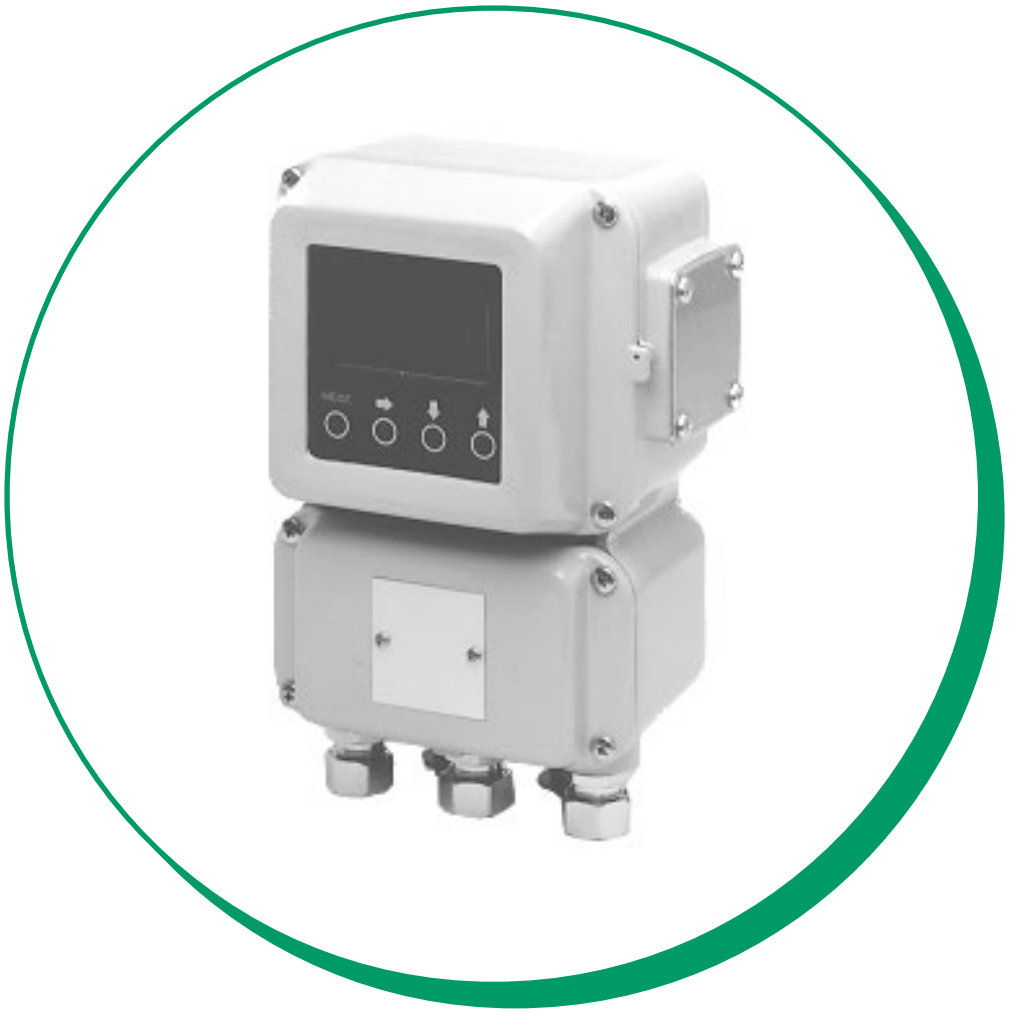
YAMATAKE

MagneW3000 FLEX/PLUS Smart Electromagnetic Flowmeter Converter Model MGH10/14C

User's Manual



Yamatake Corporation

CM2-MGH210-2001
First issue: Jul. 2004

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Safety

About this manual

This manual contains information and warnings that must be observed to keep the model MGH10/14C MagneW3000 FLEX/PLUS Flowmeter operating safely. Correct installation, correct operation and regular maintenance are essential to ensure safety while using this device.

For the correct and safe use of this flowmeter, it is essential that both operating and service personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The following symbols are used in this manual to alert you to possible hazards:

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

⚠ CAUTION
Denotes a potentially hazardous situation which, if not avoided could result in minor injury or damage to device.

Safety messages

Carefully read this section before installing or operating this device.

⚠ WARNING
ELECTRIC SHOCK HAZARD! Turn the power supply OFF before opening the converter cover.

⚠ CAUTION
Switch the control equipment to manual control before terminating flowmeter operation and shutting off the output to the control equipment. This action prevents the power shut-off from directly affecting the control equipment.

⚠ CAUTION

Install the flowmeter in a location with an ambient temperature of -25 °C to 60 °C (-13 °F to 140 °F) and an ambient humidity of 5 to 100% RH to prevent equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter near high-current power lines, motors or transformers to prevent damage from electromagnetic induction, which can cause equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter in a location subject to direct sunlight, wind, rain, severe vibration, or in a highly corrosive atmosphere. The converter and detector can be damaged.

⚠ CAUTION

Be sure to ground the welding power transformer when welding near the flowmeter to avoid output errors.

⚠ CAUTION

DO NOT use the flowmeter to ground a welder. It can damage the flowmeter.

MagneW3000 FLEX/PLUS Electromagnetic Flowmeter CE Conformity Supplement

CE CONFORMITY: This product is in conformity with the protection requirements of the following European Council Directive: **89/336/EEC**, the EMC Directive and **73/23/EEC**, Low Voltage Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.

EMC Directive/Standard	PC	Conformity	Notes
ELECTROMAGNETIC COMPATIBILITY: 89/336 EEC, EMC Directive			
EMISSIONS: EN 61326-1997+A1:1998+A2:2001 Electrical equipment for measurement, control and laboratory use			
EN 55011-1998 /A1:1999, Group 1, Class A, Industrial Control Equipment, 150 KHz-1000 MHz		0.15MHz-0.5MHz quasi-peak limit 79dB (uV/m) at 10 m average limits 66dB (uV/m) at 10 m 0.5MHz-30MHz quasi-peak limit 73dB (uV/m) at 10 m average limits 60dB (uV/m) at 10 m 30MHz-230MHz quasi-peak limit 40dB (uV/m) at 10 m 230MHz-1000MHz quasi-peak limit 47dB (uV/m) at 10 m	1
IMMUNITY: **EN 61326-1997+A1:1998+A2:2001 AnnexA**, Electrical equipment for measurement, control and laboratory use, Industrial locations		PERFORMANCE: Unless otherwise noted, the performance of this product, at the specified levels of electromagnetic interference, is within the specifications for "Performance Under Rated Conditions,"	
EN 61000-4-2-1995+A1:1998+A2:2001 (IEC 1000-4-2-1995), ESD, Electrostatic Discharge	B B	±4 kV Contact ±8 kV Air	
EN 61000-4-3-1996 (IEC 1000-4-3-1995), Radiated RF Fields, 80 -1000 MHz	A	10 V/m1kHz,AM80%	1
EN 61000-4-4-1995+A1:2001 (IEC 1000-4-4-1995), Electrical Fast Transients/Burst	B	±2 kV AC Power±1 kV I/O signal/control	
EN 61000-4-5-1995+A1:2001 (IEC 61000-4-5-1995)Surge	B	±1kV Line to line: Power Lines ±2kV Line to ground: Power Lines ±1kV Line to ground: I/O signal/control Lines	
EN 61000-4-6-1996+A1:2001 (IEC 61000-4-6-1996) Conducted Radio-frequency, 150 KHz - 80 MHz	A	3V	1, 2
EN 61000-4-8-1993+A1:2001 (IEC 61000-4-8-1993)Power frequency magnetic field	A	30A/m50Hz	1
EN 61000-4-11-1994+A1:2001 (IEC 61000-4-11-1994) Voltage Dip/short iterruptions	B	0.5cycle,each polarity/100%	

NOTES:

PC = Performance Criteria

1. Twist pair cables required for all I/O interface circuits.
   In case of remote model two core double shield cable in metal conduit pipe required for the input line in connection with detector.
2. In around 30-35MHz, the output value may change 5%.

LV Directive	Conformity
LOW VOLTAGE DIRECTIVE: 73/23/EEC	EN 61010-1:2001(IEC61010-1:2001), Safety requirements for electrical equipment for measurement, control and laboratory use Part 1: General requirements

MagneW3000 FLEX/PLUS Electromagnetic Flowmeter Documentation Supplement

1. Mains supply

The symbol for a.c. or d.c. on the name plate is as follows:

~ for a.c. power supply

⎓ for d.c. power supply

2. Fuse marking

⚠ The fuse cannot be replaced by the operator.

Fuse rating and electric characteristics are as follows:

Fuse rating: Voltage 250V

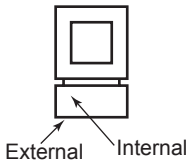
Current 3A

Manufacturer type:239003 (LITTEL FUSE)

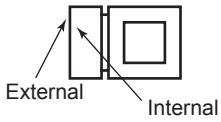
3. Grounding (Earthing)

Protective grounding (earthing) should be connected as shown in Operator's Manual.

The MagneW FLEX/PLUS has protective grounding (earthing) terminals in the terminal box and on the external surface of its casing (see figure).



Remote models



Integral models

An external switch or circuit-breaker must be installed near the MagneW FLEX/PLUS on the power line.

4. Equipment operation

⚠ Power line is connected to commercial power. The terminal cover must not be opened when power is on.

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Chapter 1: Introduction

This chapter contains an overview of the model MGH10/14C MagneW3000 FLEX/PLUS Flowmeter. It provides definitions for all the major parts of the converter.

MagneW 3000 FLEX/PLUS Flowmeter

Thank you for purchasing the Yamatake Corporation model MGH10/14C Flowmeter. This system features:

- Digital panel display
- Intuitive, versatile operator interface with large characters and backlit liquid crystal display (LCD)
- I/O Capacity

Main components

The model MGH10/14C MagneW3000 FLEX/PLUS Flowmeter consists of a detector and a converter which operate on the principles of Faraday's law.

Remote - The converter and detector are installed separately and connected together via cables.

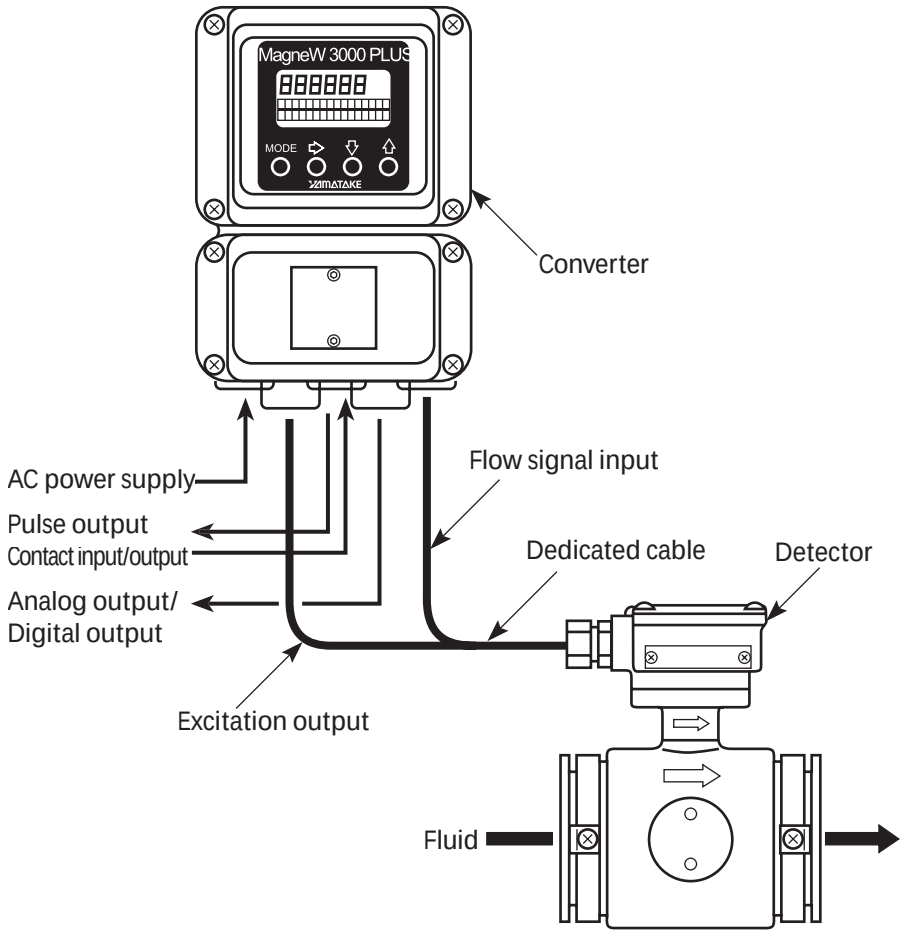


Figure 1-1 Remote System

The converter consists of the components shown in the figure below.

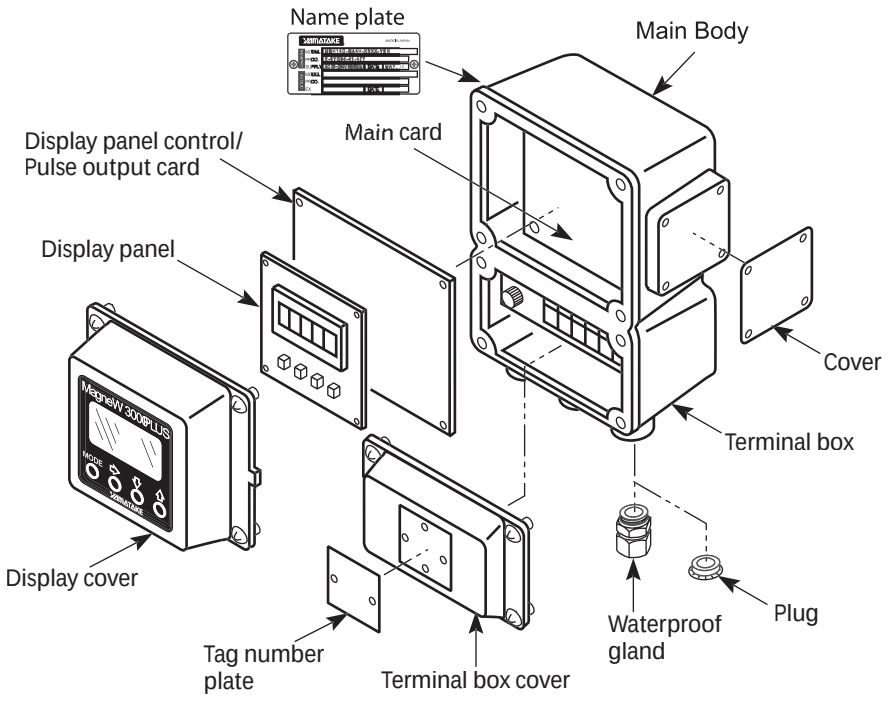


Figure 1-2 Parts of the converter

Main body

• Encloses the main card, display panel control / fieldbus interface card, and the display panel.

Name plate

• Indicates model numbers and product numbers, power supply requirements, date of manufacture and the detector constant (EX) for the flowmeter.

Main card / Display panel control / Pulse output card

• These cards work together to convert signal electromotive force generated in the detector into the instantaneous flow rate.

Display -panel

• Indicates the instantaneous flow rate or the totalized valve. The flowmeter functions can be accessed using the four infrared sensor keys on the panel.

Display cover

• Protects the display panel and contents of the main body.

Tag number plate

• Indicates the tag number as specified in the product order.

Terminal box cover

• Protects the input/output terminals.

Waterproof gland

• Protects cables and keeps moisture from entering the terminal box.

Plug

• Keeps moisture from entering the terminal box from openings without cables.

Terminal box

• Encloses the input/output terminals. Contains an integrated 12 kV, 1000A isolator.

Connection cover

• Protects the contents of the main body in remote installations. In integral flowmeters, this is where the detector connects to the converter.

Analog output and digital output

Introduction

The choice of either an analog output or digital output system configuration depends on whether or not you want to use the digitally enhanced (DE) communication mode.

Analog output (4-20 mA DC output)

In analog mode, the flowmeter sends the instantaneous flow rate as a proportional 4 to 20 mA output signal to a controller or a recorder in the control system.

Digital output (DE output)

A flowmeter in the DE mode can communicate in a direct digital fashion with Yamatake or Honeywell DCS system. The digital signal can include flow rate, flowmeter database, and self-diagnostics.

Switching output mode

The analog/digital output mode is selectable.

The output mode can be changed using the SFC, Smart Field Communicator.

System configuration for analog output (4-20 mA DC output)

Introduction

In the analog mode, the flowmeter can be configured with or without SFC communications.

WITHOUT the communication function

The DC power supply that transmits the analog output, when the flowmeter is used without SFC communications, is built into the product.

The analog output signal is transmitted directly to the host control system.

- Analog output range: 0.8 to 22.4 mA (-20 to +115%)
- Resistive load: 0 to 600 Ω

WITH the communication function

When the flowmeter is used in the analog mode with SFC communications, an external power supply (DC power) and external resistive load (minimum 250 Ω) is required.

- Analog output range: 3.2 to 22.4 mA (-5 to +115%)
- DC power: 16 to 45V DC
- Maximum value of external resistive load is calculated:

$$\textit{Maximum resistive load } (\Omega) = \frac{\textit{External power supply for communication - 8.5V}}{\textit{0.025}}$$

⚠ CAUTION

For systems WITH the communication function, failure to install the external power supply and the external resistive load, will prevent the analog output from being accepted on the receiving instrument side. Be sure to install the external power supply and the external resistive load as specified.

System configuration WITHOUT the communication function

Figure 1-3 shows a sample system configuration without SFC communication.

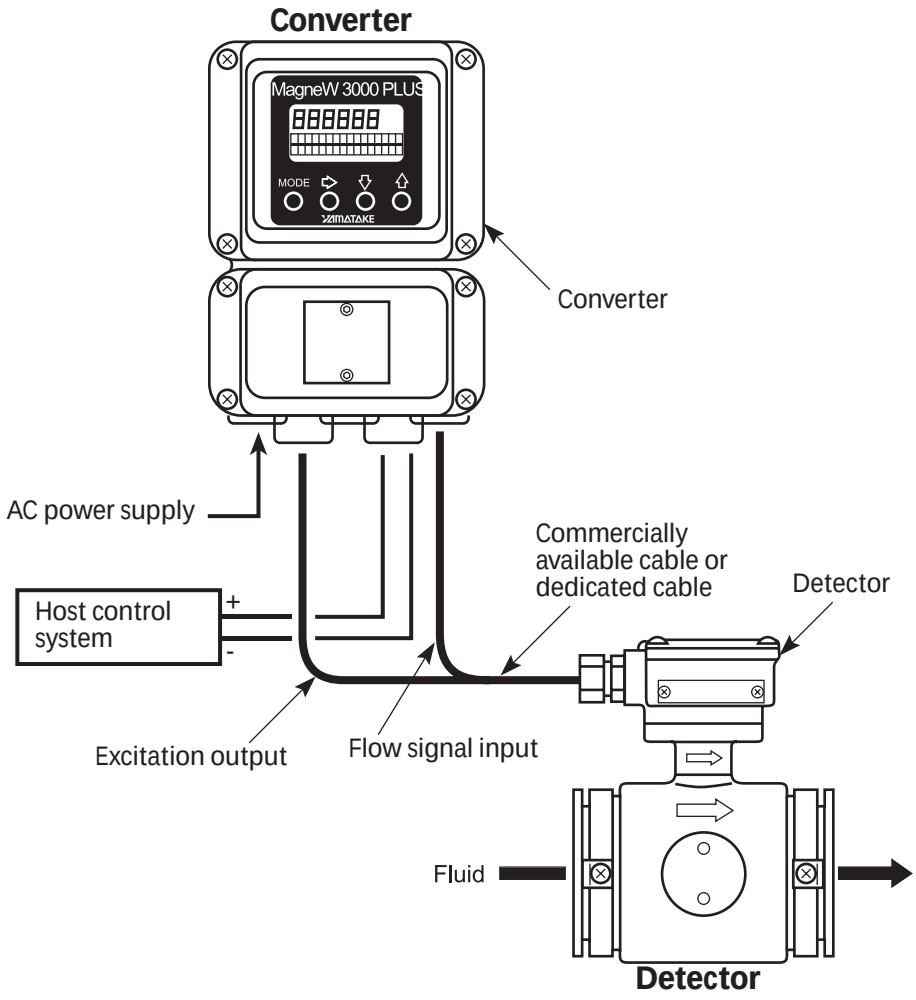


Figure 1-3 System configuration of analog output WITHOUT communication function

System configuration WITH the communication function

Figure 1-4 shows a sample system configuration with SFC communication.

In order to enable communications, a DC power supply and a resistance of 250Ω or more must be installed on the receiving side.

