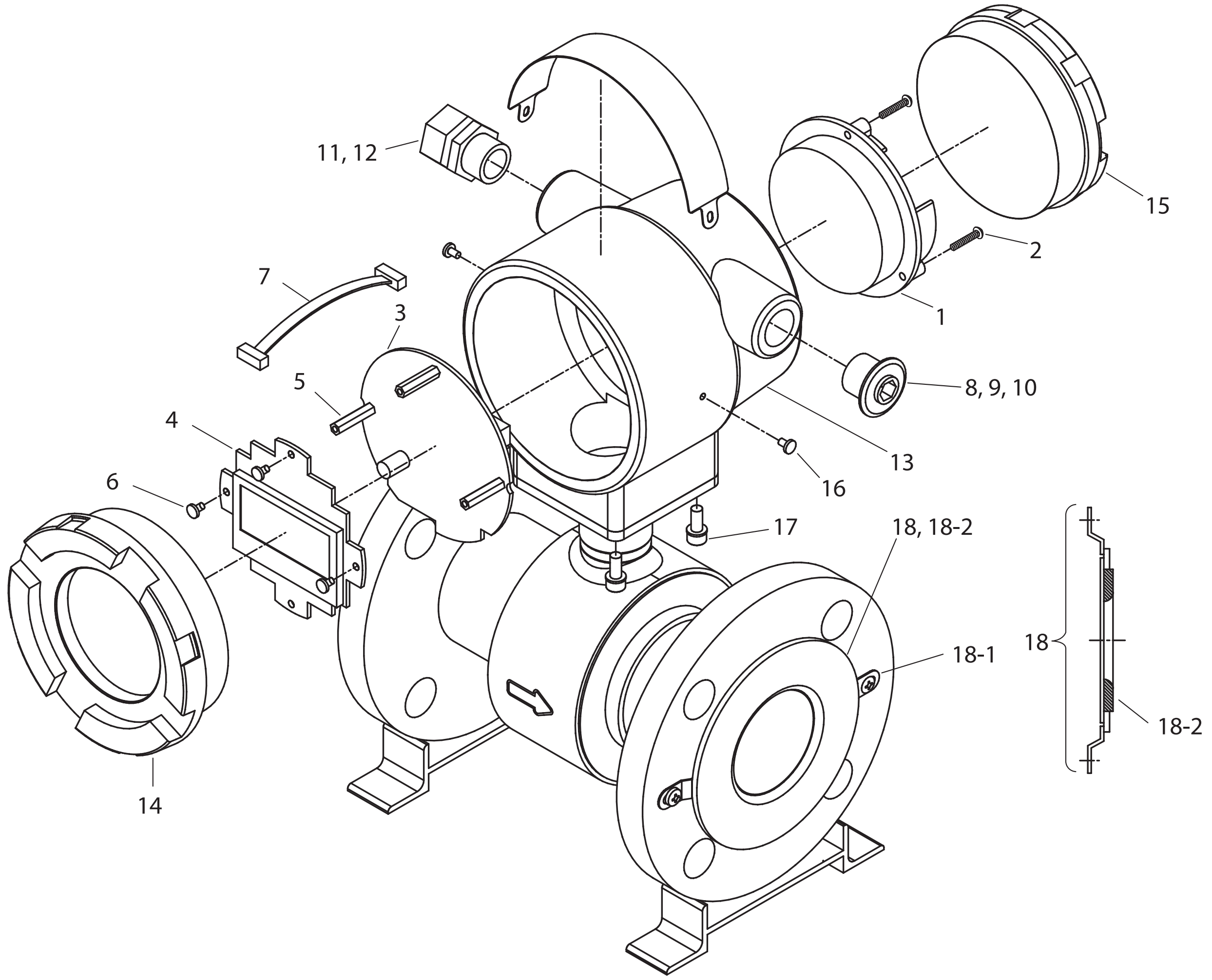


Figure 8-8 Spare parts for integral type

Table 8-1 Spare parts for integral type

No.	Parts number	Parts name
1	8038308900-100	Terminal assembly
2	HS309-230-16000	Screw
3	8038308800-100	Main board
4	8038308700-100	LCD board
5	8398907801-300	Spacers
6	HS311-530-06200	Screw
7	80382637-00100	Main LCD cable assembly
8	80381052-00100	Plug assembly (G1/2)
9	80020810-00600	Plug (1/2NPT)
10	8038237700-100	Plug assembly (CM20)
11	80352997-00100	Plastic gland
12	80356020-10100	Watertight gland assembly (brass Ni plated)
13	80382671-00100	Case (conduit connection G1/2, standard finish)
	80382671-00200	Case (conduit connection 1/2NPT, standard finish)
	80382671-00300	Case (conduit connection CM20, standard finish)
	80382671-00400	Case (conduit connection G1/2, corrosion proof finish)
	80382671-00500	Case (conduit connection 1/2NPT, corrosion proof finish)
	80382671-00600	Case (conduit connection CM20, corrosion proof finish)
14	80382673-00100	Cover assemblies (display) (standard finish)
	80382673-00200	Cover assemblies (display) (corrosion proof finish)
15	80277719-00100	Cover assemblies (terminal) (standard finish)
	80277719-00300	Cover assemblies (terminal) (corrosion proof finish)
16	HS311-230-05000	Screw
17	80356995-00100	Screw
18	Refer to Table 8-4	Wafer type grounding ring assembly
18-1	Refer to Table 8-4	Screw
18-2	Refer to Table 8-4	PTFE gasket for grounding ring other than SUS
18	Refer to Table 8-5	Flange type grounding ring assembly
18-1	Refer to Table 8-5	Screw
18-2	Refer to Table 8-5	PTFE gasket for grounding ring other than SUS

8-3-2 : Spare parts for remote type converter

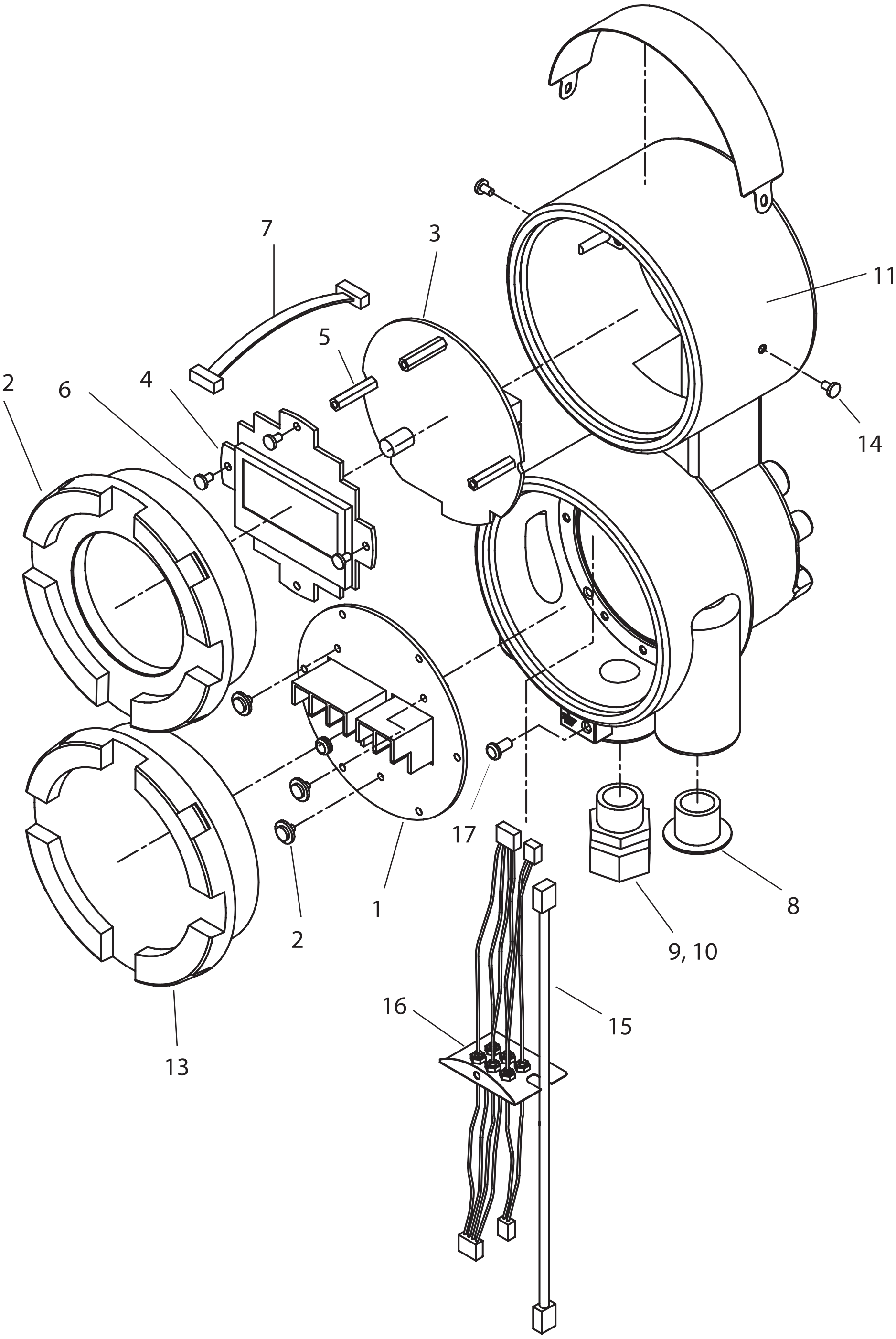


Figure 8-9 Spare parts for remote type converter

Table 8-2 Spare parts for remote-type converter (Model MTG11B)

No.	Parts number	Parts name
1	80383090-00100	Terminal assembly
2	HS309-230-16000	Screw
3	8038308800-100	Main board
4	8038308700-100	LCD board
5	83989078-01300	Spacers
6	HS311-530-06200	Screw
7	80382637-00100	Main LCD cable assembly
8	80381052-00100	Plug assembly (G1/2)
9	80352997-00100	Plastic gland
10	80356020-10100	Watertight gland assembly (brass Ni plated)
11	80382366-00100	Case (conduit connection G1/2, standard finish)
	80382366-00400	Case (conduit connection G1/2, corrosion proof finish)
12	80382673-00100	Cover assemblies (display) (standard finish)
	80382673-00200	Cover assemblies (display) (corrosion proof finish)
13	80382673-00300	Cover assemblies (terminal) (standard finish)
	80382673-00400	Cover assemblies (terminal) (corrosion proof finish)
14	HS311-230-05000	Screw
15	80382358-00100	Signal cable assembly
16	80382372-00100	Shields plate assembly
17	HS397-204-08000	Screw