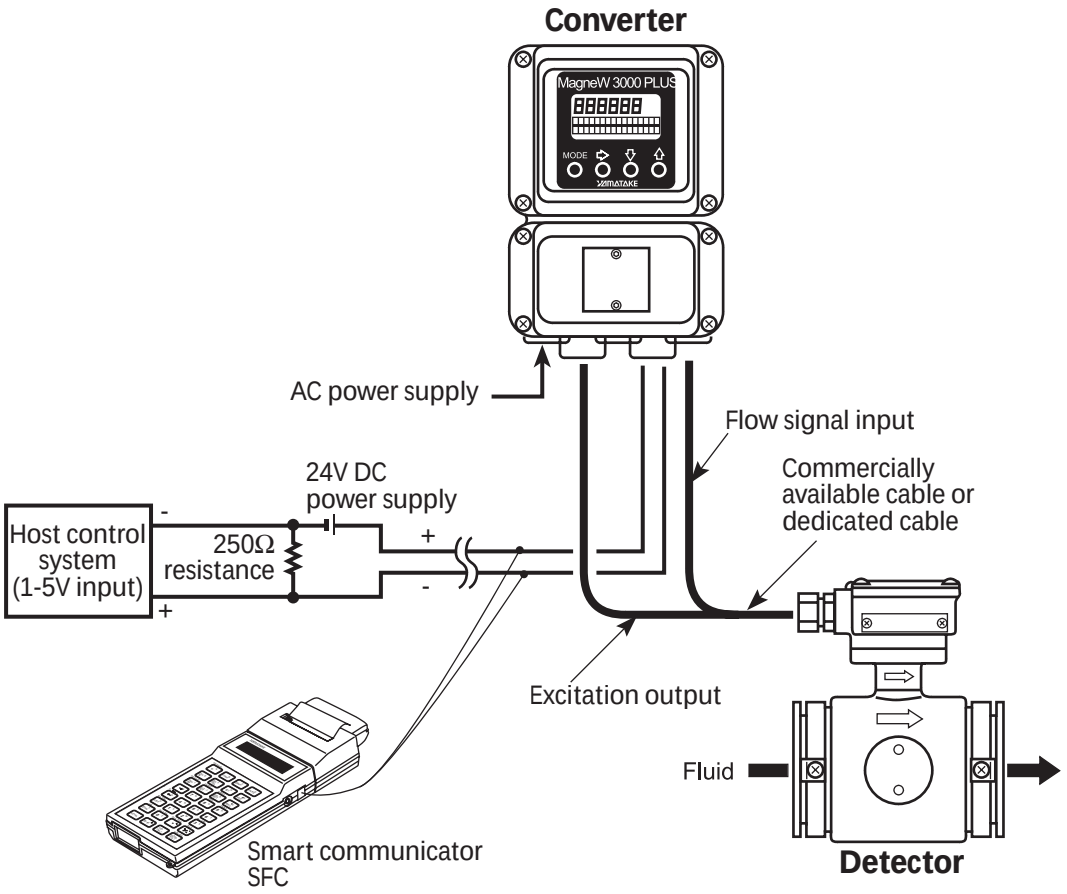


Figure 1-4 System configuration for analog output WITH communication function (example setup)

System configuration for digital output (DE output)

System configuration

Figure 1-5 shows a system configuration with the digital output.

In the DE (Digital Enhanced) mode, the flowmeter outputs the digital signal directly to Yamatake or Honeywell DCS system. The digital signal includes the flow rate, self-diagnostics, and can be configured to include or not include the flowmeter's database.

In this system, the DE digital signal transmitted from the unit is output to the control system after conversion to an analog signal at the smart protocol converter (SPC). Or, the digital signal is directly transmitted to the control system, if it is capable of receiving the DE signal directly.

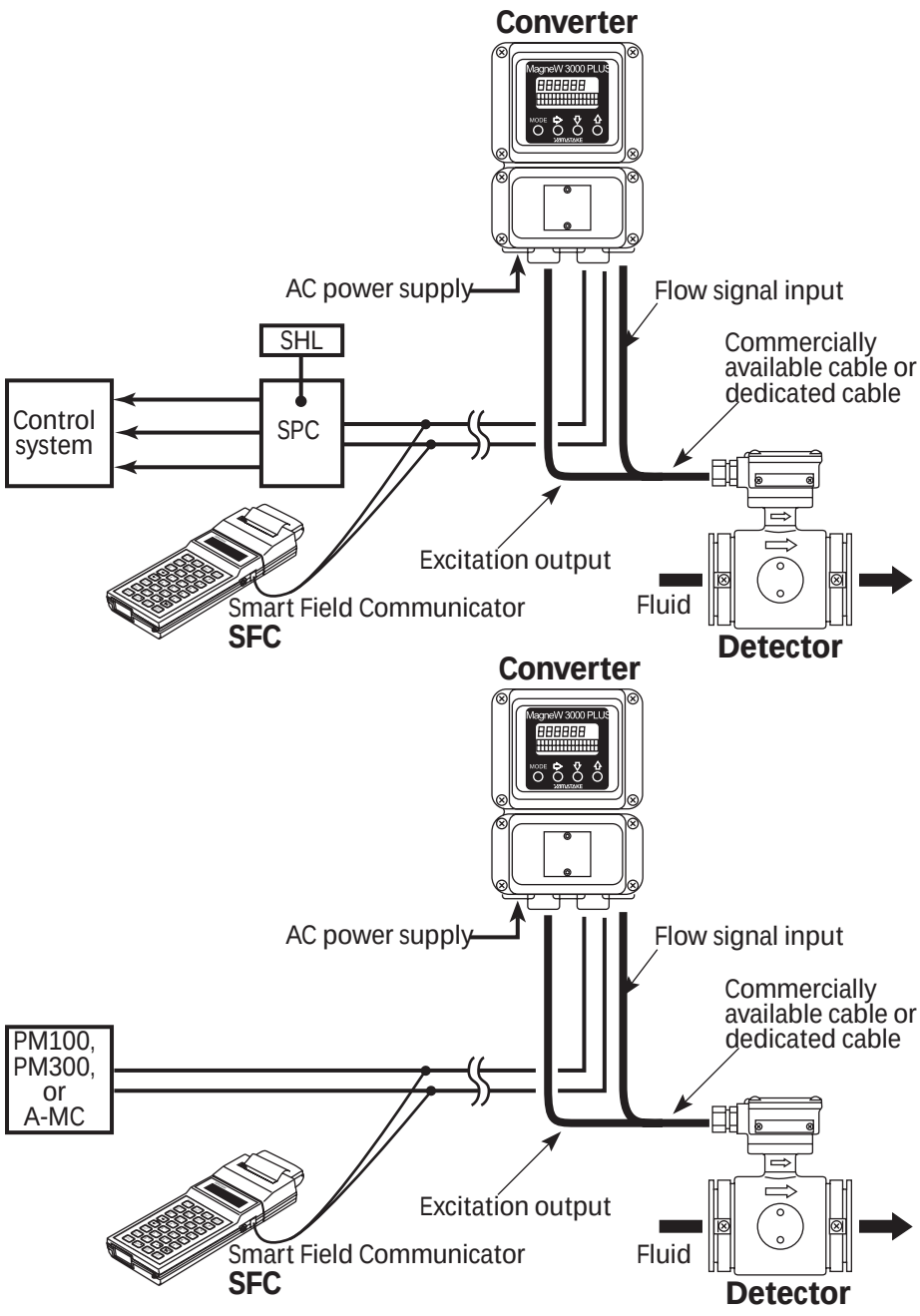


Figure 1-5 System configuration for digital output

Smart electromagnetic flowmeter (device)

• Outputs the flow rate and unit self-diagnostics using a digital signal.

Smart protocol converter (SPC)

• Converters the DE digital signal into a 4-20 mA or 1-5V DC analog signal for output.

Smart handy loader (SHL)

• Used to change the SPC settings.

Smart communicator (SFC)

• Used to communicate with the device to read data and change the device settings.

PM100

• Simultaneously executes such functions as process control on the UCN, regulatory control, sequencing, calculation, and process input/output.

Chapter 2: Installation

This chapter describes the installation and wiring procedures for the flowmeter.

⚠ WARNING

ELECTRIC SHOCK HAZARD! DO NOT perform wiring work while the power is ON!

Site selection

When selecting an installation site for the flowmeter, observe the following safety measures:

⚠ CAUTION

Install the flowmeter in a location with an ambient temperature of -25 °C to 60 °C (-13 °F to 140 °F) and an ambient humidity of 5 to 100% RH to prevent equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter near high-current power lines, motors or transformers to prevent damage from electromagnetic induction, which can cause equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter in a location subject to direct sunlight, wind, rain, severe vibration, or in a highly corrosive atmosphere. The converter and detector can be damaged.

⚠ CAUTION

Be sure to ground the welding power transformer when welding near the flowmeter to avoid output errors.

⚠ CAUTION

DO NOT use the flowmeter to ground a welder. It can damage the flowmeter.

Unpacking and storage

The model MGH10/14C MagneW3000 FLEX/PLUS Flowmeter is a precision instrument and should be handled with care to prevent damage or breakage.

After unpacking the flowmeter, verify that the following items are included:

- Model MGH10/14C converter
- Standard accessories
- MagneW setting data sheet
- Test report

If you have questions regarding the technical specifications of the flowmeter, contact your nearest Yamatake Corporation office or Yamatake Corporation representative. When making an inquiry, make sure to provide the model number and product number of your flowmeter.

Storage

When storing the flowmeter before use:

- Store indoors at room temperature (77 °F or 25 °C) within a humidity level of approximately 65%.
- Store away from vibration or shock.
- Store the converter and detector in the original packaging.

In addition, when storing the converter after use:

- Attach the display cover, Terminal box cover and Waterproof gland(s) to prevent moisture ingression into the device.

Installation options

There are two ways to install the model MGH10/14C converter. Remote systems allow you to install the converter in a remote location - wall mounted or mounted directly to a 2-inch (50.8 mm) pipe. The following illustrations provide dimensions for the two different installation options.

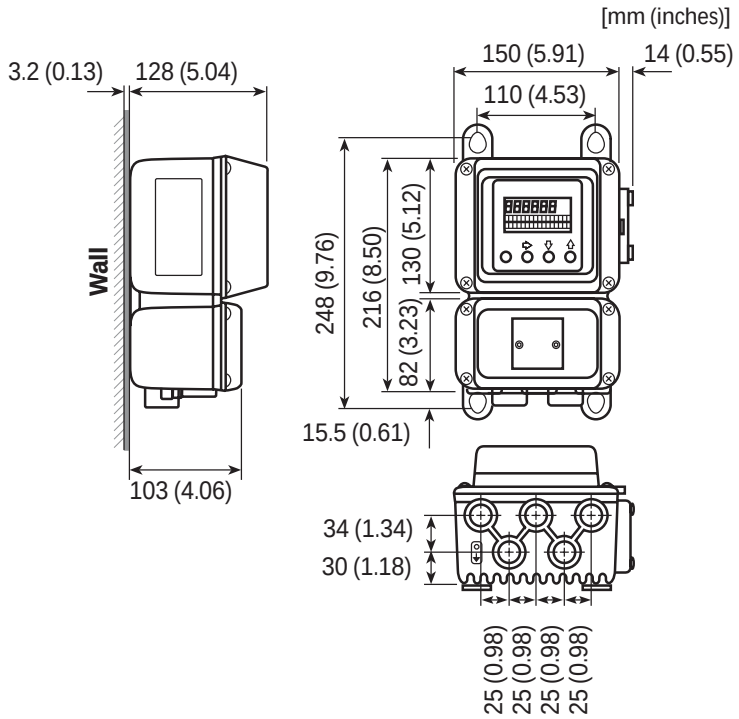


Figure 2-1 Wall Mounted Remote Installation

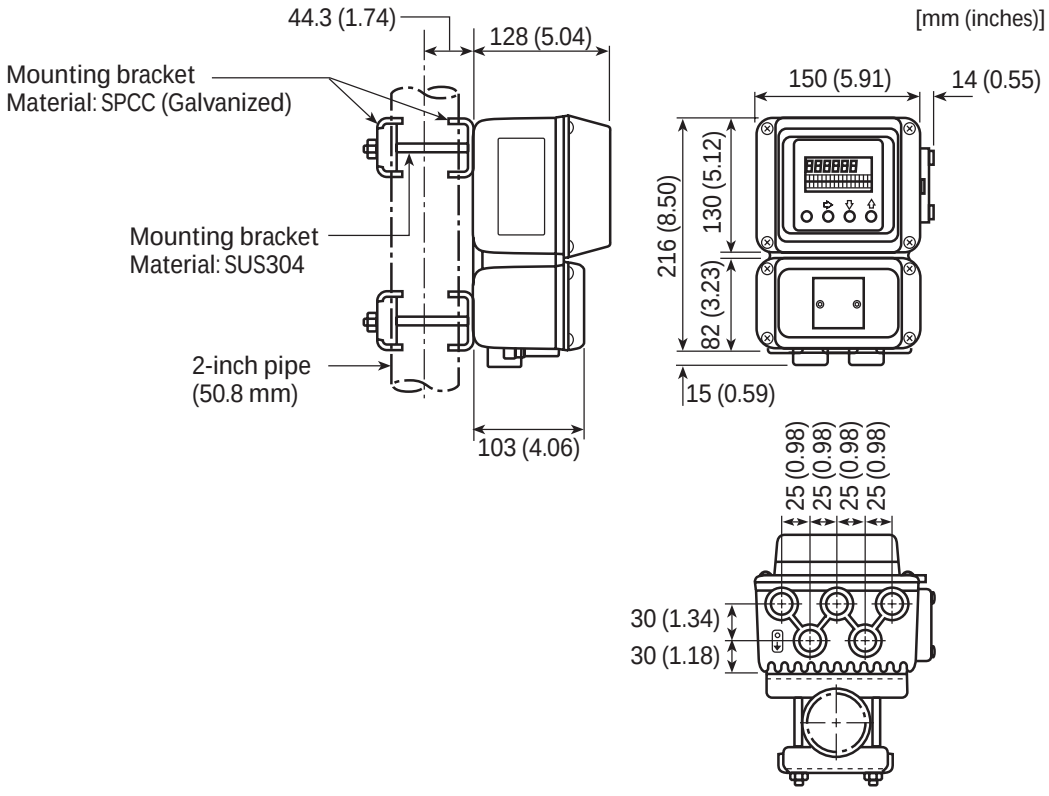


Figure 2-2 Pipe Mounted Remote Installation

Wiring

⚠ CAUTION

Use electrical tube and duct to prevent water entry and protect the cable from external damage.

⚠ CAUTION

Be sure to use a waterproof gland at the conduit connection to prevent water entry inside of the terminal box and prevent output errors.

⚠ CAUTION

Turn off the power supply before connecting the cables to the converter. The converter can be damaged. This type of damage is not covered by Yamatake's warranty.

Remote wiring - 1 (1-contact input and 1- contact output)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-8
- Excitation cable - see page 2-8
- Analog output cable - see page 2-13
- Pulse output cable - see page 2-13
- Contact input/output cable - see page 2-14
- Power cable - see page 2-19

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

1-contact input and 1-contact output

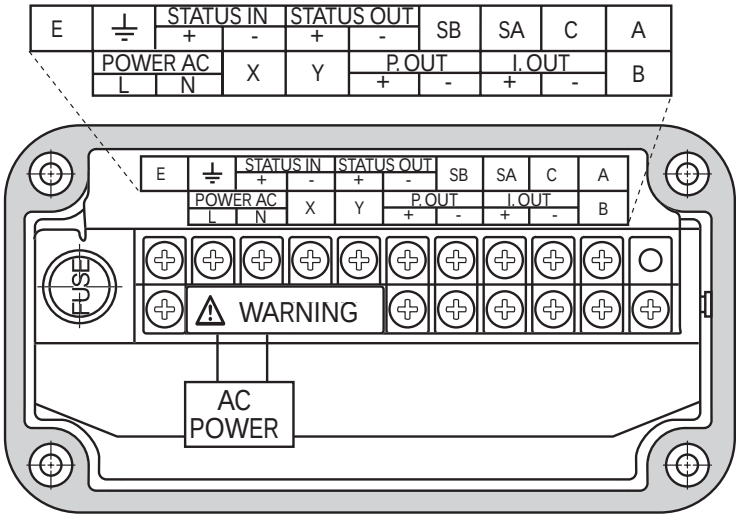


Figure 2-3 Remote converter terminal block

Table 2-1 Remote converter terminal descriptions (1-contact input & 1-contact output)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS IN	+	Contact input
	–	
STATUS OUT	+	Contact output
	–	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be <100Ω)

Remote wiring - 2 (2-contact input)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-8
- Excitation cable - see page 2-8
- Analog output cable - see page 2-13
- Pulse output cable - see page 2-13
- Contact input/output cable - see page 2-14
- Power cable - see page 2-19

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact input

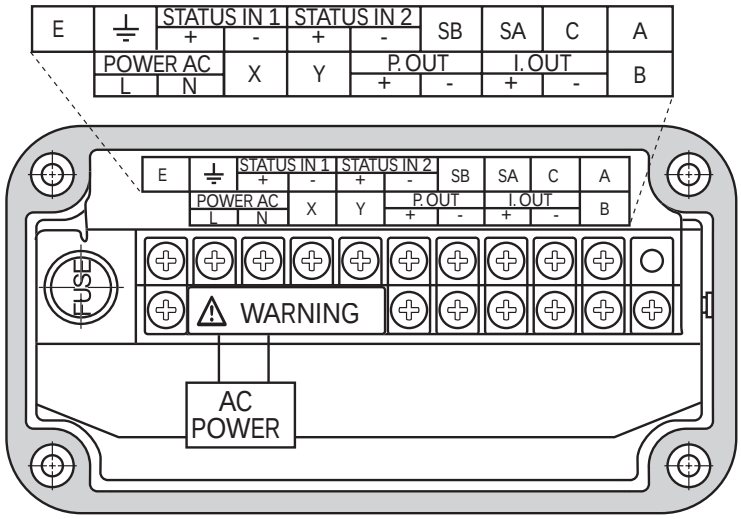


Figure 2-4 Remote converter terminal block

Table 2-2 Remote converter terminal descriptions (2-contact input)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	−	
P. OUT	+	Pulse output
	−	
STATUS IN 1	+	Contact i5nput 1
	−	
STATUS IN 2	+	Contact input 2
	−	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

Remote wiring - 3 (2-contact output)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-8
- Excitation cable - see page 2-8
- Analog output cable - see page 2-13
- Pulse output cable - see page 2-13
- Contact input/output cable - see page 2-14
- Power cable - see page 2-19

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact output

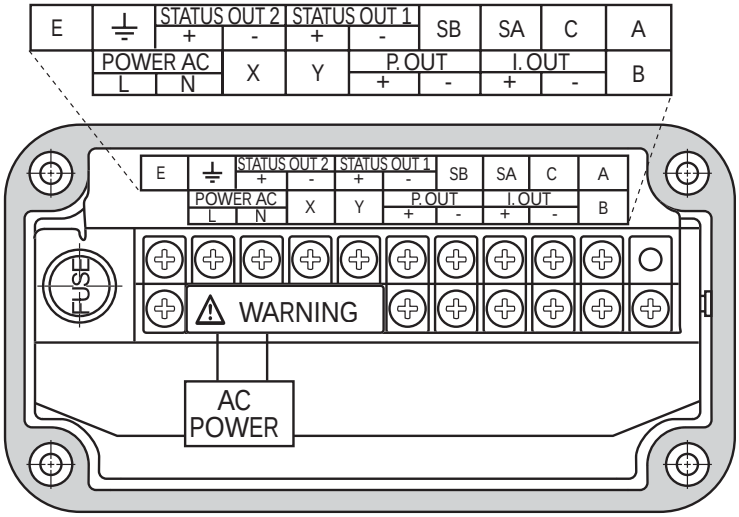


Figure 2-5 Remote converter terminal block

Table 2-3 Remote converter terminal descriptions (2-contact output)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS OUT 1	+	Contact input 1
	–	
STATUS OUT 2	+	Contact input 2
	–	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

Grounding

⚠ CAUTION

ELECTRIC SHOCK HAZARD! Grounding is essential for accurate measurement. The grounding resistance must be less than 100Ω.

Signal and excitation cable specifications

For remote installations, the converter and detector are connected using a set of dedicated cables (model MGA12W). The signal cable connects the output signal of the detector to the converter and the excitation cable feeds the excitation current to the detector. You can obtain these cables from Yamatake or purchase commercially available cables. Integral flowmeters already contain the converter to detector connections.

The cables between the detector and converter should be no longer than 300 m (984 ft.), but the actual length depends on conductivity of the fluid being measured.

The following cable diameters apply:

Signal cable - 11.4 mm (0.45 inch), 0.75 mm^2 (.0011625 sq. inch) or equivalent commercially available cable (CVVS or CEEV, for example)

Excitation cable - 10.5 mm (0.41 inch), 2 mm^2 (.0031 sq. inch) or equivalent commercially available cable (CVV, for example)

Cable dimensions and construction are shown on the following pages.

The following graphs show the ratio of fluid conductivity to cable length and show cable usage ranges for different diameter cables. The acceptable usage range for Yamatake cable model MGA12W cables encompass both areas A and B in the graphs below while commercially available cables are limited to area A only.

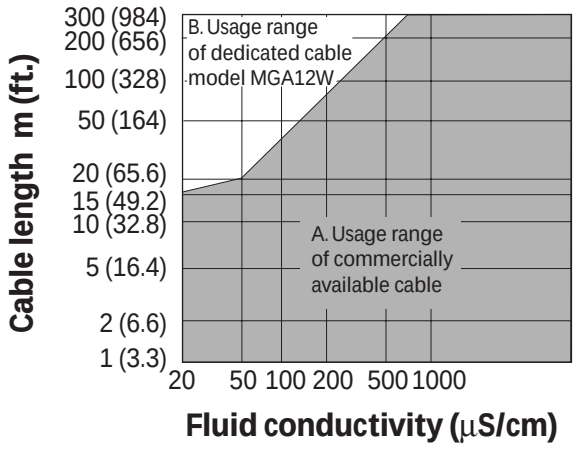


Figure 2-6 Cable usage ranges

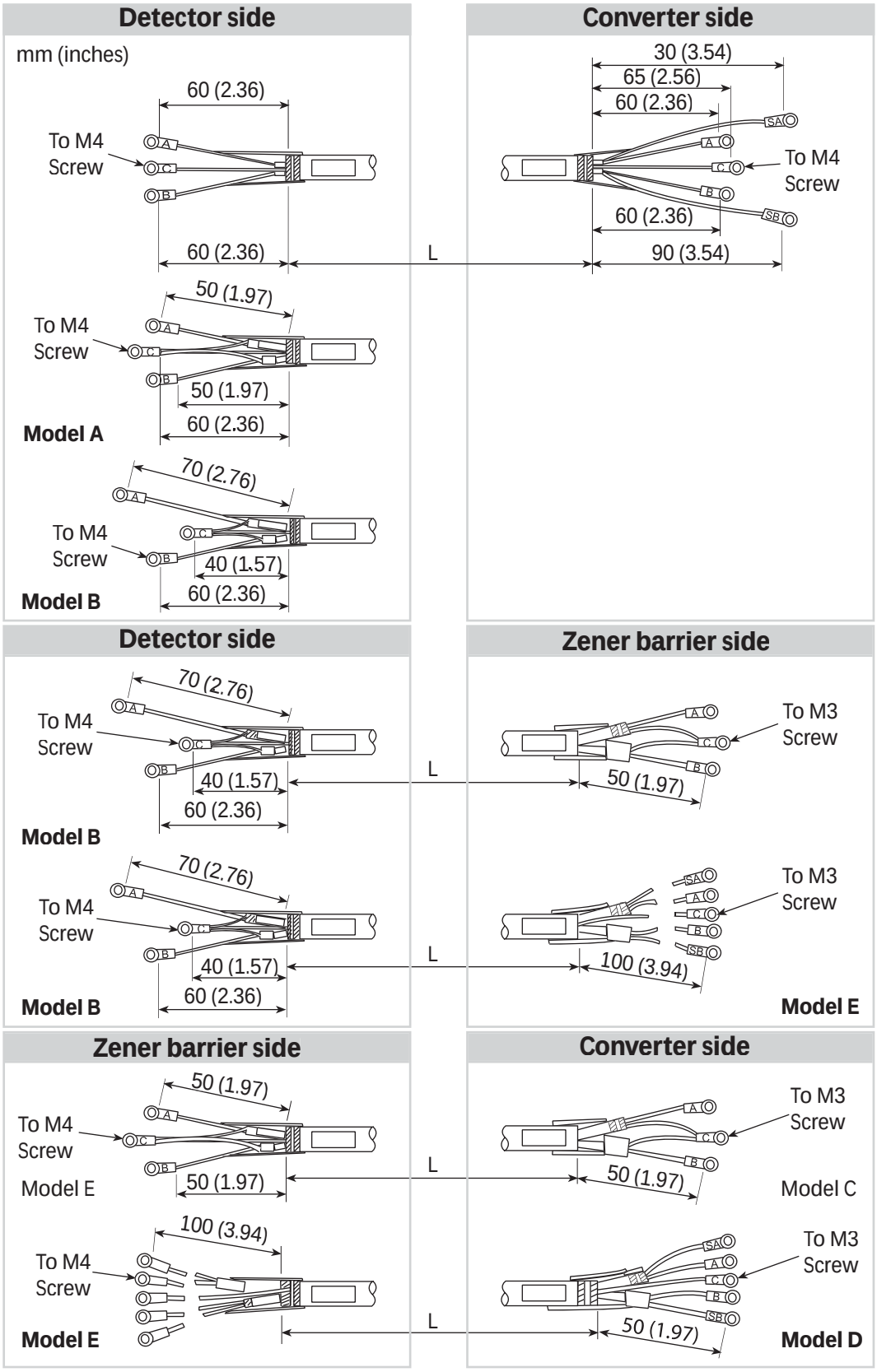


Figure 2-7 Signal Cable Dimensions

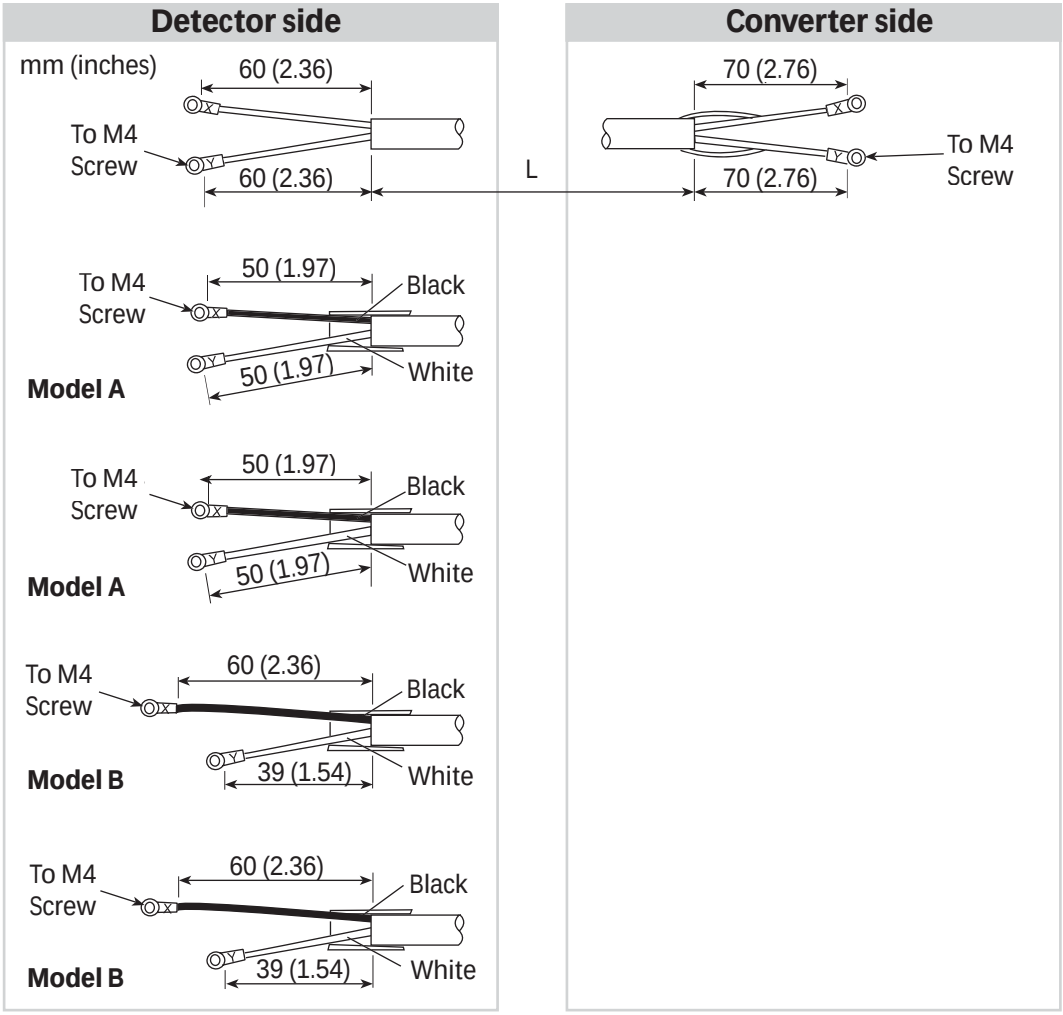


Figure 2-8 Excitation Cable Dimensions

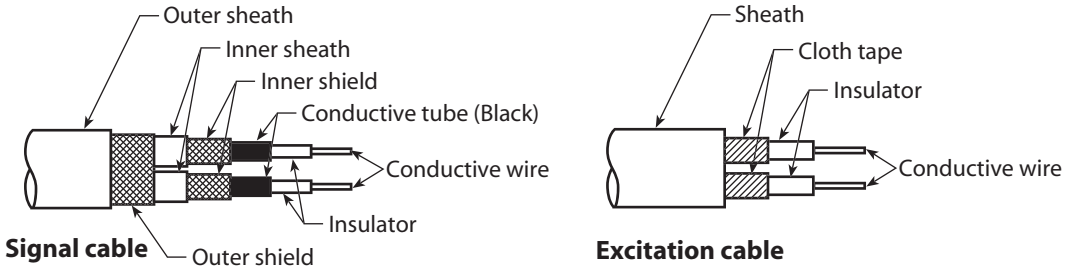


Figure 2-9 Signal and excitation cable construction

~ Note *Strip the conductive tubing (black) down to the ends of the inner shields on the conductive wires for terminals A and B of the signal cable.*

Signal and excitation cable wiring

The following figure shows the proper terminal connections for the signal and excitation cables for both model MGA12W cables and commercial cable.

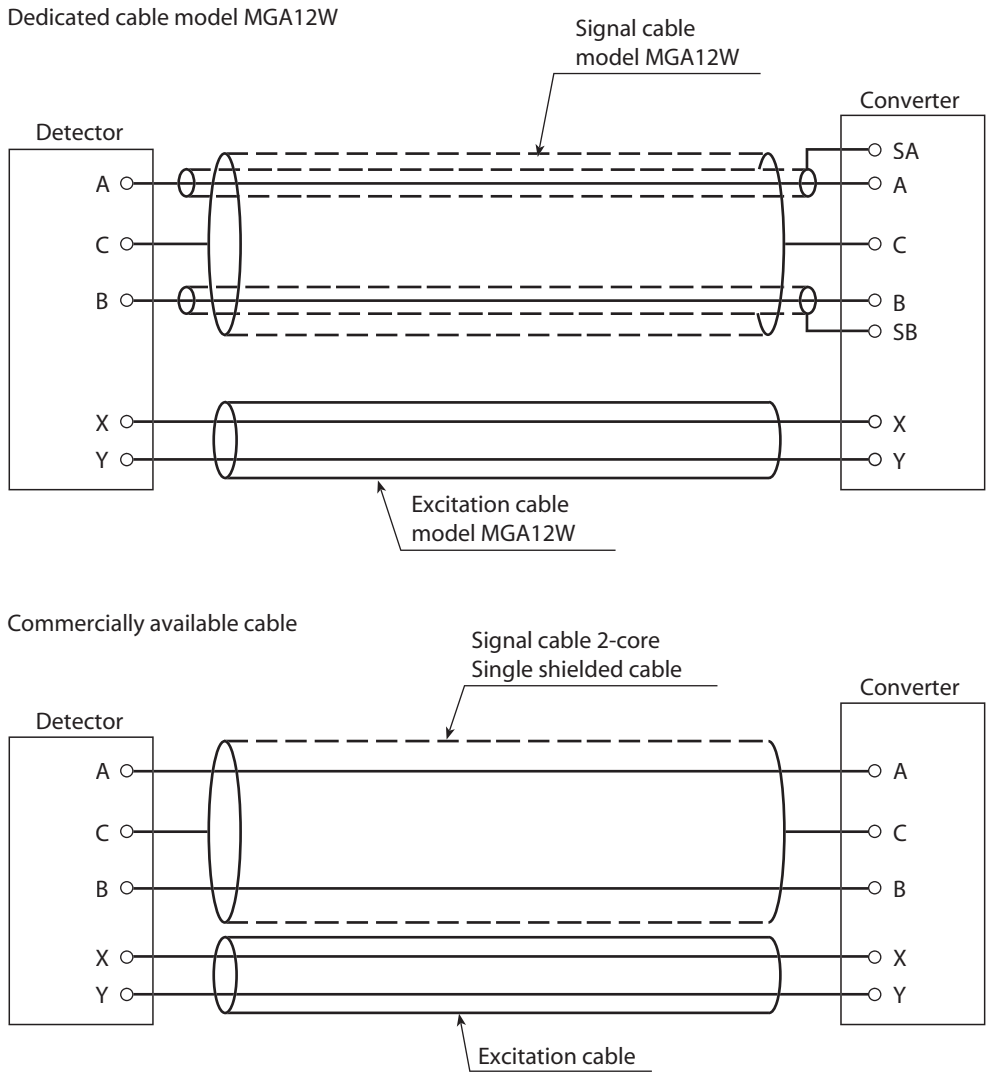


Figure 2-10 Detector to converter wiring diagram

Wiring cable

Selecting the cable

The recommended wiring cable is a 600V vinyl sheath electrical wire CVV (JIS C 3401) with a conductor section of 2 mm^2, or a twisted cable with an equivalent or higher capacity.

Shielded wire is recommended for wiring at locations subject to electromagnetic noise interference.

Select a sheath material suitable for the cable installation environment (consider ambient temperature, corrosive gas, corrosive fluid, etc.)

Run the cable into the terminal block through the conduit connection (G1/2 internal thread, CM20 external thread, Pg13.5 or 1/2NPT internal thread).

An outer diameter of ϕ11 is optimum. (The applicable range of cable outer diameters is ϕ10 - ϕ12.)

A crimp terminal (M4 screw) with an insulation sleeve is recommended for the terminal connections.

The maximum length of the wiring cable is 1500 m. However, the maximum length between converter and detector is 300 m.

Wiring the cable

When wiring the cable between this product and the control equipment, the following precautions must be observed.

~ Note

- ***Run the wiring away from equipment that may generate noise, such as high-capacity transformers, motors, or power supplies. DO NOT install the cable in the same tray or duct as other power cables. Output errors may result.***

- *For water proofing and damage prevention of the wire, we recommend cabling work using conduits and ducts. Use a water proof cable gland.*

Wiring

Analog output wiring

The current output wiring method depends on whether or not communication with the SFC is used.

An external power supply is required to communicate with the SFC.

(Switch the main board pins after turning the power supply OFF.)

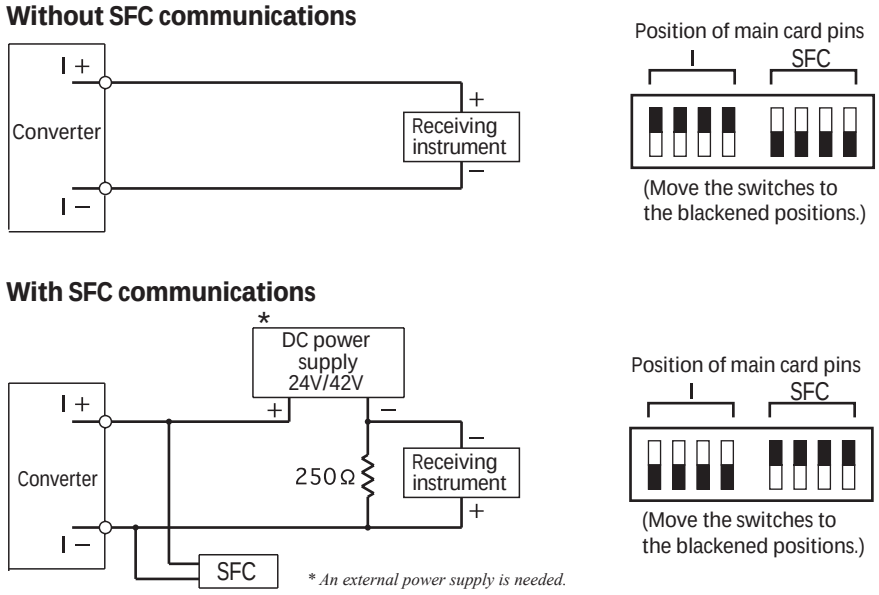


Figure 2-11 Wiring diagram for current output

~ Note *Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.*

Pulse output wiring

The pulse output is an open collector output.

Pay close attention to voltage and polarity when wiring.

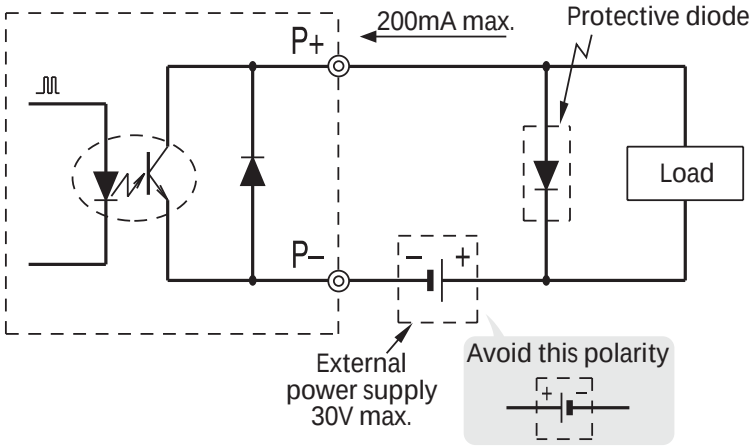


Figure 2-12 Wiring diagram for pulse output

~ Note ***Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.***
Use an external power supply that meets the voltage and capacity specifications.

Contact input wiring

Either a semiconductive contact or a no-voltage contact can be used as the contact input. The contact input/output terminals are not available when a 2-contact output model has been selected.

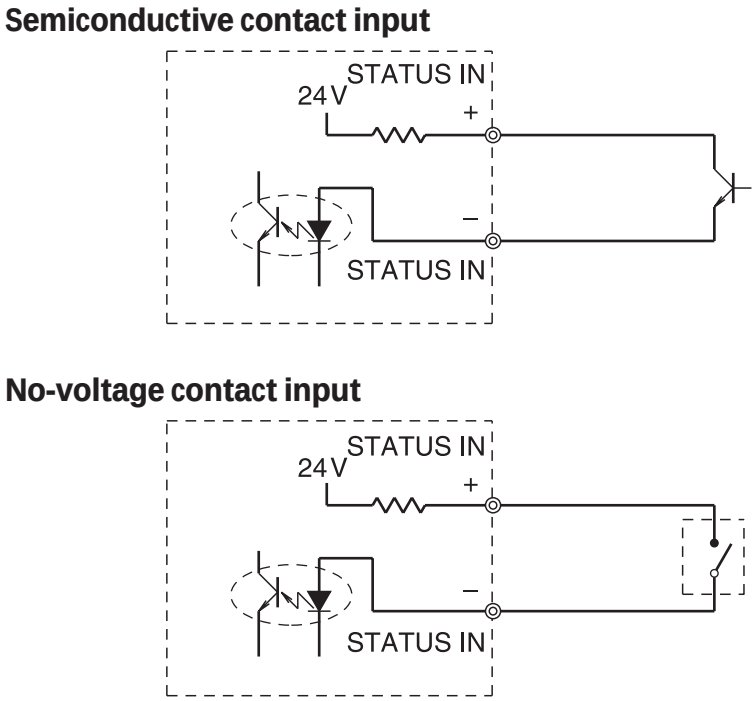


Figure 2-13 Wiring diagram for contact input

Contact output wiring

Pay close attention to voltage and polarity when wiring for an open collector output.

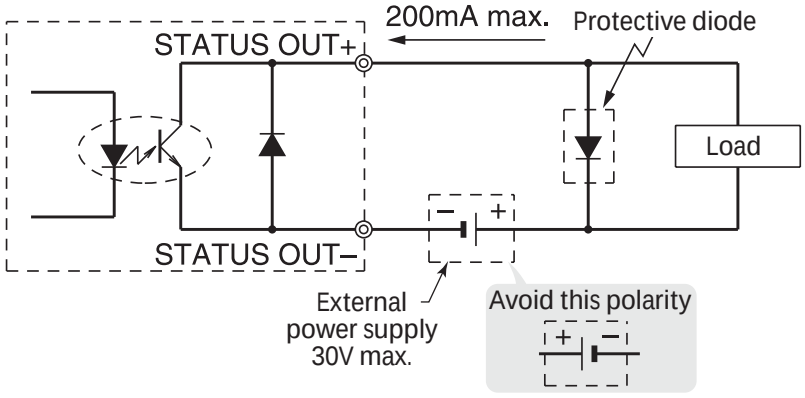


Figure 2-14 Wiring diagram for contact output

~ Note ***Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.***
Use an external power supply that meets the voltage and capacity specifications.