8-3-3 : Spare parts for remote type detector

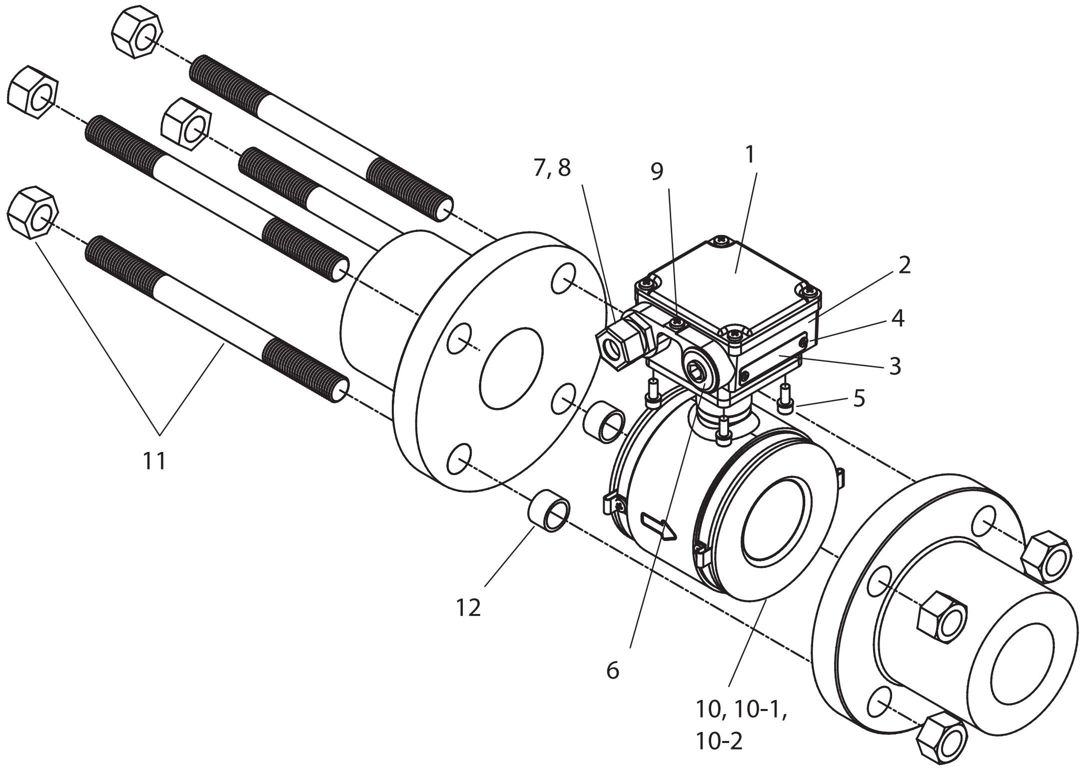


Figure 8-10 Spare parts for remote type detector

Table 8-3 Spare parts for remote-type detector

No.	Parts number	Parts name
1	80380573-00100	Terminal box cover (standard finish)
	80380573-00300	Terminal box cover (corrosion proof finish)
2	80380571-00100	Terminal boxes (conduit connection G1/2, standard finish)
	80380571-00900	Terminal boxes (conduit connection G1/2, corrosion proof finish)
3	80380584-00100	Tag plate
4	HS311-230-05000	Screw
5	80356995-00100	Screw
6	80381052-00100	Plug assembly (G1/2)
7	80352997-00100	Plastic gland
8	80356020-10100	Watertight gland assembly (brass Ni plate)
9	HS397-204-08000	Grounding terminal

No.	Parts number	Parts name
10	Refer to Table 8-4	Wafer type grounding ring assembly
10-1	Refer to Table 8-4	Screw
10-2	Refer to Table 8-4	PTFE gasket for grounding ring other than SUS
10	Refer to Table 8-5	Wafer type grounding ring assembly
10-1	Refer to Table 8-5	Screw
10-2	Refer to Table 8-5	PTFE gasket for grounding ring other than SUS
11	Refer to Table 8-6	Through bolt and nut for wafer type detector
12	Refer to Table 8-7	Special centering tool for wafer type detector
13	80380997-00100	Terminal block assembly
14	80279919-010M	Bracket assembly

Table 8-4 Wafer type grounding ring assembly

Grounding ring material	Diameter (mm)	Parts number	Qty.	Parts number	Qty.
SUS316	25	80380640-00100	1	HS314203-05000	1
	40	80380641-00100	1	HS311230-06000	1
	50	80380641-00200	1	HS311230-06000	1
	65	80380641-00300	1	HS311230-06000	1