Setting write protection

Write protection settings allow you to control the level at which data confirmation and manipulation are possible. The system has three modes:

Operator's mode - used to run the flowmeter on a day-to-day basis.

Engineering mode - used by those who are responsible for running tests.

Maintenance mode - used when system maintenance is required.

Write protection settings are changed by setting the switch positions of the write protection switch on the main card in the converter. When the flowmeter is shipped, settings can be made in any mode (Level 0). The following table shows the write protect levels available by resetting the switch:

Table 2-4 Write Protection Levels

Level	Operator's mode	Engineering mode	Maintenance mode	Remarks
0	✔	✔	✔	Setting when shipped
1	✔	✔	✕	
2	✔	–	✕	
3	–	–	✕	

✔ *- Both data confirmation and manipulation are possible.*
– *- Only data confirmation is possible.*
✕ *- Neither data confirmation nor manipulation are possible.*

To set the write protection level:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the write protection switch.

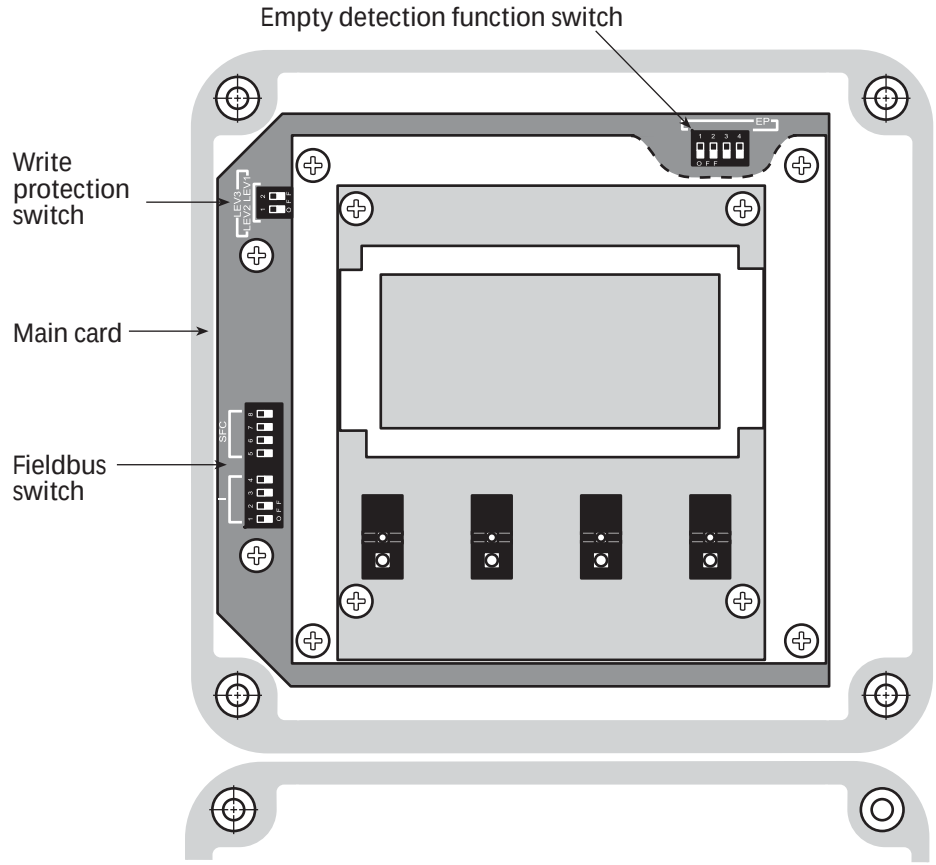


Figure 2-15 Switch locations on main card

3. Set the write protection switch positions to the required level of protection.

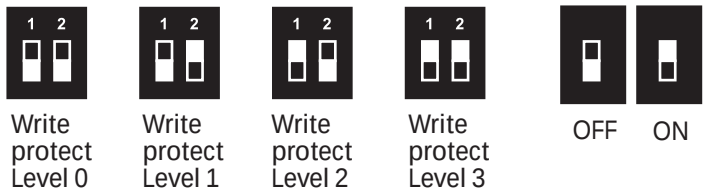


Figure 2-16 Write protection switch positions

~ Note *For fieldbus communications, the write protection switch must be set to level 0. Write protection is then set using the WRITE_LOCK parameter. See page 3-2 to set the write protection for fieldbus communication.*

Setting the empty detection function

This function fixes the fieldbus output and latches the display to zero when the detector is empty.

To set the empty detection function:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the empty detection function switch.

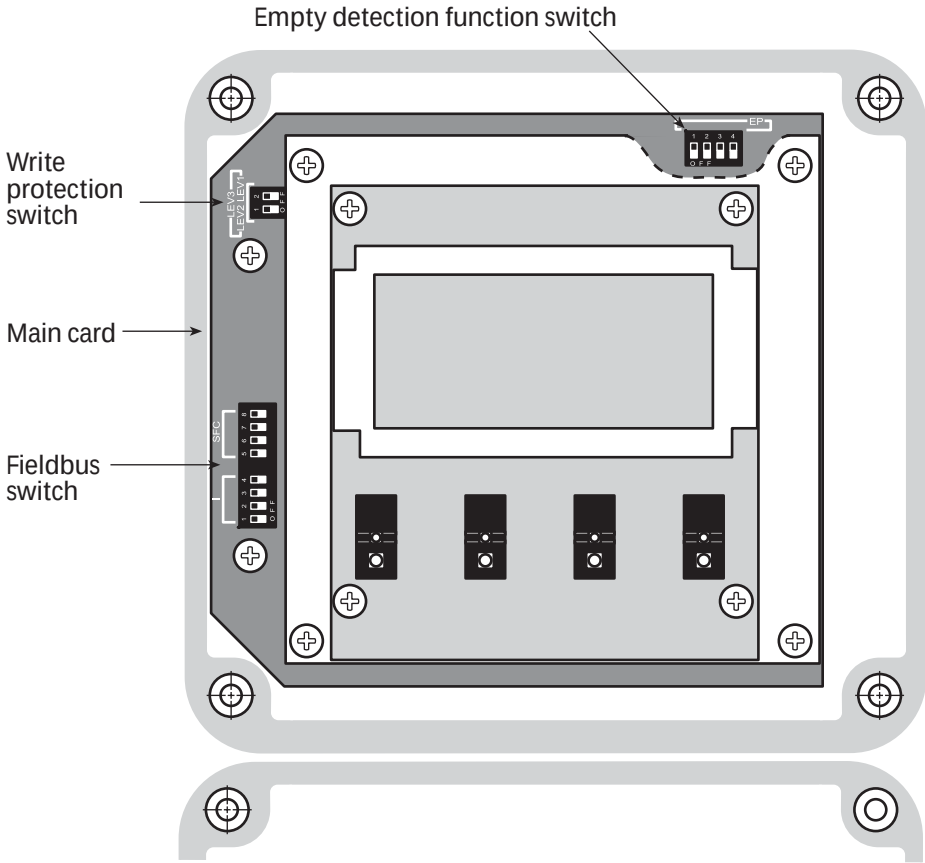


Figure 2-17 Switch locations on main card

3. Set the empty detection function switch positions to the required setting.

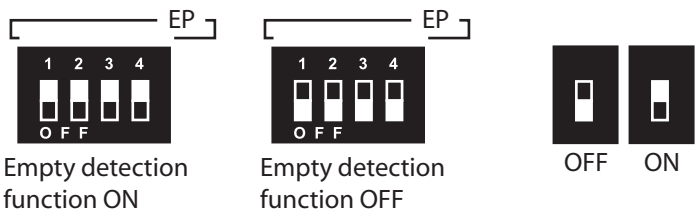


Figure 2-18 Empty detection function switch positions

Setting the communication via the SFC

To check the SFC communication switch position on the main card:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the SFC communication switch

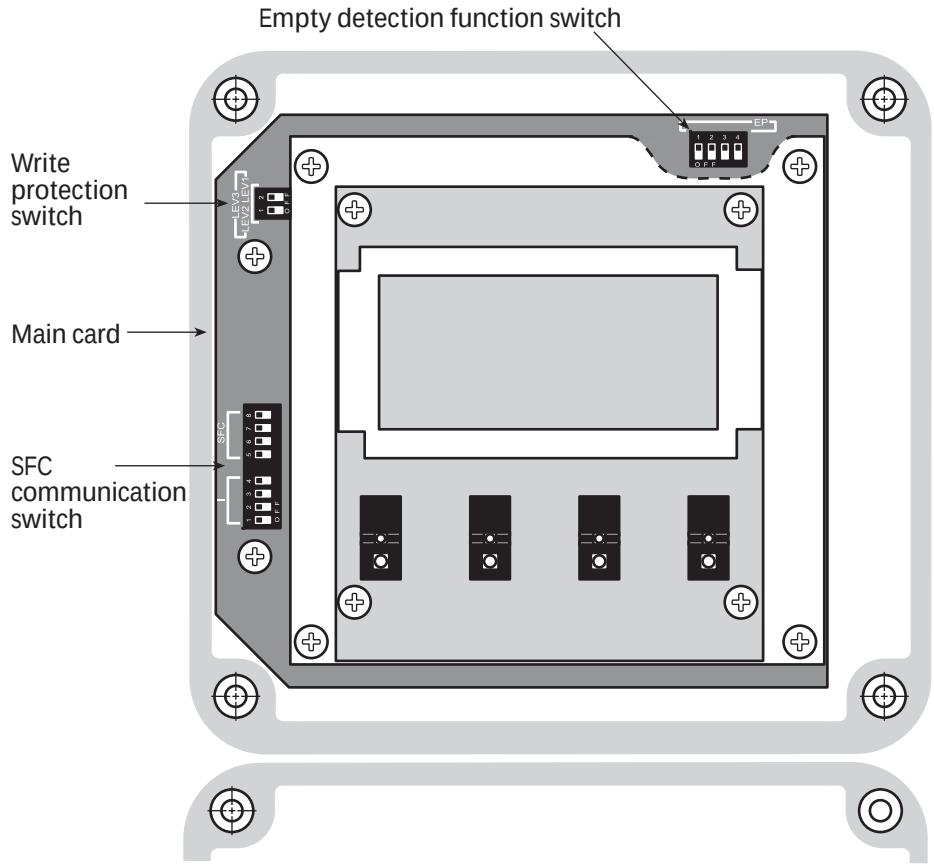


Figure 2-19 Switch locations on main card

3. Make sure that position of the I switch (1-4) are OFF and positions of the SFC switch (5-8) are ON.

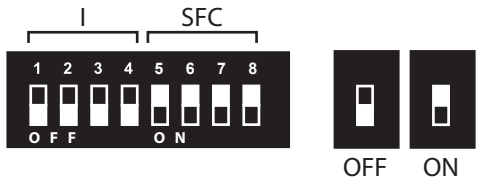


Figure 2-20 SFC communication switch positions

Connecting power

⚠ WARNING

ELECTRIC SHOCK HAZARD! DO NOT perform wiring work while the power is ON!

Commercial power (85-264Vrms, 50-60 Hz) or a 24 VDC ± 10% power supply is required for this system. The power supply specification is shown on the name plate of your converter.

The 24V DC converter has a terminal marked “POWER 24V DC” instead of “POWER,” as on the remote converter.

Chapter 3: Operation

This chapter describes the procedure for starting and shutting down the flowmeter and using the display panel and the infrared touch sensor keys.

Start-up

To start operation of the flowmeter:

1. Confirm that the detector is correctly installed on the pipe.
2. Confirm that the wiring between the converter and the detector has been properly completed according to the installation instructions specified in this manual.
3. Begin and then stop fluid flow through the detector so that fluid is present in the detector in a static condition.
4. Confirm that there is no leakage at the flanges of the detector.
5. Apply power to the converter.
6. The following display appears:

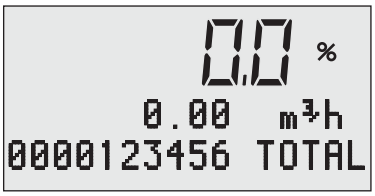


Figure 3-1 Start-up display

7. Zero the flowmeter using the procedure on page 4-7.

   The flowmeter is now on and operational.

Shut down

⚠ CAUTION

Switch the control equipment to manual control before terminating flowmeter operation and shutting off the output to the control equipment. This action prevents the power shut-off from directly affecting the control equipment and causing the valve positioner to malfunction.

To stop operation of the flowmeter:

1. Switch the control equipment connected to the flowmeter to manual control.
2. Turn off power to the converter.

Using the display panel

The display panel is shown below, followed by a description of each feature. The infrared touch sensor keys are described in the next section.

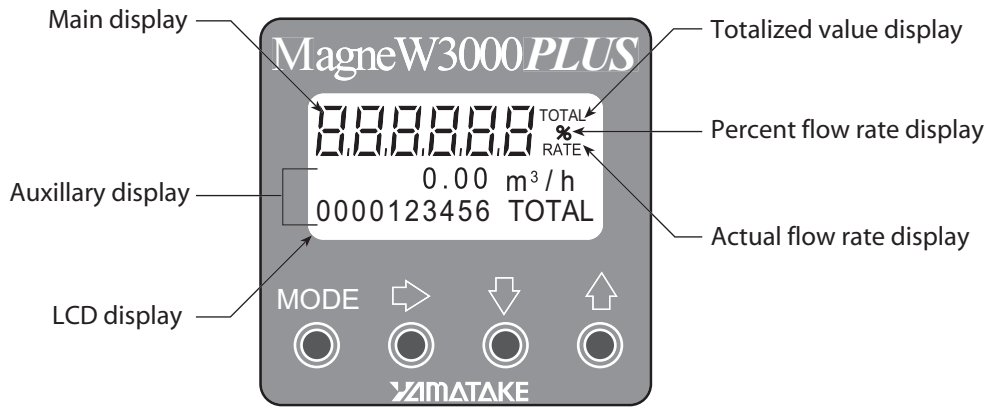


Figure 3-2 Display panel

Main display

- Indicates the flow rate selected in operator's mode.

Auxiliary display

- Several values are displayed in this area:

- During measurement mode, indicates a flow rate to supplement the flow rate selected in the operator's mode.
- Indicates the totalized value
- When not in measurement mode, indicates the procedures for parameter setting, adjustment, etc.

Percent flow display

- When lit, indicates that the percent flow rate is currently being displayed.

Actual flow rate display

- When lit, indicates that the actual flow rate is currently being displayed.

Totalized value display

- When lit, indicates that the totalized value is currently being displayed.

Using the infrared touch sensor keys

The infrared touch sensor keys allow you to make selections by simply touching the display panel.

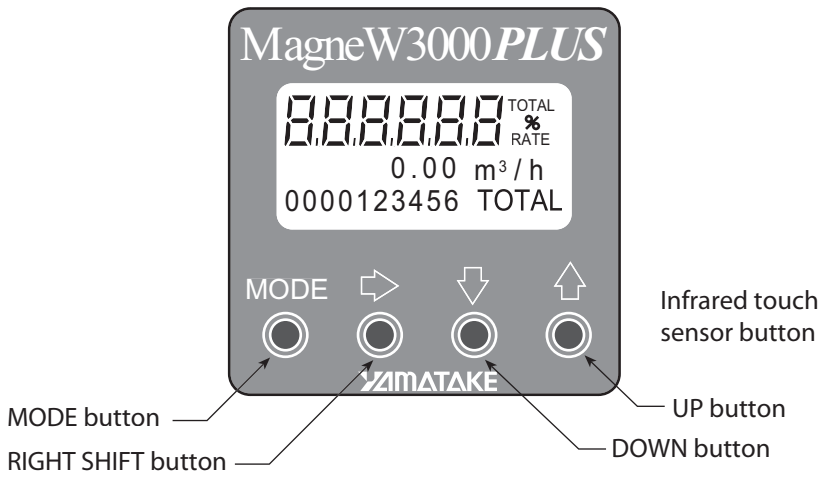


Figure 3-3 Touch sensor keys

For best results, approach the key from below and completely cover the circle. Then move your finger straight down to its original position. These motions ensure correct operation. Moving sideways across the keys can accidently activate the wrong control.

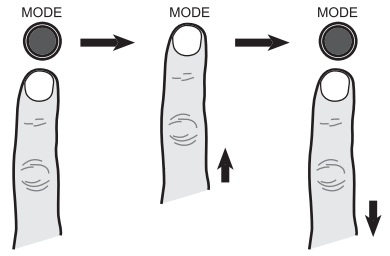


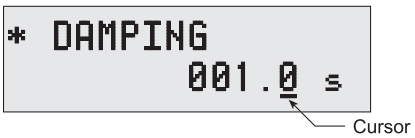
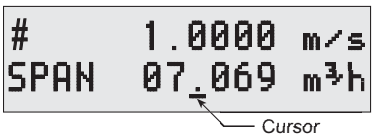
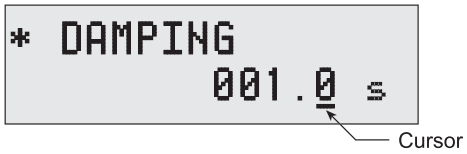
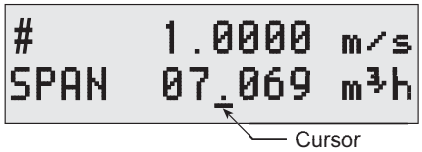
Figure 3-4 Using the touch sensor keys

The following table is a summary of the functions of each of the keys.

Table 3-1 Touch Sensor key Functions

key	Function
MODE key 	Touching and holding this key for two seconds opens OPERATOR'S MODE. Writes data into memory after changing the parameters or internal data in engineering mode or maintenance mode
RIGHT SHIFT key 	Shifts the cursor in the display to the right.

Table 3-1 Touch Sensor key Functions

key	Function
DOWN key 	When the cursor is on the Mode Indicator as shown below, touching the DOWN key displays the next screen.  When the cursor is located at a number, touching the DOWN key decrements the number.  When the cursor is located at the decimal point, touching the DOWN key moves the decimal point to the right. 
UP key 	When the cursor is on the Mode Indicator as shown below, touching the UP key displays the next screen.  When the cursor is located at a number, touching the UP key increments the number.  When the cursor is located at the decimal point, touching the UP key moves the decimal point to the left.  When the cursor is located at READY, touching the UP key starts operation. 

Chapter 4: Using the display panel

This chapter describes the four modes of operation and how to use each one. A flow chart of the functions for each mode is also included.

About modes

The MagneW3000 FLEX/PLUS Flowmeter has four modes of operation:

- Measuring mode
- Operator's mode
- Engineering mode
- Maintenance mode
- Calibration mode

The following table describes the functions available in each mode.

Table 4-1 Mode functions

Mode	Description
MEASURING MODE	This is the normal operational mode and indicates the measuring status. Each time the measuring mode is selected, data is written into memory. Settings entered in other modes are held in temporary memory for two minutes, but will return to the previously saved value unless the measuring mode is selected to save the data. The only exception is the counter, which is always saved into memory immediately.
OPERATOR'S MODE Mode indicator: ✱	This mode is used to change data settings that must be recorded or changed frequently. These settings include: Damping time constant Auto zero Flow counter Flow rate indicator Auto spike cut function
ENGINEERING MODE Mode indicator: #	This mode is used to change data settings that are used less frequently. These settings include: ID function Detector data Flow rate span Pulse data Drop out Output at error
MAINTENANCE MODE Mode indicator: >	This mode is used when adjustment or verification is required for regular maintenance of the system or when troubleshooting the system. This mode includes: Output adjustment Gain adjustment This mode is further divided into the following three modes: OUTPUT CHECK MODE CALIBRATION MODE CRITICAL MODE

⚠ CAUTION

The CALIBRATION MODE and CRITICAL MODE contain adjustments and operations that are very important for proper flow rate measurement. Improper settings in these modes will prevent measurement.

Measuring mode

This is the normal operational mode. In this mode, the screen indicates the measuring status. What is displayed on screen depends upon the setting selections made in the other modes.

This mode performs one other important function. Entering this mode causes the system to save settings entered in other modes. Each time the MEASURING MODE is selected, data is written into memory. Settings entered in other modes are held in temporary memory for two minutes, but will return to the previously saved value unless the MEASURING MODE is selected. The only exception is the counter, which is always saved into memory immediately.

⚠ CAUTION

After entering settings in other modes, ALWAYS immediately select the MEASURING MODE to save settings.

Operator’s mode

The following screens appear in this order in OPERATOR’S MODE.

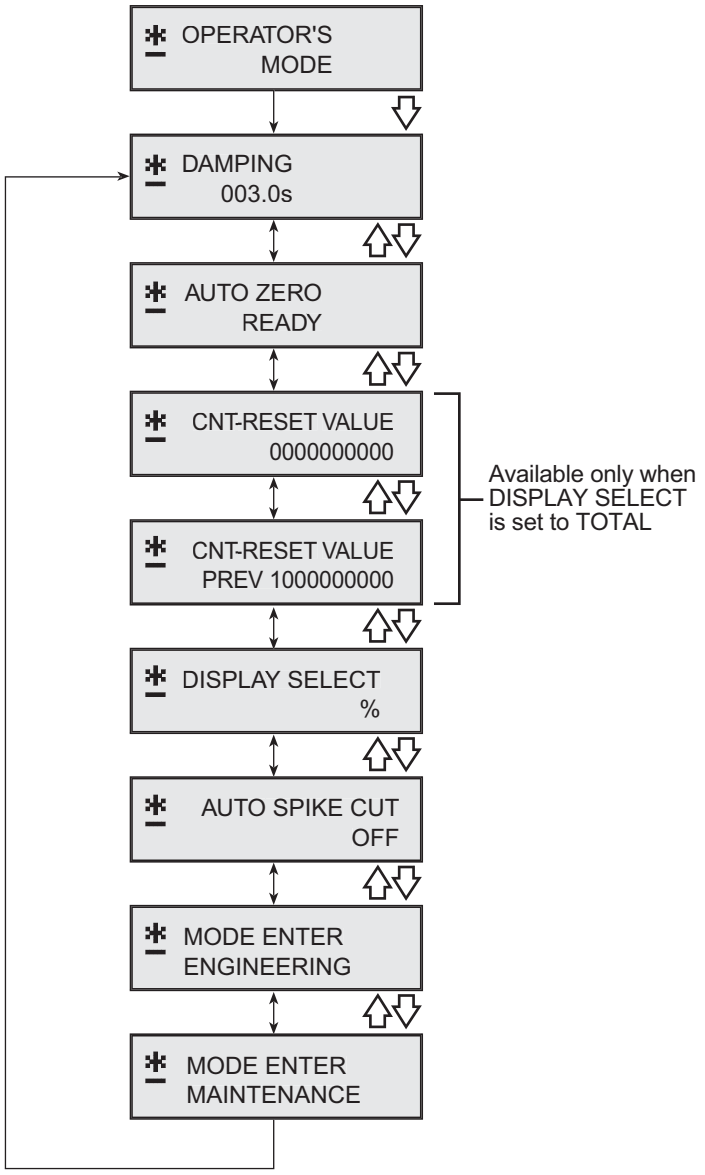


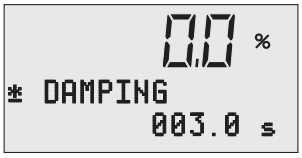
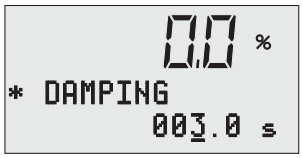
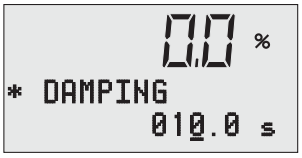
Figure 4-1 OPERATOR’S MODE screen organization

Entering OPERATOR'S MODE

Step	Key	Screen	Procedure
1	MODE ◉ hold for 3 sec.	100.0 % ENTER IN OP.MODE YES OR NO	Touch the MODE key and hold for three seconds. The MODE ENTER screen appears.
2	⇨ ◉ twice	100.0 % ENTER IN OP.MODE YES OR NO	Touch the ⇨ key twice to move the cursor to YES. (To exit without changing modes, move the cursor to NO.)
3	⇧ ◉	100.0 % * OPERATOR'S MODE 2 sec. later ↓ 0.0 % * DAMPING 003.0 s	Touch the ⇧ key once to make the selection. The OPERATOR'S MODE screen appears for approximately two seconds followed by the DAMPING screen. As long as the cursor remains under the mode indicator (the * symbol), touching the ⇩ or ⇧ key cycles through the screens available in this mode.

Damping time constant

The damping time constant removes minute fluctuations when transmitting the measured flow rate to the control equipment. Check the amplitude of fluctuation in flow output and set the damping time constant to an appropriate value. The new value becomes effective as soon as it is entered.

Step	Key	Screen	Procedure
1			Enter OPERATOR's MODE (see page 4-4). In OPERATOR'S MODE, the DAMPING screen is the first screen that appears.
2	⇨		Touch the ⇨ key until the cursor is at the value to be changed. (In the example, the key is touched three times.)
3	⇧ or ⇩		Use the ⇩ or ⇧ key to change the numerical value. Touching and holding either key quickly increments or decrements the values.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the Damping Time Value. **⚠ CAUTION** You have only two minutes to return to MEASUREMENT MODE to save this new value before the system resets it to the previously saved value.

Auto zero

This function adjusts the flowmeter so that the measured flow rate is zero when the fluid is in static condition inside the detector.

⚠ CAUTION

Before operating the flowmeter for the first time, be sure to carry out auto zero. Zero adjustment is very important for accurate flow measurement.

⚠ CAUTION

Before performing auto zero calibration of the flowmeter, make sure the detector is properly grounded (grounding resistance must be less than 100 Ω), that the detector is filled with the fluid to be measured and that the fluid is in static condition. Zero adjustment is possible with a flow speed of 0.2 m/s (0.656 ft./s) or less, but the flow speed should be 0.0 m/s (0.0 ft./s) for accurate adjustment. Output errors can result from improper zeroing.

Step	Key	Screen	Procedure
1	⇧ or ⇩	0.0 % * AUTO ZERO READY	Enter OPERATOR's MODE (see page 4-4). (The first screen in this mode is always the DAMPING screen.) Use the ⇩ or ⇧ key to cycle through the screens until the AUTO ZERO screen appears.
2	⇨	0.0 % * AUTO ZERO READY	Touch the ⇨ key once to move the cursor to READY to indicate that the system is ready for zeroing.
3	⇧	0.0 % * AUTO ZERO ON	Touch the ⇧ key once to select READY and start the auto zero adjustment. The large numerical display flashes and READY changes to ON during adjustment. When the zero adjustment is complete, the flashing stops and ON changes back to READY. Zero adjustment takes approximately 30 seconds.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the zero setting. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Flow counter - Reset value

This function sets the integration starting value of the built-in flow counter.

Step	Key	Screen	Procedure
1	⇧ or ⇩	123456 TOTAL *CNT-RESET VALUE 0000010000	To change this function, the DISPLAY SELECT must be set to TOTAL (see page 4-11). Enter OPERATOR's MODE (see page 4-4). (The first screen in this mode is always the DAMPING screen.) Use the ⇩ or ⇧ key to cycle through the screens until the CNT-RESET VALUE screen appears.
2	⇨	123456 TOTAL *CNT-RESET VALUE 0000010000	Touch the ⇨ key as many times as is necessary to move the cursor to the value to be changed. (In the example, the key is touched six times.) **Default setting**: 0000000000 **Setting Range:** -999999999 to 999999999
3	⇧ or ⇩	123456 TOTAL *CNT-RESET VALUE 0000050000	Touch the ⇩ or ⇧ key to change the numerical value. Touching and holding either key quickly increments or decrements the values.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Flow counter - Resetting

This function resets the current totalized value and saves it to memory.

Step	Key	Screen	Procedure
1	⇧ or ⇩	123456 TOTAL ±CNT-RESET READY PREV 0000000000	Enter OPERATOR'S MODE (see page 4-4). (The first screen in this mode is always the DAMPING screen.) Use the ⇩ or ⇧ key to cycle through the screens until the CNT-RESET screen appears. (The default value for the counter is 000000000 at power-up.)
2	⇨	123456 TOTAL *CNT-RESET READY PREV 0000000000	Touch the ⇨ key once to move the cursor to READY.
3	⇧	123456 TOTAL *CNT-RESET ON PREV 0000000000 ↓ 000000 TOTAL *CNT-RESET READY 0000123456	Touch the ⇧ key to select READY and reset the counter. READY changes to ON as the counter resets and then changes back to READY when it's done.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Setting / Changing the preset value of the built-in flow counter

Introduction

This changes the contact output status from H to L or from L to H when the flow counter reaches a preset value.

This function is used when contact output has been selected (additional specification) and pulse output has been selected (additional specification).

Also, be sure to select the preset counter for the contact output in function setting.

Default setting

The preset value is set to “0000000000” at shipment.

Setting range

0000000000 - 9999999999

Step	Key	Screen	Procedure
1		123456 TOTAL ±COUNTER PRESET 0000200000	Open the built-in flow counter preset value setup screen by following the steps to enter the Operator’s mode.
2	⇨ ◉	123456 TOTAL *COUNTER PRESET 0000200000	Touch the ⇨ key to move the cursor to the desired digits. In this example, the cursor is moved to the “2” position by touching the RIGHT SHIFT key five times.
3	⇧ ◉ or ⇩ ◉	123456 TOTAL *COUNTER PRESET 0000500000	Touch the ⇩ or ⇧ key to set the desired numbers. In this case, the numeral “2” is changed to “5” by three touches of the increment key.
4	⇨ ◉	123456 TOTAL ±COUNTER PRESET 0000500000	When the counter reset value has been changed, touch the ⇨ key to return the cursor to the “*”.

Flow rate indication

This function selects the flow rate indication displayed on screen. The data can be displayed as a percent (%), the actual flow rate (RATE) or the totalized value (TOTAL).

Step	Key	Screen	Procedure
1	⇧ or ⇩	0.0 % *DISPLAY SELECT %	Enter OPERATOR'S MODE (see page 4-4). (The first screen in this mode is always the DAMPING screen.) Use the ⇩ or ⇧ key to cycle through the screens until the DISPLAY SELECT screen appears.
2	⇨	0.0 % *DISPLAY SELECT %	Touch the ⇨ key once to move the cursor to the flow rate Indication value.
3	⇧ or ⇩	0.000 RATE *DISPLAY SELECT RATE ↓ 0 TOTAL *DISPLAY SELECT TOTAL	Touch the ⇩ or ⇧ key to scroll through the selections (%, RATE or TOTAL). Note that the Main Display changes as the different display selections appear. The current flow rate Indication value appears at the upper right in the Main Display.
4	⇨		Touch the ⇨ key until the cursor is back at the model indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

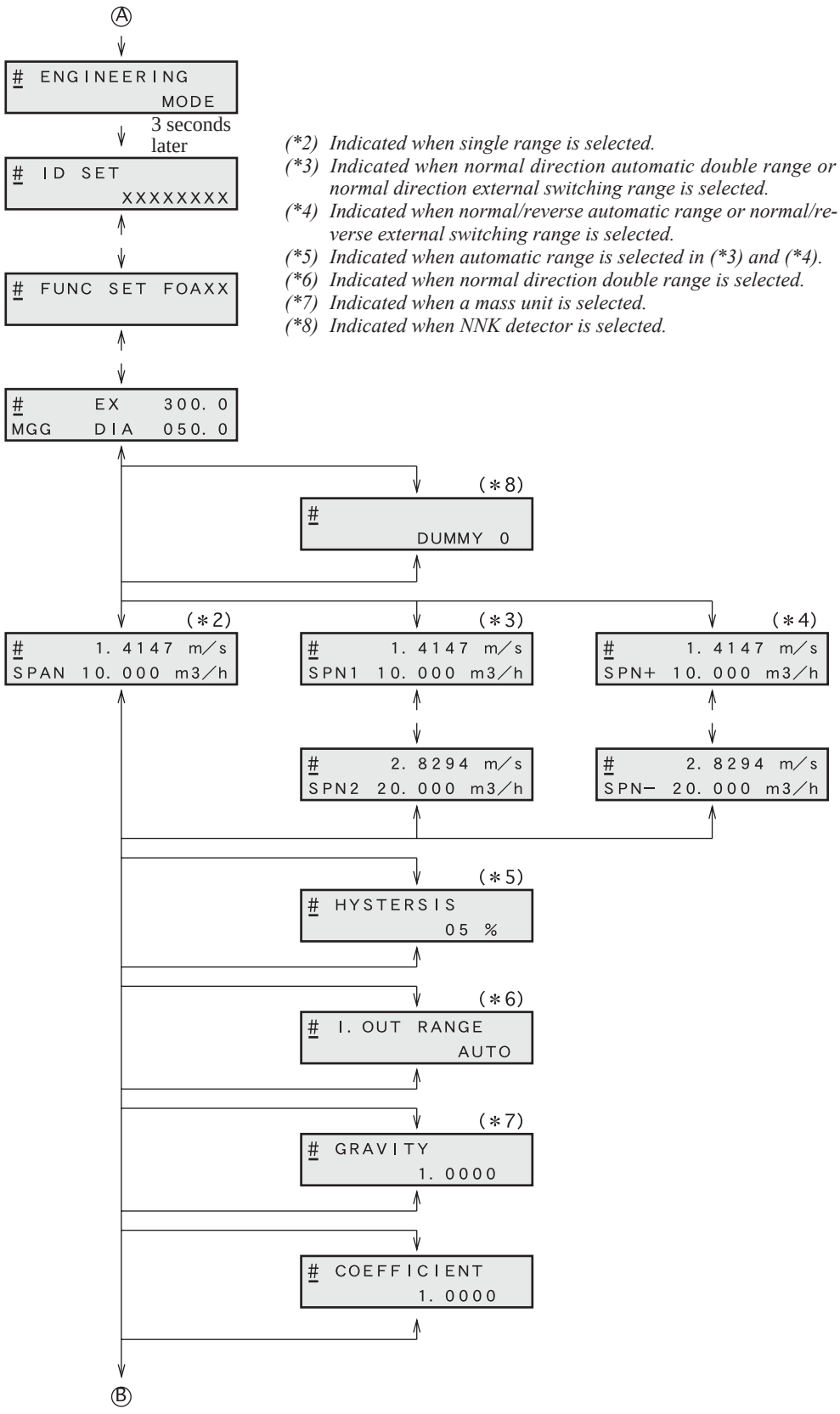
Auto spike cut function

This function eliminates steep noise spikes in the flow rate.

Step	Key	Screen/key	Procedure
1	⇧ or ⇩	0.0 % ±AUTO SPIKE CUT OFF	Enter OPERATOR'S MODE (see page 4-4). (The first screen in this mode is always the DAMPING screen.) Use the ⇩ or ⇧ key to cycle through the screens until the DISPLAY SELECT screen appears.
2	⇨	0.0 % *AUTO SPIKE CUT OFF	Touch the ⇨ key once to move the cursor to OFF.
3	⇧ or ⇩	0.0 % *AUTO SPIKE CUT ON	Touch the ⇩ or ⇧ key to change the selection to ON.
4	⇨		Touch the key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Engineering mode

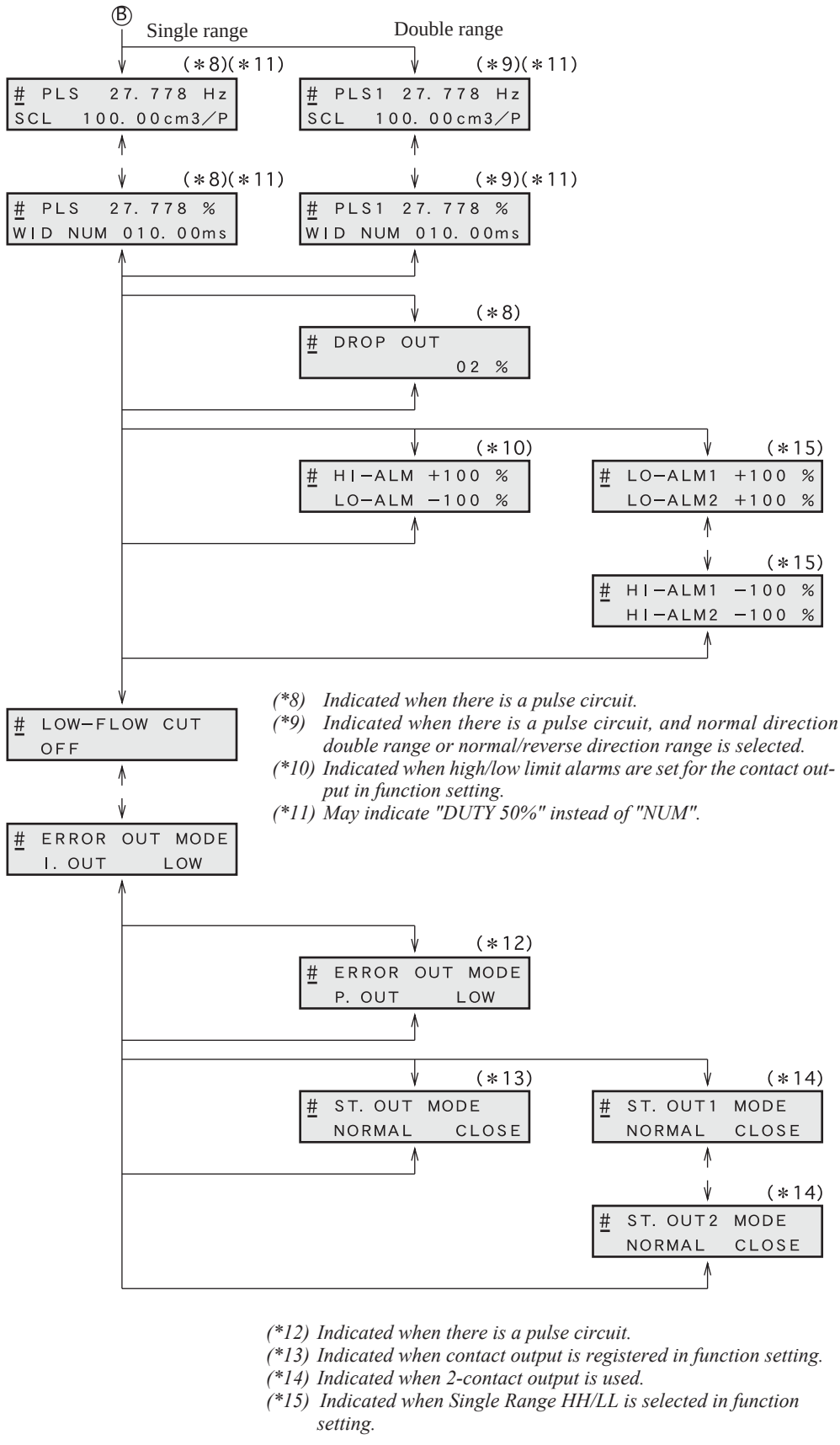
The following screens appear in this order in ENGINEERING MODE.



*(*2) Indicated when single range is selected.*
*(*3) Indicated when normal direction automatic double range or normal direction external switching range is selected.*
*(*4) Indicated when normal/reverse automatic range or normal/reverse external switching range is selected.*
*(*5) Indicated when automatic range is selected in (*3) and (*4).*
*(*6) Indicated when normal direction double range is selected.*
*(*7) Indicated when a mass unit is selected.*
*(*8) Indicated when NNK detector is selected.*

(to be continued)

(Continued from previous page)



*(*8) Indicated when there is a pulse circuit.*
*(*9) Indicated when there is a pulse circuit, and normal direction double range or normal/reverse direction range is selected.*
*(*10) Indicated when high/low limit alarms are set for the contact output in function setting.*
*(*11) May indicate "DUTY 50%" instead of "NUM".*

*(*12) Indicated when there is a pulse circuit.*
*(*13) Indicated when contact output is registered in function setting.*
*(*14) Indicated when 2-contact output is used.*
*(*15) Indicated when Single Range HH/LL is selected in function setting.*

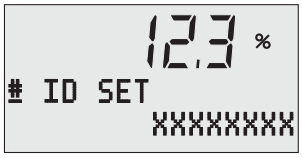
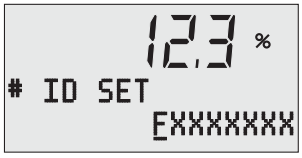
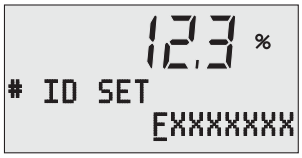
Figure 4-2 ENGINEERING MODE Screen Organization

Entering ENGINEERING MODE

Step	Key	Screen/key	Procedure
1	MODE hold for 3 sec.	100.0 % ENTER IN OP.MODE YES OR NO	Touch the MODE key and hold for three seconds. The MODE ENTER screen appears.
2	⇨ twice	100.0 % ENTER IN OP.MODE YES OR NO	Touch the ⇨ key twice to move the cursor to YES. (To exit without changing modes, move the cursor to NO.)
3	⇧	100.0 % * OPERATOR'S MODE 0.0 % * DAMPING 003.0 s	Touch the ⇧ key once to make the selection. The OPERATOR'S MODE screen appears for approximately two seconds followed by the DAMPING screen.
4	⇧ or ⇩	12.3 % * MODE ENTER ENGINEERING	Use the ⇩ or ⇧ key to cycle through the screens until the MODE ENTER screen appears displaying ENGINEERING.
5	⇨	12.3 % * MODE ENTER ENGINEERING	Touch the ⇨ key to move the cursor to ENGINEERING.
6	⇧	12.3 % # ENGINEERING MODE	Touch the ⇧ key to select. The ENGINEERING MODE screen appears for approximately two seconds followed by the ID SET screen. Note that the mode indicator has changed to indicate ENGINEERING MODE (#). As long as the cursor remains under the mode indicator, touching the DOWN or UP key cycles through the screens available in this mode.