	80	80380641-00400	1	HS311240-06000	1
	100	80380641-00500	1	HS311240-06000	1
ASTM B575 (Hastelloy C-276 equivalent)	25	80380617-00100	1	HS314203-05000	1
	40	80380618-00100	1	HS311230-06000	1
	50	80380619-00100	1	HS311230-06000	1
	65	80380620-00100	1	HS311230-06000	1
	80	80380621-00100	1	HS311240-06000	1
	100	80380622-00100	1	HS311240-06000	1
Titanium	25	80380617-00200	1	HS314203-05000	1
	40	80380618-00200	1	HS311230-06000	1
	50	80380619-00200	1	HS311230-06000	1
	65	80380620-00200	1	HS311230-06000	1
	80	80380621-00200	1	HS311240-06000	1
	100	80380622-00200	1	HS311240-06000	1
Zirconium	25	80380617-00700	1	HS314203-05000	1
	40	80386018-00700	1	HS311230-06000	1
	50	80380619-00700	1	HS311230-06000	1
	65	80380620-00700	1	HS311230-06000	1
	80	80380621-00700	1	HS311240-06000	1
	100	80380622-00700	1	HS311240-06000	1

Table 8-4 Wafer type grounding ring assembly

Grounding ring material	Diameter (mm)	Parts number	Qty.	Parts number	Qty.
Tantalum	25	80380617-00300	1	HS314203-05000	1
	40	80380618-00300	1	HS311230-06000	1
	50	80380619-00300	1	HS311230-06000	1
	65	80380620-00300	1	HS311230-06000	1
	80	80380621-00300	1	HS311240-06000	1
	100	80380622-00300	1	HS311240-06000	1
Platinum	25	80380617-00400	1	HS314203-05000	1
	40	80380618-00400	1	HS311230-06000	1
	50	80380619-00400	1	HS311230-06000	1
	65	80380620-00400	1	HS311230-06000	1
	80	80380621-00400	1	HS311240-06000	1
	100	80380622-00400	1	HS311240-06000	1

Gasket	Diameter (mm)	Parts number	Qty.
PTFE	25	80380613-00400	1
	40	80380613-00500	1
	50	80380613-00600	1
	65	80380613-00700	1
	80	80380613-00800	1
	100	80380613-00900	1