Setting the ID

This function sets the ID Code for the flowmeter.

Step	Key	Screen	Procedure
1			Enter ENGINEERING MODE (see page 4-13). In ENGINEERING MODE, the ID SET screen is the first screen that appears.
2	⇨		Touch the ⇨ key until the cursor is at the character to be changed. **Default setting:** XXXXXXXX
3	⇧ or ⇩		Touch the ⇩ or ⇧ key to change the character. Cycle through the following alphanumeric characters to select the required one: ABCDEFGHIJKLMNOPQRSTUVWXYZ (SPACE) - / .0123456789
4	⇨		Use the ⇨ key to choose another character and repeat Steps 3 and 4 until the entire ID Number is set.
5	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
6	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Selecting functions

Introduction

Sets the electromagnetic flowmeter functions: range, counter, contact input, and contact output.

There will be restrictions on the functions that can be set depending on your model's specifications. Note that the setting range will be limited depending on whether or not a pulse output board is used and the kind of contact input/output boards.

The possible combinations are shown on the following pages.

Step	Key	Screen	Procedure
1		12.3 % # FUNC SET F0A 11	Open the function setup screen by following to the steps to enter the engineering mode.
2	⇨ ◉	12.3 % # FUNC SET F0A 11 SINGLE RANGE	Touch the ⇨ key to select the kind of function settings. One touch is for range setting, two touches for built-in counter setting, three touches for the contact input function setting, and four touches for the contact output function setting.
3	⇧ ◉ or ⇩ ◉	12.3 % # FUNC SET F0A 11 DIR AUTO DUAL RG	Touch the ⇩ or ⇧ key to select the desired function.
4	⇨ ◉	12.3 % # FUNC SET F0B 13 PRESET COUNTER	Two touches of the ⇨ key in step 1 enables the selection of the built-in counter function. Touch the DOWN or UP key to select the desired function.
5	⇨ ◉	12.3 % # FUNC SET F0A2 1 EXIT AUTO ZERO	Three touches of the ⇨ key in step 1 enables the selection of the contact input function. Touch the ⇩ or ⇧ key to select the desired function.
6	⇨ ◉	12.3 % # FUNC SET F0A 14 ERROR DIAG ALM	Four touches of the ⇨ key in step 1 enables the selection of the contact output function. Touche the ⇩ or ⇧ key to select the desired function.
7	⇨ ◉		When completing the setting of the respective functions, touch the ⇨ key to move the cursor to the "#".

Relations for setting function FXXXX

Introduction

The range, built-in counter, contact input, and contact output functions can be set using the combinations shown in the table below. For example, when “Single range” and “Addition with preset” are selected, there are three contact input choices (X, 1, and 2) and three contact output choices.

1-contact input and 1-contact output (DI/DO)

Table 4-2 1-contact input and 1-contact output (DI/DO)

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	X: Not activated	X: Not activated	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		1: External 0% lock	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		2: External auto zero adjustment	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	A: Addition	X: Not activated	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		1: External 0% lock	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		2: External auto zero adjustment	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		4: Counter reset	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	X: Not activated	3: Preset output
		1: External 0% lock	3: Preset output
		2: External auto zero adjustment	3: Preset output
1: Automatic switching double range	X: Not activated	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zero adjustment	2: Range switching output
	A: Addition	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zero adjustment	2: Range switching output
		4: Counter reset	2: Range switching output

Table 4-2 1-contact input and 1-contact output (DI/DO)

Range function	Built-in counter function	Contact input function	Contact output function
2: External switching double range	X: Not activated	3: External range switching	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	A: Addition	3: External range switching	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
3: Normal/ reverse automatic switching range	X: Not activated	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zero adjustment	2: Range switching output
	A: Addition	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zero adjustment	2: Range switching output
		4: Counter reset	2: Range switching output
	C: Normal/reverse flow integration	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zero adjustment	2: Range switching output
		4: Counter reset	2: Range switching output
4: Normal/ reverse external switching range	X: Not activated	3: External range switching	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	A: Addition		X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
	C: Normal/reverse flow integration	3: External range switching	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm

2-contact input (DI/DI)

Table 4-3 2-contact input (DI/DI)

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	X: Not activated	X: Not activated	X: Not activated
		1: External 0% lock	X: Not activated
		2: External auto zero function	X: Not activated
		5: External 0% lock + Auto zero adjustment	X: Not activated
	A: Addition	X: Not activated	X: Not activated
		1: External 0% lock	X: Not activated
		2: External auto zero function	X: Not activated
		4: Counter reset	X: Not activated
		5: External 0% lock + Auto zero adjustment	X: Not activated
		7: External 0% lock + Counter reset	X: Not activated
		9: External auto zero + Counter reset	X: Not activated
2: External switching double range	X: Not activated	3: External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zero adjustment + Range switching	X: Not activated
	A: Addition	3: External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zero adjustment + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated
4: Normal/ reverse external switching range	X: Not activated	3: External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zero adjustment + Range switching	X: Not activated
	A: Addition	3: External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zero adjustment + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated
	C: Normal/ reverse flow integration	3: External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zero adjustment + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated

2-contact output (DO/DO)

Table 4-4 2-contact output (DO/DO)

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	X: Not activated	X: Not activated	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	A: Addition	X: Not activated	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	X: Not activated	3: Preset
			D: Alarm + Preset output
1: Automatic switching double range	X: Not activated	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8: Self-check result + Range switching output
			9: Empty detection function + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching + Self-check empty detection function
	A: Addition	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8: Self-check result + Range switching output
			9: Empty detection function + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching + Self-check empty detection function
	B: Addition with preset	X: Not activated	B: Range switching + Preset output
3: Normal/ reverse automatic switching range	X: Not activated	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8: Self-check result + Range switching output
			9: Empty detection function + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching + Self-check empty detection function
	A: Addition	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8: Self-check result + Range switching output
			9: Empty detection function + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching + Self-check empty detection function
	B: Addition with preset	X: Not activated	B: Range switching + Preset output
	C: Normal/ reverse flow integration	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8: Self-check result + Range switching output
			9: Empty detection function + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching + Self-check empty detection function

Without DI/DO

Table 4-5 Without DI/DO

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	X: Not activated	X: Not activated	X: Not activated
	A: Addition	X: Not activated	X: Not activated

Range functions

Single range

Measures a single range in the normal direction.
The output for a reverse flow will be as follows

Analog output: Possible to approx. -20% (0.8 mA). With SFC communication, to approx. -5% (3.2 mA).

Pulse output: No output

Display: A minus (-) symbol appears.

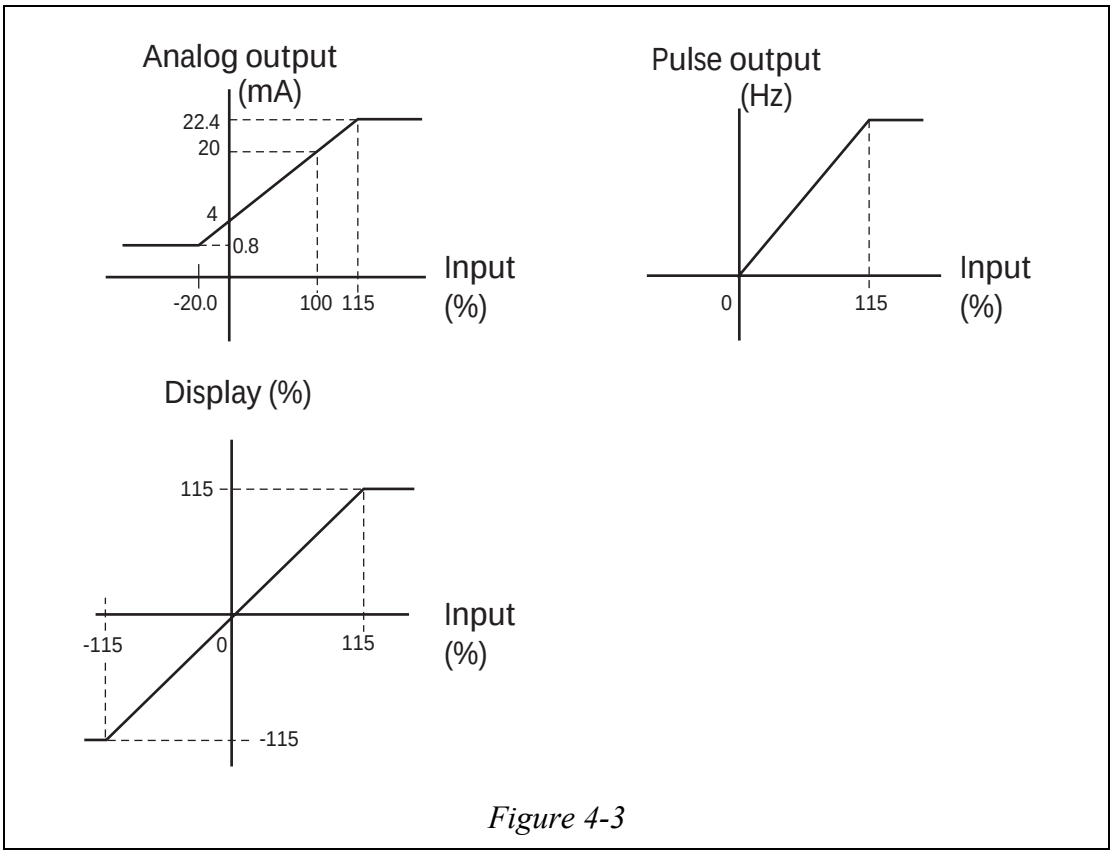


Figure 4-3

Normal direction automatic double range

This function has two ranges: wide and narrow. When the narrow range measurement exceeds 100%, the unit automatically changes to the wide range.

This function should be used in combination with the wide/narrow range distinction output contact. Hysteresis is available when range switching. (See Figure 4-4.)

① When AUTO is selected for an analog output

Range No.1 4-20 mA DC
Range No.2 4-20 mA DC

② When WIDE is selected for an analog output

4-20 mA DC is output according to either range No.1 or range No.2, whichever has the wider span.

When there is a pulse output

The pulse weight is the same for both ranges No.1 and No.2.

Contact output

At shipment, the contact output status of the distinction status signal for ranges No.1 and No.2 is as follows.

Range No.1: Open
Range No.2: Closed

Reverse setting is also possible.

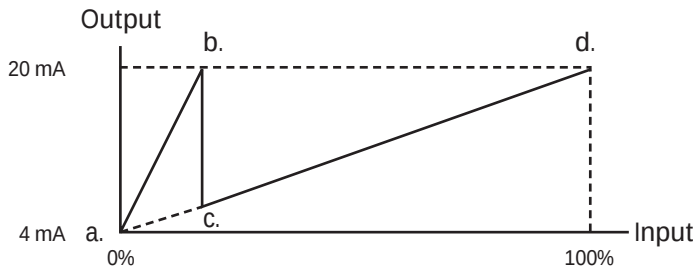


Figure 4-4 Normal direction automatic double range

(Example)

① AUTO range

Range No.1 (narrow range): Outputs 4-20 mA for 0-10 m^3/h (a-b).

Range No.2 (wide range): Outputs 4-20 mA for 0-40 m^3/h (a-d)

② WIDE range

Range No.1 (narrow range): Outputs 4-8 mA for 0-10 m^3/h (a-c).

Range No.2 (wide range): Outputs 8-20 mA for 0-40 m^3/h (c-d).

Normal direction, external switching double range

The range is switched via an external switching command contact input.
Also, the wide/narrow range distinction contact output (status signal) can be sent out using the same timing.

Analog output

① When AUTO is selected for an analog output

Range No.1 4-20 mA DC
Range No.2 4-20 mA DC

② When WIDE is selected for an analog output

4-20 mA DC is output according to either range No.1 or range No.2 whichever has the wider span.

When there is a pulse output

The pulse weight is the same for both ranges No.1 and No.2.

Contact input

Range switching command contact input

Range No.1: Open
Range No.2: Closed

Contact output (select functions as required.)

Range switching distinction status signal
The contact output status at shipment is as follows.

Range No.1: Open
Range No.2: Closed

Reverse setting is also possible.

Normal/reverse automatic switching range

Automatically switches the range when the fluid flow direction reverses.
Hysteresis is a available at the time of normal/reverse switching.

Analog output

Normal direction: 4-20 mA DC
Reverse direction: 4-20 mA DC

When there is a pulse output

There is no distinction in output between the normal and reverse directions. The pulse weight is also the same.
The built-in counter simply integrates the flow rate without distinguishing normal and reverse directions. However, when normal/reverse differential flow integration is selected, integration of the "-" direction (subtraction) is available.

Example: In the normal direction
-100 → -99 → -98 → ... 0 → 1, 2, 3
In the reverse direction
100 → 99 → 98 ... 0 → 1, 2, 3

With indication

With a reverse flow rate, the "-" symbol will appear on the flow rate display. With a pulse output, it is possible to select the normal/reverse differential flow integration function.

Contact output

Normal/reverse distinction status signal
The contact output status at shipment is as follows.
Range No.1: Open
Range No.2: Closed
Reverse setting is also possible

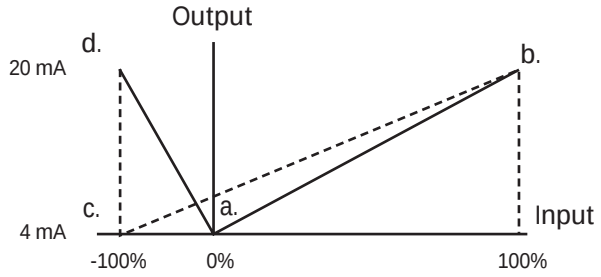


Figure 4-5 Normal/reverse automatic switching range

(Example of setting)

① AUTO range

- Range No.1 (narrow range): Outputs 4-20 mA for 0-10 m^3/h (a-d).
- Range No.2 (wide range): Outputs 4-20 mA for 0-43 m^3/h (a-b).

② WIDE range

- Range No.1 (narrow range): Outputs 4-8 mA for 0-10 m^3/h (a-d).
- Range No.2 (wide range): Outputs 8-20 mA for 0-30 m^3/h (c-b).

When WIDE in selected, Low-flow-cut is not performed.

Normal / Reverse external switching range

Switches between the normal and reverse ranges by inputting a switching command contact from the gear section.

It is also possible to output the normal/reverse range distinctive contact output (status signal) using the same timing.

Analog output

① When AUTO is selected for an analog output

Normal direction: 4-20 mA DC

Reverse direction: 4-20 mA DC

② When WIDE is selected for an analog output

4-20 mA DC is output according to either range No.1 or range No.2, whichever has the wider span.

With pulse output

There is no distinction in output between the normal and reverse directions. The pulse weight is also the same.

The built-in counter simply integrates the flow rate without distinguishing between the normal and reverse directions. However, when normal/reverse differential flow integration is selected, the integration of the "-" direction (subtraction) is available.

Example: In the normal direction

-100 → -99 → -98 ... 0 → 1, 2, 3

In the reverse direction

100 → 99 → 98 ... 0 → 1, 2, 3

With indication

With a reverse flow rate, the "-" symbol will appear on the flow rate display.

When there is a pulse output, it is possible to select the normal/reverse differential flow integration function.

Contact input

Range switching command contact input

Normal direction:when opened

Reverse direction:when closed

Contact output (select the function required.)

Normal/reverse distinction status signal

The contact output status at shipment is as follows.

Range No.1: Open

Range No.2: Closed

Reverse setting is also possible.

[Built-in counter function]

X: Not activated (Not pulse output)

A: Addition counter

In the normal/reverse range, addition is performed in the normal and reverse directions, respectively.

B: Addition counter with preset

The preset value ranges from 0000000000 - 9999999999.

In the normal/reverse range, addition is made in the normal and reverse directions, respectively.

C: Normal/reverse differential flow rate integration display

Displays the difference in integration between the normal and reverse directions.

It is necessary to determine the direction: normal or reverse.

[Contact input function]

This function can be set when either 1- or 2-contact input has been selected in the additional specifications.

X: Not activated

1: External 0% lock input

Use to completely halt the flow rate signal (display, analog output, or pulse output) at 0%.

2: External auto zero adjustment input

Enables zero adjustment from a remote location.
Zero adjustment is possible when the contact is ON for 0.2 seconds or more.
When the contact is ON for 15 seconds or more, the status will become ON again.
Be sure to stop the fluid.

3: External range switching input

Range No.1 or normal direction: when opened
Range No.2 or reverse direction: when closed

4: Built-in counter reset input

Effective when there is a pulse output
Reset will take effect when the contact is ON for 0.2 seconds or more, and counting will start from the counter reset value at the moment when the contact turns OFF.

5: External 0% lock input and external auto zero adjustment input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to external auto zero adjustment input.

6: External 0% lock input and external range switching input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to external range switching input.

7: External 0% lock input and built-in counter reset input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to the built-in counter reset input.

8: External auto zero adjustment input and external range switching input

Terminal ST IN1 can be set to external auto zero adjustment input and the terminal ST IN2 to external switching input.

9: External auto zero adjustment input and built-in counter reset input

Terminal ST IN1 can be set to auto zero adjustment input and terminal ST IN2 to built-in counter reset input.

A: External range switching input and built-in counter reset input

Terminal ST IN1 can be set to external range switching input and terminal ST IN2 to built-in counter reset input.

[Contact output function]

This function can be set when 1- or 2-contact output has been selected in the additional specifications.

X: Not activated

1: Alarm contact output
An alarm is output when any of the following items becomes abnormal.
The abnormal item can be checked on the display inside the instrument.
Also, external confirmation is available using the SFC.

① Self-diagnostic
- Coil disconnection
- ROM error
- RAM error
- NVM error
- ADC error

Table 4-6 Output selection

Mode selection	Burn-out high (HIGH)	Hold (HOLD)	Burn-out low (LOW)
Analog output 4-20 mA	Burn-out high (HIGH) without SFC communication: 24 mA DC with SFC communication: 23.8 mA DC	Hold (HOLD)	Burn-out low (LOW) Without SFC communication: 0.8 mA DC With SFC communication: 2.96 mA DC
Pulse output	—	Hold (HOLD)	Burn-out low (LOW)
Contact output	Abnormal status (Open/closed can be freely selected.)		

⚠ CAUTION

If the power supply is turned OFF with the “Burn-out high” setting, the 4-20 mA output will emit a burn-out high output once. Pay close attention when turning the power supply OFF.

② Empty detection function

When the detector becomes empty of the measured fluid, the respective output signals will be as follows.

Status / Output signal	When the detector is empty of fluid
Analog output 4-20 mA DC	4 mA DC
Pulse output	0%
Contact output	Abnormal status (Open/closed can be freely selected.)

However, this function can be used when the conductivity is 150 μS/cm (equivalent to that of water) or higher. The empty detection function selector switch determines whether this function is activated or not. (The empty detection function is set to "NOT activated" at shipment.)

~ Note *Using the empty detection function with a conductivity of 150 μS/cm or less will cause a measurement error (minus).*

2: Range switching output
The contact output status at shipment is as follows.
Range No.1 or normal direction: Open
Range No.2 or reverse direction: Closed
Reverse setting is also possible.

3: Counter preset status output
Activated when the counter reaches the preset value.

4: Self-check result output
Activated only when a self-diagnostic abnormality occurs in the alarm contact output of code 1.

5: Empty detection function
Activated only when an empty status is detected in the alarm contact output of code 1.

6: High/low limit alarm
Activated only when a high/low limit alarm occurs in the alarm contact output of code 1.

7: Alarm contact output and range switching output (2-contact output)
The alarm contact output can be set to ST.OUT1 and the range switching output to ST.OUT2.

8: Self-diagnostic result output and range switching output (2-contact output)
The self-diagnostic result output can be set to ST.OUT1 and the range switching output to ST.OUT2.

9: Empty detection function and range switching output (2-contact output)
The empty status detection output can be set to ST.OUT1 and the range switching output to ST.OUT2.

A: High/low limit alarm and range switching output (2-contact output)

The high/low limit alarm can be set to ST.OUT1 and the range switching output to ST.OUT2.

B: Range switching output and counter preset status output (2-contact output)

The range switching output can be set to ST.OUT1 and the preset status output to ST.OUT2.

C: Range switching output and (self-check result output or empty detection) (2-contact output)

The range switching output can be set to ST.OUT1 and the output when either a self-check result or empty detection abnormality occurs to ST.OUT2.

D: Alarm contact output and counter preset status output (2-contact output)

The alarm contact output can be set to ST.OUT1 and the counter preset status output to ST.OUT2.

E: 2-stage flow rate alarm output

The high/low limit alarm can be set to ST.OUT1 and the 2-stage high limit alarm or 2-stage low limit alarm to ST.OUT2.

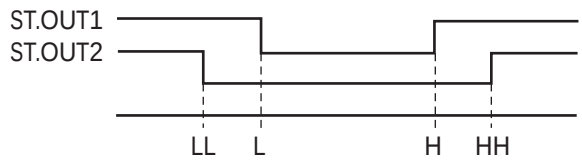


Figure 4-6

Detector data

This function is used to select the constant, model and diameter of the detector being used with this converter. In this screen, two values can be changed: the detector Constant (EX) and the detector diameter (DIA).