Table 8-5 Flange type grounding ring assembly

Grounding ring material	Diameter (mm)	Parts number	Qty.	Parts number	Qty.
SUS316	2.5/5	80380151-00100	1	HS311240-06000	1
	10	80380151-00200	1	HS311240-06000	1
	15	80380151-00300	1	HS311240-06000	1
	25	80380648-00900	1	HS311240-06000	1
	40	80380648-00100	1	HS311240-06000	1
	50	80380648-00200	1	HS311240-06000	1
	65	80380648-00300	1	HS311240-06000	1
	80	80380648-00400	1	HS311240-06000	1
	100	80380648-00500	1	HS311240-06000	1
	150	80380648-00700	1	HS311240-06000	1
	200	80380648-00800	1	HS311240-06000	1
ASTM B575 (Hastelloy C-276 equivalent)	2.5/5	80380152-00100	1	HS311240-06000	1
	10	80380152-00200	1	HS311240-06000	1
	15	80380152-00300	1	HS311240-06000	1
	25	80380630-00100	1	HS311240-06000	1
	40	80380631-00100	1	HS311240-06000	1
	50	80380632-00100	1	HS311240-06000	1
	65	80380633-00100	1	HS311240-06000	1
	80	80380634-00100	1	HS311240-06000	1
	100	80380635-00100	1	HS311240-06000	1
	150	80380637-00100	1	HS311240-06000	1
	200	80380638-00100	1	HS311240-06000	1

Table 8-5 Flange type grounding ring assembly

Grounding ring material	Diameter (mm)	Parts number	Qty.	Parts number	Qty.
Titanium	2.5/5	80380152-30100	1	HS311240-06000	1
	10	80380152-30200	1	HS311240-06000	1
	15	80380152-30300	1	HS311240-06000	1
	25	80380630-00200	1	HS311240-06000	1
	40	80380631-00200	1	HS311240-06000	1
	50	80380632-00200	1	HS311240-06000	1
	65	80380633-00200	1	HS311240-06000	1
	80	80380634-00200	1	HS311240-06000	1
	100	80380635-00200	1	HS311240-06000	1
	150	80380637-00200	1	HS311240-06000	1
	200	80380638-00200	1	HS311240-06000	1
Zirconium	2.5/5	80380751-10100	1	HS311240-06000	1
	10	80380751-10200	1	HS311240-06000	1
	15	80380751-10300	1	HS311240-06000	1
	25	80380630-00700	1	HS311240-06000	1
	40	80380631-00700	1	HS311240-06000	1
	50	80380632-00700	1	HS311240-06000	1
	65	80380633-00700	1	HS311240-06000	1
	80	80380634-00700	1	HS311240-06000	1
	100	80380635-00700	1	HS311240-06000	1
	150	80380637-00700	1	HS311240-06000	1
	200	80380638-00700	1	HS311240-06000	1
Tantalum	2.5/5	80380152-10100	1	HS311240-06000	1
	10	80380152-10200	1	HS311240-06000	1
	15	80380152-10300	1	HS311240-06000	1
	25	80380630-00300	1	HS311240-06000	1
	40	80380631-00300	1	HS311240-06000	1
	50	80380632-00300	1	HS311240-06000	1
	65	80380633-00300	1	HS311240-06000	1
	80	80380634-00300	1	HS311240-06000	1
	100	80380635-00300	1	HS311240-06000	1
	150	80380637-00300	1	HS311240-06000	1
	200	80380638-00300	1	HS311240-06000	1
Platinum	2.5/5	80380152-20100	1	HS311240-06000	1
	10	80380152-20200	1	HS311240-06000	1
	15	80380152-20300	1	HS311240-06000	1
	25	80380630-00400	1	HS311240-06000	1
	40	80380631-00400	1	HS311240-06000	1
	50	80380632-00400	1	HS311240-06000	1
	65	80380633-00400	1	HS311240-06000	1
	80	80380634-00400	1	HS311240-06000	1
	100	80380635-00400	1	HS311240-06000	1
	150	80380637-00400	1	HS311240-06000	1
	200	80380638-00400	1	HS311240-06000	1

Gasket	Diameter (mm)	Key number (18-2)	Qty.
PTFE	2.5/5	82728099-00100	1
	10	82728099-00200	1
	15	82728099-00300	1
	25	80380613-00400	1
	40	80380613-00500	1
	50	80380613-00600	1
	65	80380613-00700	1
	80	80380613-00800	1
	100	80380613-00900	1
	150	80380613-01100	1
	200	80380613-01200	1