⚠ CAUTION

If the converter and detector are purchased together, the converter contains the detector data that was set during actual flow calibration. DO NOT change this data or the flowmeter output will be incorrect.

Step	Key	Screen/key	Procedure
1	⇧ or ⇩	12.3 % # EX 300.0 MGH DIA 050.0	Enter ENGINEERING MODE (see page 4-13). (The first screen in this mode is always the ID SET screen.) Use the ⇩ or ⇧ key to cycle through the screens until the DETECTOR DATA (EX/DIA) screen appears.
2	⇨	12.3 % # EX 300.0 MGH DIA 050.0	Touch the ⇨ key until the cursor is at the detector Constant (EX) to be changed. **Default settings:** • EX: 300.0 • MGH • DIA: 050.0
3	⇧ or ⇩	12.3 % # EX 320.0 MGH DIA 050.0	Touch the ⇩ or ⇧ key to change the value.
4	⇨	12.3 % # EX 320.0 MGH DIA 050.0	Use the ⇨ key to move the cursor to the detector diameter value. The converter works with the following detector diameters (in millimeters): • 40 • 150 • 400 • 50 • 200 • 450 • 80 • 250 • 500 • 100 • 300 • 600
5	⇧ or ⇩	12.3 % # EX 320.0 MGH DIA 100.0	Touch the ⇩ or ⇧ key to change the value.
6	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
7	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Flow rate measurement range

This function is used to set the flow rate measurement range (the value when the electromagnetic output reaches 100%). In this screen, three values can be changed: flow rate value, flow rate unit. and Time unit.

Step	Key	Screen	Procedure
1	⇧ or ⇩	12.3 % # 1.4147 m/s SPAN 10.000m³/h	Enter ENGINEERING MODE (see page 4-13). (The first screen in this mode is always the ID SET screen.) Use the ⇩ or ⇧ key to cycle through the screens until the SPAN (Range) screen appears.
2	⇨	12.3 % # 1.4147 m/s SPAN 10.000m³/h	Touch the ⇨ key until the cursor is at the flow rate value to be changed. Values can range from 0.0001 to 99999.
3	⇧ or ⇩	12.3 % # 2.8294 m/s SPAN 20.000m³/h	Touch the ⇩ or ⇧ key to change the value.
4	⇨	12.3 % # 2.8294 m/s SPAN 20.000m³/h	Use the ⇨ key to move the cursor to the flow rate unit.
5	⇧ or ⇩	12.3 % # 10.186 m/s SPAN 20.000kg/s	Touch the ⇩ or ⇧ key to change the unit. **⚠ CAUTION** If a weight unit is set, the Specific Gravity must also be set to avoid output errors. **Available units:** m^3, l, cm^3, t, kg, g, BPH, KGPH, GPH, mGPH, lb.
6	⇨	12.3 % # 10.186 m/s SPAN 20.000kg/s	Use the ⇨ key to move the cursor to the Time unit.
7	⇧ or ⇩	12.3 % # .16977 m/s SPAN 20.000kg/min	Touch the ⇩ or ⇧ key to change the unit. **Available units:** h, min., s, d
8	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.

Step	Key	Screen	Procedure
9	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Setting hysteresis

Introduction

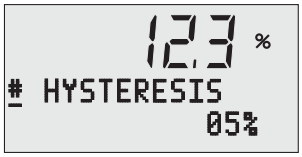
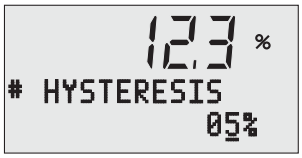
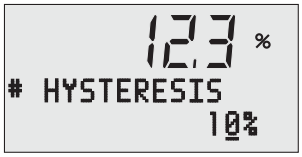
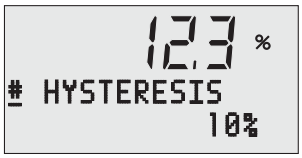
This is used to set the hysteresis as a range function to be used at range switching. Use for normal direction automatic double range or the normal/reverse direction automatic double range.

Default setting

0

Setting range

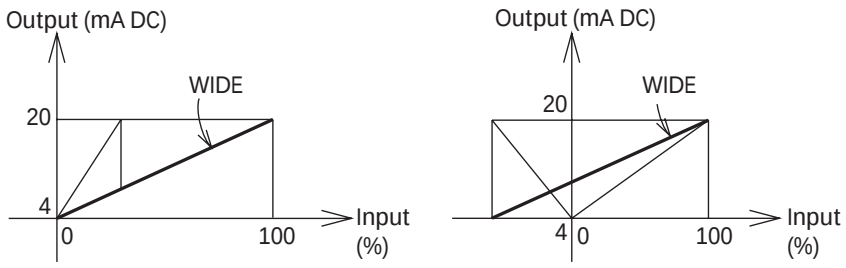
0-20%

Step	Key	Screen/key	Procedure
1			Open the hysteresis setup screen by following the steps to enter the engineering mode.
2	⇨		Touch the ⇨ key once.
3	⇧ or ⇩		Use the ⇩ and ⇧ keys to input the desired hysteresis value. In this example, here the hysteresis is changed from 5% to 10%.
4	⇨		Touch the ⇨ key to move the cursor to the "#".

Selecting the current output method

Introduction

This is used as a range function with the normal direction double range or normal/ reverse direction double range, to select how to output the 4-20 mA analog output: with either the range switching method or the wider range method.



Normal direction double range Normal/reverse direction double range

Figure 4-7

Default setting

AUTO

Setting the range

Either AUTO or WIDE

Step	Key	Screen	Procedure
1		12.3 % # I. OUT RANGE AUTO	Open the current output method selection screen by following the steps to enter the engineering mode.
2	⇨ ◉	12.3 % # I. OUT RANGE AUTO	Touch the ⇨ key once.
3	⇧ ◉ or ⇩ ◉	12.3 % # I. OUT RANGE WIDE	Use the ⇩ and ⇧ keys to enter the desired hysteresis value.
4	⇨ ◉	12.3 % # I. OUT RANGE WIDE	Touch the ⇨ key to move the cursor to the "#"

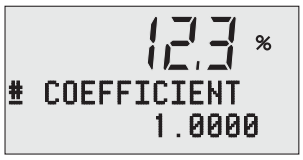
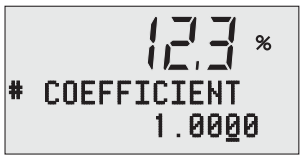
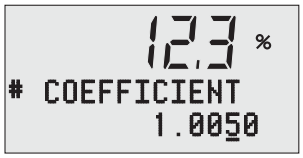
Specific gravity

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

Step	Key	Screen	Procedure
1		12.3 % # GRAVITY 1.0000	Enter ENGINEERING MODE (see page 4-13). (The first screen in this mode is always the ID SET screen.) Use the DOWN or UP key to cycle through the screens until the GRAVITY screen appears.
2	⇨	12.3 % # GRAVITY 1.0000	Touch the ⇨ key until the cursor is at the value to be changed. **Default setting:** 1.0000 **Setting range:** 0.1000 to 9.9999
3	⇧ or ⇩	12.3 % # GRAVITY 1.0050	Touch the ⇩ or ⇧ key to change the value.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

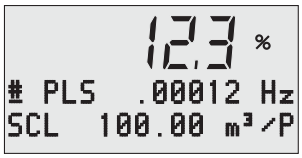
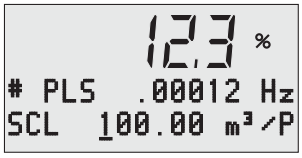
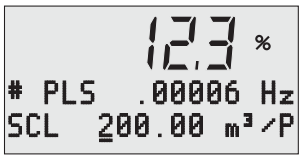
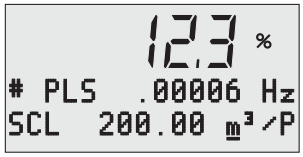
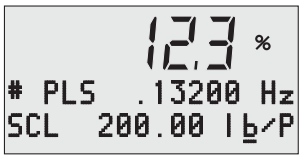
Coefficient of compensation

This function changes the Coefficient of Compensation, which multiplies the Output flow rate in the Main Display.

Step	Key	Screen	Procedure
1			Enter ENGINEERING MODE (see page 4-13). (The first screen in this mode is always the ID SET screen.) Use the DOWN or UP key to cycle through the screens until the COEFFICIENT screen appears.
2	⇨		Touch the ⇨ key until the cursor is at the value to be changed. **Default setting:** 1.0000 **Setting Range:** 0.1000 to 9.9999
3	⇧ or ⇩		Touch the ⇩ or ⇧ key to change the value.
4	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
5	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Pulse weight

This function is used to set the pulse weight value and pulse weight unit.

Step	Key	Screen	Procedure
1			Enter ENGINEERING MODE (see page 4-13). (The first screen in this mode is always the ID SET screen.) Use the DOWN or UP key to cycle through the screens until the PLS (pulse weight) screen appears.
2	⇨		Touch the ⇨ key until the cursor is at the pulse weight value to be changed. **Default setting**: 100.00 cm^3/P.
3	⇧ or ⇩		Touch the ⇩ or ⇧ key to change the value.
4	⇨		Use the ⇨ key to move the cursor to the pulse weight unit.
5	⇧ or ⇩		Touch the ⇩ or ⇧ key to change the unit. **Available units:** m^3, ℓ, cm^3, t, kg, g, B, kG, G, mG, lb.
6	⇨		Touch the ⇨ key until the cursor is back at the mode indicator.
7	MODE		Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASUREMENT MODE within two minutes to save this new value before the system resets it to the previously saved value.

Setting the pulse width

Introduction

The pulse width that will be output from the pulse output terminal can be set when a pulse output board has been selected. This is used to set the pulse width so that the duty ratio at the upper right of the 16-digit display will not exceed 70%.

When changing the pulse width with a double range, use the wider range.

Default setting

NUM 010.00

Setting range

Pulse width: "NUM", "DUTY"

Pulse width: 000.00 - 999.99 ms
When "NUM" is selected, the pulse width can be set freely.
When "DUTY" is selected, "DUTY" is fixed at 50%.

Step	Key	Screen	Procedure
1		12.3 % # PLS 27.778% WID NUM 010.00ms	Open the pulse width setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # PLS 27.778% WID NUM 010.00ms	Use the ⇨ key to move the cursor to "NUM".
3	⇧	12.3 % # PLS WID DUTY 50%	By touching the ⇧ key, the screen used to enter a numerical value pulse width will change to the screen used to fix the duty ratio at 50%.
4	⇧ ⇨	12.3 % # PLS 27.778% WID NUM 010.00ms	To enter the pulse width using a numerical value, return to the numerical value entry screen by using the ⇧ key, and move the cursor to the desired digits using the ⇨ key.
5	⇧ and ⇩	12.3 % # PLS 13.889% WID NUM 005.00ms	Use the ⇩ and ⇧ keys to change the numbers.
6	⇨	12.3 % # PLS 13.889% WID NUM 005.00ms	Touch the ⇨ key to move the cursor to the "#".

Setting the drop-out

Introduction

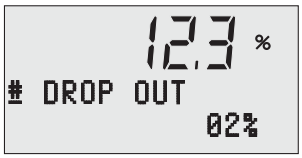
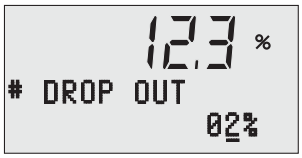
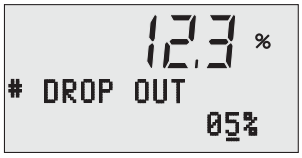
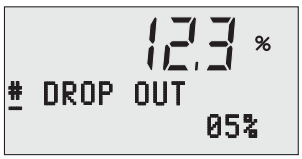
A drop out is set to prevent incorrect integration of the flow rate. Pulse counting will pause when the flow rate is at the preset percentage of the set range.

Default setting

2%

Setting range

0 - 10%

Step	Key	Screen	Procedure
1			Open the drop-out setup screen by following the steps to enter the engineering mode.
2	⇨		Touch the ⇨ key.
3	⇧ and ⇩		Use the ⇩ and ⇧ keys to change the numbers.
4	⇨		Touch the ⇨ key to move the cursor to the “#”.

Setting high and low limit alarms

Introduction
An alarm is output when the instantaneous percent flow rate exceeds the preset high and low limits.

Important
This function can be used when the high/low limit alarm is selected in the contact output function.

Default setting
HI-ALM +100%, LO-ALM +100%

Setting range
HI-ALM -115 to +115%, LO-ALM -115 to +115%

Step	Key	Screen	Procedure
1		12.3 % # HI-ALM +100% LO-ALM -100%	Open the high and low limit alarm setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # HI ALM +100% LO ALM -100%	Use the ⇨ key to move the cursor to desired digit.
3	⇧ and ⇩	12.3 % # HI-ALM +180% LO-ALM -100%	Use the ⇩ and ⇧ keys to change the numbers.
4	⇨	12.3 % # HI-ALM +100% LO-ALM -100%	Touch the ⇨ key to move the cursor to the "#".

Setting a 2-stage flow rate alarm

Introduction
A first alarm will be output when the instantaneous percent flow rate exceeds the preset first high or low limit. A second alarm will be output when the flow rate exceeds the second high or low limits.

Important
This function can be used when the 2-stage high/low limit alarm is selected in the contact output function.

Default setting
HI-ALM1, HI-ALM2 +100% LO-ALM1, LO-ALM2 -100%

Setting range
HI-ALM1, HI-ALM2 -115 to +115% LO-ALM1, LO-ALM2 -115 to +115%

Step	Key	Screen	Procedure
1		12.3 % # LO-ALM1 -100% LO-ALM2 -100%	Open the 2-stage high/low limit alarm setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # LO-ALM1 -100% LO-ALM2 -100%	Use the ⇨ key to move the cursor to the desired digits.
3	⇧ and ⇩	12.3 % # LO-ALM1 +020% LO-ALM2 +010%	Use the ⇩ and ⇧ keys to change the numbers.
4	⇨	12.3 % # LO-ALM1 +020% LO-ALM2 +010%	Touch the ⇨ key to move the cursor to the "#".
5	⇧	12.3 % # HI-ALM1 -100% HI-ALM2 -100%	Touch the ⇧ key to set the 2-stage high limit alarm in the same way.
6	⇨	12.3 % # HI-ALM1 +100% HI-ALM2 +100%	Use the ⇨ key to move the cursor to the desired digits.
7	⇧ and ⇩	12.3 % # HI-ALM1 +090% HI-ALM2 +110%	Use the ⇩ and ⇧ keys to change the numbers.

Step	Key	Screen	Procedure
8	⇨ ◉	12.3 % # HI-ALM1 +100% HI-ALM2 +110%	Touch the ⇨ key to move the cursor to the "#".

Setting the low flow cut

Introduction

When the fluid flow inside the detector is narrow, the fluid is regarded as stationary and the analog output can be latched to zero. The value at which to cut the flow in this situation is referred to as the "low flow latch".

Default setting

OFF

Setting range

OFF or ON 0% - ON 10%

Step	Key	Screen	Procedure
1		12.3 % # LOW FLOW CUT OFF	Open the low flow cut setup screen by following the steps to enter the engineering mode.
2	⇨ ◉	12.3 % # LOW FLOW CUT OFF	Use the ⇨ key.
3	⇧ ◉	12.3 % # LOW FLOW CUT ON 00%	By touching the ⇧ key, the "OFF" message will change to "ON". Now you can enter the low flow cut in a numerical value.
4	⇨ ◉	12.3 % # LOW FLOW CUT ON 00%	Touch the ⇨ key, and the cursor will moves to the numerical figures.
5	⇧ ◉ and ⇩ ◉	12.3 % # LOW FLOW CUT ON 05%	Use the ⇩ and ⇧ keys to select the desired numbers.
6	⇨ ◉	12.3 % # LOW FLOW CUT ON 05%	Touch the ⇨ key to move t.he cursor to the "#".

Determining the pulse output abnormality treatment direction

Introduction

It is possible to determine the pulse output direction when an abnormality occurs in the electromagnetic flowmeter and flow rate measurement becomes impossible. Use this function when analog output is selected.

⚠ CAUTION

The abnormality treatment direction is very important for securing the safety of the overall control process. Determine the treatment direction very carefully. Otherwise the equipment will be damaged.

Default setting

"LOW"

Setting range

"LOW": Outputs no pulse
"HOLD": Holds the pulse to the value obtaining just before the abnormality occurred.

Step	Key	Screen	Procedure
1		12.3 % # ERROR OUT MODE P. OUT LOW	Open the pulse output abnormality treatment direction setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # ERROR OUT MODE P. OUT LOW	Touch the ⇨ key
3	⇧ and ⇩	12.3 % # ERROR OUT MODE P. OUT HOLD	Use the ⇩ and ⇧ keys to determine the abnormality treatment direction.
4	⇨	12.3 % # ERROR OUT MODE P. OUT HOLD	Touch the ⇨ key to move the cursor to the "#".

Determining the analog output abnormality treatment direction

Introduction

It is possible to determine the analog output direction when an abnormality occurs in the electromagnetic flowmeter and flow rate measurement becomes impossible. Use this function when analog output is selected.

⚠ CAUTION

The abnormality treatment direction is very important for securing the safety of the overall control process. Determine the treatment direction very carefully. Otherwise the equipment will be damaged.

Default setting

"LOW"

Setting range

"LOW": Minimizes the output.
"HIGH": Maximizes the output.
"HOLD": Holds the pulse to the value obtaining just before the abnormality occurred.

Step	Key	Screen	Procedure
1		12.3 % # ERROR OUT MODE I. OUT LOW	Open the analog output abnormality treatment direction setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # ERROR OUT MODE I. OUT LOW	Touch the ⇨ key
3	⇧ and ⇩	12.3 % # ERROR OUT MODE I. OUT HIGH	Use the ⇩ and ⇧ keys to determine the abnormality treatment direction.
4	⇨	12.3 % # ERROR OUT MODE I. OUT HIGH	Touch the ⇨ key to move the cursor to the "#".

Setting the contact output status

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

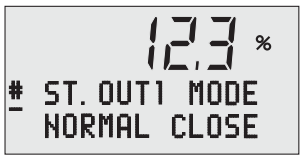
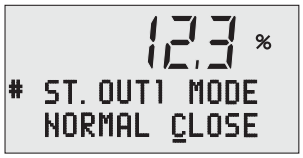
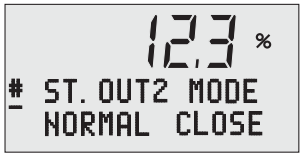
Important
This function is displayed when contact output has been selected.

Default setting
“CLOSE”

Setting range
“CLOSE”, “OPEN”
<For 1-contact input and 1-contact output>

Step	Key	Screen	Procedure
1		12.3 % # ST. OUT MODE NORMAL CLOSE	Open the contact output status setup screen by following the steps to enter the engineering mode.
2	⇨	12.3 % # ST. OUT MODE NORMAL CLOSE	Touch the ⇨ key
3	⇧	12.3 % # ST. OUT MODE NORMAL OPEN	Use the ⇧ key to set the contact output status.
4	⇨	12.3 % # ST. OUT MODE NORMAL OPEN	Touch the ⇨ key to move the cursor to the “#”.

<For 2-contact input>

Step	Key	Screen	Procedure
1			Open the contact output status setup screen by following the steps to enter the engineering mode.
2	⇨		Touch the ⇨ key
3	⇧ and ⇩		Use the ⇩ and ⇧ keys to set the contact output status.
4	⇨		Touch the ⇨ key to move the cursor to the "#".
5	⇨		Touch the ⇨ key to set contact output 2 in the same way.

Maintenance mode

The following screens appear in this order in MAINTENANCE MODE.