Table 8-6 Through bolt and nut (required 1 set per detector)
Parts number: 80380810-ITEM

ITEM	Diameter (mm)	Flange type	Material
101	25	DIN PN10	SUS304
		DIN PN16	
		DIN PN25	
102	40	JIS 10K	SUS304
		JIS 20K	
		DIN PN10	
		DIN PN16	
		DIN PN25	
	50	JIS 10K	
		DIN PN10	
		DIN PN16	
		DIN PN25	
	65	JIS 10K	
		DIN PN10	
		DIN PN16	
	80	JIS G3451 F12	
103	50	JIS 20K	SUS304
		JIS 30K	
	65	JIS 20K	
		DIN PN25	
	80	JIS 10K	
		DIN PN10	
		DIN PN16	
104	150	JIS G3451 F12	SUS304

ITEM	Diameter (mm)	Flange type	Material
105	25	ANSI 150	SUS304
		JPI 150	
	40	ANSI 150	SUS304
		JPI 150	
106	50	ANSI 150	SUS304
		JPI 150	
	65	ANSI 150	
		JPI 150	
	80	ANSI 150	
		JPI 150	
107	50	ANSI 300	SUS304
		JPI 300	
108	65	ANSI 300	SUS304
		JPI 300	
	80	ANSI 300	
		JPI 300	
109	100	ANSI 300	SUS304
		JPI 300	
111	25	JIS 10K	SUS304
		JIS 20K	
		JIS 30K	
112	100	JIS G3451 F12	SUS304
114	80	DIN PN25	SUS304
	100	JIS 10K	
		DIN PN10	
		DIN PN16	
116	40	JIS 30K	SUS304
117	65	JIS 30K	SUS304
118	80	JIS 20K	SUS304
		JIS 30K	
	100	JIS 20K	
		DIN PN25	
121	100	JIS 30K	SUS304
128	25	ANSI 300	SUS304
		JPI 300	

ITEM	Diameter (mm)	Flange type	Material
129	100	ANSI 150	SUS304
		JPI 150	
130	40	ANSI 300	SUS304
		JPI 300	

Table 8-7 Centering tool for wafer type detector (required 4 pcs. per detector)
Part number: 80380811-ITEM

ITEM	Diameter (mm)	Flange type
005	25	ANSI 150
		JPI 150
	40	ANSI 150
		JPI 150
008	50	JIS 10K
		JIS 20K
		ANSI 150
		JPI 150
	65	JIS 10K
		JIS20K
	80	JIS 10K
	100	JIS 10K
009	40	JIS 10K
		JIS 20K
	80	ANSI 150
		JPI 150
010	25	JIS 10K
		JIS 20K
		ANSI 300
		JPI 300
	40	DIN PN10
		DIN PN16
		DIN PN25
	50	DIN PN10
		DIN PN16
		DIN PN25
	65	DIN PN10
		DIN PN16
		DIN PN25
	100	DIN PN10
		DIN PN16

ITEM	Diameter (mm)	Flange type
011	50	ANSI 300
		JPI 300
	80	DIN PN10
		DIN PN16
		DIN PN25
012	50	JIS 30K
		JIS 30K
015	80	JIS G3451 F12
	100	JIS G3451 F12
018	65	ANSI 300
		JPI 300
	80	JIS 20K
	100	JIS 20K
019	40	ANSI 300
		JPI 300
	80	JIS 30K
020	100	DIN PN25
		DIN PN40
021	40	JIS 30K
022	65	JIS 30K
025	100	JIS 30K
033	25	DIN PN10
		DIN PN16
		DIN PN25
035	65	ANSI 150
		JPI 150

MEMO

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

(1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
(2) Failure caused for other reasons than Azbil Corporation's product;
(3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
(4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
(5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
(6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

(1) Regulations and standards or laws that your Equipment is to comply with.
(2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
(3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.
*2. A design that is safe even if the device fails.
*3. Avoidance of device failure by using highly reliable components, etc.
*4. The use of redundancy.

3. Precautions and restrictions on application

3.1 Restrictions on application

Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

*5. Nuclear power quality: compliance with JEAG 4121 required
*6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
*7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

3.2 Precautions on application

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [When used outside a radiation controlled area and where nuclear power quality is not required]
      [When the limit switch for nuclear power is used]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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