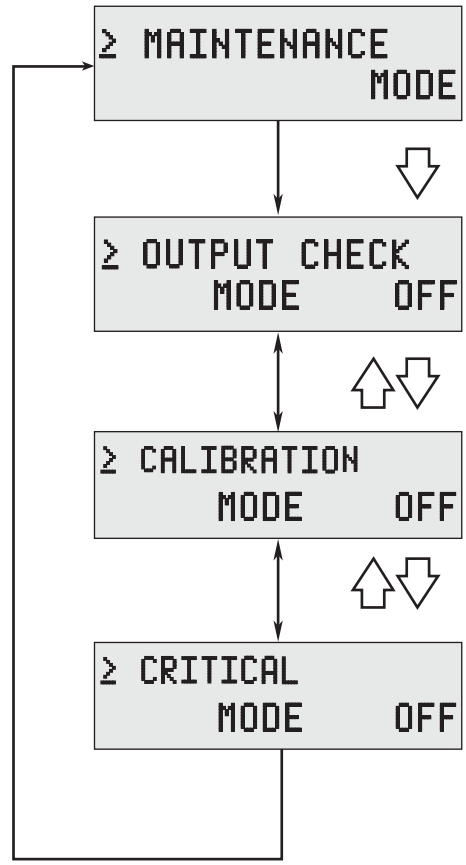


Figure 4-8 MAINTENANCE MODE Screen Organization

Entering MAINTENANCE MODE

Step	Key	Screen	Procedure
1	MODE ◉ hold for 3 sec.	100.0 % ENTER IN OP.MODE YES OR NO	Touch the MODE key and hold for three seconds. The MODE ENTER screen appears.
2	⇨ ◉ twice	100.0 % ENTER IN OP.MODE YES OR NO	Touch the ⇨ key twice to move the cursor to YES. (To exit without changing modes, move the cursor to NO.)
3	⇧ ◉	100.0 % * OPERATOR'S MODE 0.0 % * DAMPING 003.0 s	Touch the ⇧ key once to make the selection. The OPERATOR'S MODE screen appears for approximately two seconds followed by the DAMPING screen.
4	⇧ ◉ or ⇩ ◉	12.3 % * MODE ENTER MAINTENANCE	Use the ⇩ or ⇧ key to scroll through the screens until the MODE ENTER screen appears displaying MAINTENANCE.
5	⇨ ◉	12.3 % * MODE ENTER MAINTENANCE	Touch the ⇨ key to move the cursor to MAINTENANCE.
6	⇧ ◉	12.3 % > MAINTENANCE MODE	Touch the ⇧ key to select. The MAINTENANCE MODE screen appears for approximately two seconds followed by the OUTPUT CHECK screen. Note that the mode indicator has changed to indicate MAINTENANCE MODE (>). As long as the cursor remains under the mode indicator, touching the DOWN or UP key scrolls through the screens available in this mode.

Checking the excitation current

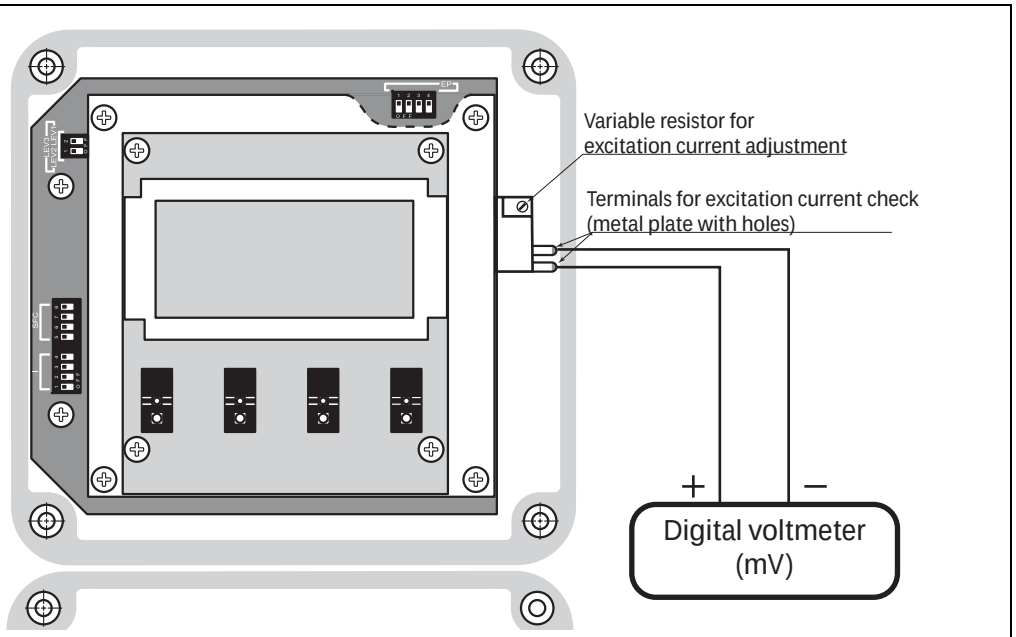


Figure 4-9 Excitation current check terminals

(Preparation)

Connect a digital voltmeter between terminals of the power unit as shown in Figure 4-9.

This function checks the excitation current value that flows into the coil in the detector. This test is not available for integral models.

Step	Key	Screen	Procedure
1		12.3 % ≥ OUTPUT CHECK MODE OFF	Enter MAINTENANCE MODE (see page 4-48). In MAINTENANCE MODE, the OUTPUT CHECK screen is the first screen that appears.
2	⇨	12.3 % > OUTPUT CHECK MODE OFF	Touch the ⇨ key until the cursor is at OFF.
3	⇧	12.3 % > OUTPUT CHECK MODE ON 12.3 % ≥ EX CHECK EX EX YX	Touch the ⇧ key to initiate output checking. The value changes to ON and the first check screen is for the EX CHECK screen. Verify absolute value of the digital voltmeter is 225 mV.
4	⇧		Touch the ⇧ key until the cursor is back at the mode indicator.

Calibration mode

To calibrate the excitation current

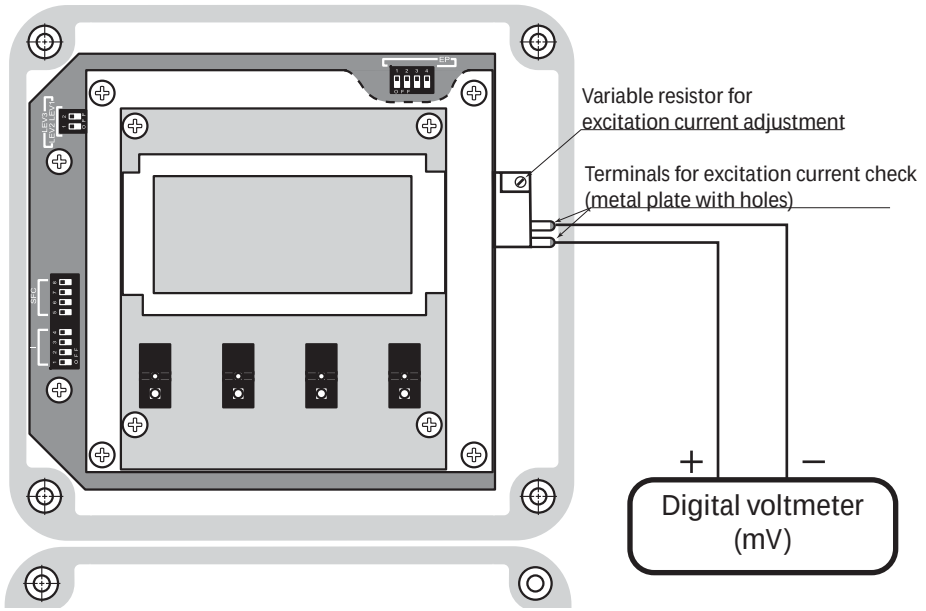


Figure 4-10 Excitation current check terminal

(Preparation)
Connect a digital voltmeter between terminals of the power unit as shown in Figure 4-10.

Step	Key	Screen	Comments
1		≥ MAINTENANCE MODE 2 sec. later ↓ ≥ OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see page 4-48.
2	⇧	≥ CALIBRATION MODE OFF	Touch the ⇧ key.
3	⇨	> CALIBRATION MODE OFF	Touch the ⇨ key
4	⇧	≥ CAL EX VR CAL	While in this display, calibrate by tuning the variable resistor (Figure 4-10) until the digital voltmeter reads 225.0 mV.
5	⇧	≥ CAL GAIN ZERO READY	Touch the ⇧ key. The CAL GAIN screen appears.

To calibrate the internal gain

The calibration of "ZERO" internal gain coefficient

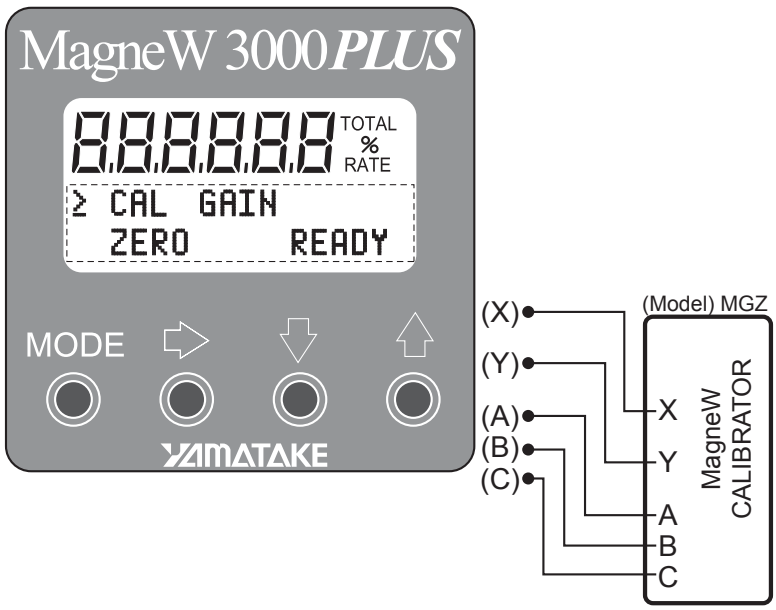


Figure 4-11 Internal gain calibration

(Preparation)
Connect a MagneW calibrator as shown in Figure 4-11.

Step	Key	Screen	Comments
1		> MAINTENANCE MODE 2 sec. later ↓ > OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see page 4-48.
2	⇧	> CALIBRATION MODE OFF	Touch the ⇧ key.
3	⇨	> CALIBRATION MODE OFF	Touch the ⇨ key
4	⇧	> CAL EX VR CAL	Touch the ⇧ key.
5	⇧	> CAL GAIN ZERO READY	Touch the ⇧ key.

Step	Key	Screen	Comments
6	⇨	> CAL GAIN ZERO READY	Input “zero (0m/s)” from MagneW calibrator
7	⇧	> CAL GAIN ZERO ON 20 sec. later ↓ > CAL GAIN ZERO READY	The calibration of “zero (0m/s)” starts by the ⇧ key operation. The calibration of “zero (0m/s)” point has completed.
8	⇨	> CAL GAIN ZERO READY To be continued ↓	Touch the ⇨ key

The calibration of 0.4 m/s internal gain coefficient

Step	Key	Screen	Comments
1		> CAL GAIN ZERO READY	The CAL GAIN is the first screen that appears.
2	⇧	> CAL GAIN1 00.40 m/s READY	Touch the ⇧ key.
3	⇨	> CAL GAIN1 00.40 m/s READY	Input “0.4 m/s” signal from MagneW Calibrator.
4	⇧	> CAL GAIN1 00.40 m/s ON 12 sec. later ↓ > CAL GAIN1 00.40 m/s READY	The calibration of “0.4 m/s” gain starts by the ⇧ key operation. The calibration of “0.4 m/s” gain has completed.
5	⇨	> CAL GAIN1 00.40 m/s READY To be continued ↓	Touch the ⇨ key

The calibration of 1.2 m/s internal gain coefficient

Step	Key	Screen	Comments
1		> CAL GAIN 1 00.40 m/s READY	
2		> CAL GAIN 2 01.20 m/s READY	Touch the ⇧ key.
3		> CAL GAIN 2 01.20 m/s READY	Input “1.20 m/s” signal from MagneW Calibrator.
4		> CAL GAIN 2 01.20 m/s ON 12 sec. later ↓ > CAL GAIN 2 01.20 m/s READY	The calibration of “1.20 m/s” gain starts by the ⇧ key operation. The calibration of “1.20 m/s” gain has completed.
5		> CAL GAIN 2 01.20 m/s READY To be continued ↓	Touch the ⇨ key

The calibration of 3.6 m/s internal gain coefficient

Step	Key	Screen	Comments
1		> CAL GAIN 2 01.20 m/s READY	
2		> CAL GAIN 3 03.60 m/s READY	Touch the ⇧ key.
3		> CAL GAIN 3 03.60 m/s READY	Input “3.60 m/s” signal from MagneW Calibrator.
4		> CAL GAIN 3 03.60 m/s ON 12 sec. later ↓ > CAL GAIN 3 03.60 m/s READY	The calibration of “3.60 m/s” gain starts by the ⇧ key operation. The calibration of “3.60 m/s” gain has completed.
5		> CAL GAIN 3 03.60 m/s READY To be continued ↓	Touch the ⇨ key

The calibration of 10 m/s internal gain coefficient

Step	Key	Screen	Comments
1		> CAL GAIN 3 03.60 m/s READY	
2	⇧	> CAL GAIN 4 10.00 m/s READY	Touch the ⇧ key.
3	⇨	> CAL GAIN 4 10.00 m/s READY	Input “10.00 m/s” signal from MagneW Calibrator.
4	⇧	> CAL GAIN 4 10.00 m/s ON 12 sec. later ↓ > CAL GAIN 4 10.00 m/s READY To be continued ↓	The calibration of “10.00 m/s” gain starts by the ⇧ key operation. The calibration of “10.00 m/s” gain has completed.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor with the ⇨ key and then select other displays with the ⇧ and ⇧ keys.

To check PROM version

Step	Key	Screen	Comments
1		> MAINTENANCE MODE 2 sec. later ↓ > OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see page 4-48.
2	⇩	> CRITICAL MODE OFF	Touch the ⇩ key.
3	⇨	> CRITICAL MODE OFF	Touch the ⇨ key
4	⇧	> ROM VER.□.□□ DATE YY-MM-DD	Touch the ⇧ key.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor with the ⇨ key and then select other displays with the ⇧ and ⇧ keys.

To recover the shipping data

Using this “SHIPPING DATA RECOVERY” function, all of the converter internal data can be changed to the shipping data of Yamatake.

Step	Key	Screen	Comments
1		> MAINTENANCE MODE 2 sec. later ↓ > OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see page 4-48.
2	⇩	> CRITICAL MODE OFF	Touch the ⇩ key.
3	⇨	> CRITICAL MODE OFF	Touch the ⇨ key
4	⇧ 3 times	> SHIPPING DATA RECOVERY READY	Touch the ⇧ key.
5	⇨	> SHIPPING DATA RECOVERY READY	Touch the ⇨ key
6	⇧ more than 8 sec.	> SHIPPING DATA RECOVERY ON 1 sec. later ↓ - SELF CHECK MODE 5 sec. later ↓ - MEASURING MODE 1 sec. later ↓ % SPAN [0.00] m³/h	Touch the ⇧ key, more than 8 sec., the SHIPPING DATA RECOVERY works. After the execution of this function, the mode is automatically changed to “measuring mode”.

Mode for emergency (data broken, etc.)

This mode is used in the event that normal operation can not be recovered even after proper countermeasures were taken.

⚠ CAUTION

After executing this function, re-calibration is necessary.

Step	Key	Screen	Comments
1		> MAINTENANCE MODE 2 sec. later ↓ > OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see page 4-48.
2	⇩	> CRITICAL MODE OFF	Touch the ⇩ key.
3	⇨	> CRITICAL MODE OFF	Touch the ⇨ key
4	⇧ 4 times	> INITIAL DATA RECOVERY READY	Touch the ⇧ key.
5	⇨	> INITIAL DATA RECOVERY READY	Touch the ⇨ key
6	⇧ more than 8 sec.	- SELF CHECK MODE 5 sec. later ↓ - MEASURING MODE 1 sec. later ↓ % SPAN 00.000 m³/h	Touch the ⇧ key, more than 8 sec., the SELF CHECK MODE screen appears. After the execution of this function, the mode is automatically changed to “measuring mode”.

Chapter 5: Operations Using model SFC160/260

Safety precautions

Introduction

Correct operation is necessary for the safe and efficient use of the SFC and MagneW3000 PLUS. Carefully read the safety precautions described in this user's manual and have a thorough understanding of it before operating the product.

Operating precautions

For safe use of the instrument, this manual uses the following symbols:

⚠ WARNING
Denotes a potentially hazardous situation, which is not avoided could result in death or serious injury.

⚠ CAUTION
Denotes a potentially hazardous situation which if not avoided could result in minor injury or damage to device.

Examples of symbol

	The symbol indicates a specific action that is prohibited to prevent danger. The prohibited action (prohibition of dismantling in the case of the figure at left) is indicated by a symbol or next to the symbol.
	The symbol indicates a specific action that is mandatory to prevent danger. The mandatory action (the plug should be removed from the socket in the case of the figure at left) is indicated by a symbol.

⚠ CAUTION
Set the loop of the electromagnetic flow meter whose setting is to be changed to “manual” before starting communication with the SFC. Its output may change due to a communication signal, affecting the operation or control of the plant.

⚠ CAUTION
Do not throw the battery for the SFC into fire. This may result in explosion. Be sure to remove the AC adapter for the SFC from the socket if it is not used. The AC adapter may be over heat.

Structure and functions of SFC

This section presents the structure and functions of the Smart Field Communicator SFC.

- Describes the key types, brief functions of keys, which are color-coded, and general rules of key operations of the SFC.
- Describes names and functions of the SFC keys.

~ Note *For the method of connection between the SFC and MagneW3000 Flowmeter, see the user's manual of the MagneW3000 Flowmeter.*

Using this manual

Organization and method of use

This user's manual describes how to use the SFC for the MagneW3000 Flowmeter in the following sequence.

In this chapter, describes the structure, names of components and parts and the functions of the Smart Field Communicator (SFC), and how to operate the MagneW3000 Flowmeter using the SFC. In respect to the basic operation method of the Smart Field Communicator (SFC), the parts related to the operation of the MagneW3000 Flowmeter will be explained. The keyboard and display screens of the SFC described in this section are all expressed in English.

Notation

SFC key operations

Each of the SFC keys is assigned to two or more functions. To distinguish between these functions, this manual uses the following notations for key operations.

- Press xxxx key: Press the xxxx key only.
- Press SHIFT + xxxx keys: Press the SHIFT key first then press the xxxx key when "SHIFT-" appears on the SFC screen.

INDEX

Configuration and structure of SFC measurement system

Operation using model SFC160/260 (English)

Structure and functions of SFC

Overview of this section

This section presents the structure and functions of the Smart Field Communicator SFC.

- Describes the structure, names of components and parts, and functions of the SFC.
- Describes the key types, basic functions of keys, which are color-coded, and the general rules of key operations of the SFC.
- Describes the names and functions of the SFC keys.

~ Note *For the method of connection between the SFC and MagneW3000 Flowmeter, see the MagneW3000 user's manual.*

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 newer. 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 life of the battery.*

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 MagneW3000 Flowmeter, see the model SFC160/260 user's manual of the respective series’.

Structure of Smart Field Communicator (SFC)

Names of components

Figure 5-1 shows the structure and names of components for the Smart Field Communicator (SFC).

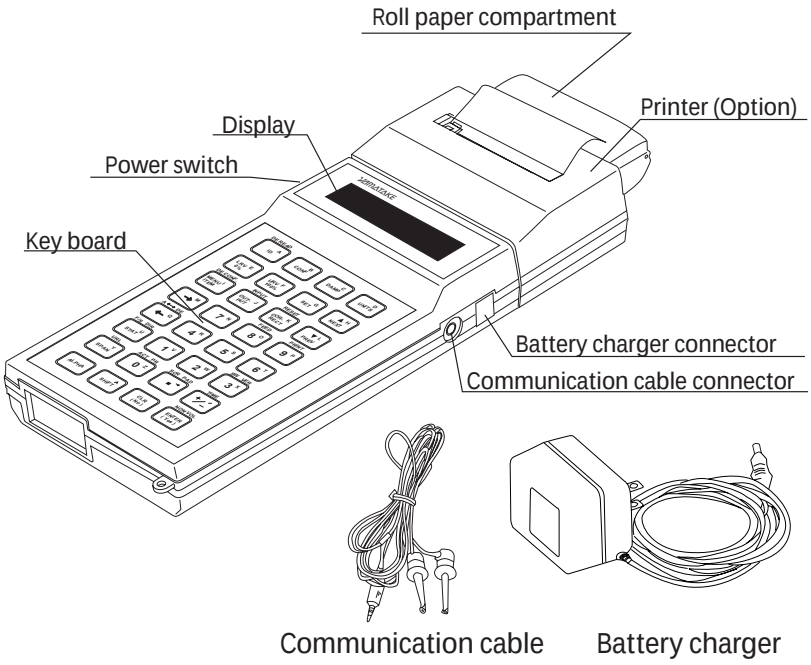


Figure 5-1 Details of SFC

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 one 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 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.* : SFCM00006001D

Functions of SFC

SFC keyboard (1)

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.

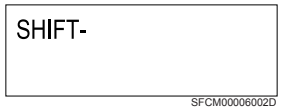
• Function, numeral or symbol at the center of the DE READ ID A key

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.



SFCM00006002D

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 converter or display or change the setting.
- Orange: Mainly used to communicate with the SMT 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.

SFC keyboard (2)

General rules for keyboard 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.
- The status in the display window shows whether the key is active or inactive. Pressing an inactive key does not affect the entry on the screen and the function just before the key is pressed remains active. Retry pressing an active key.
- The SFC operates on an interactive basis. When an interrogative message appears on the screen, press the NON-VOL ENTER (Yes) key to answer “Yes” and press CLR (No) to answer “No”.

Key names and functions

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

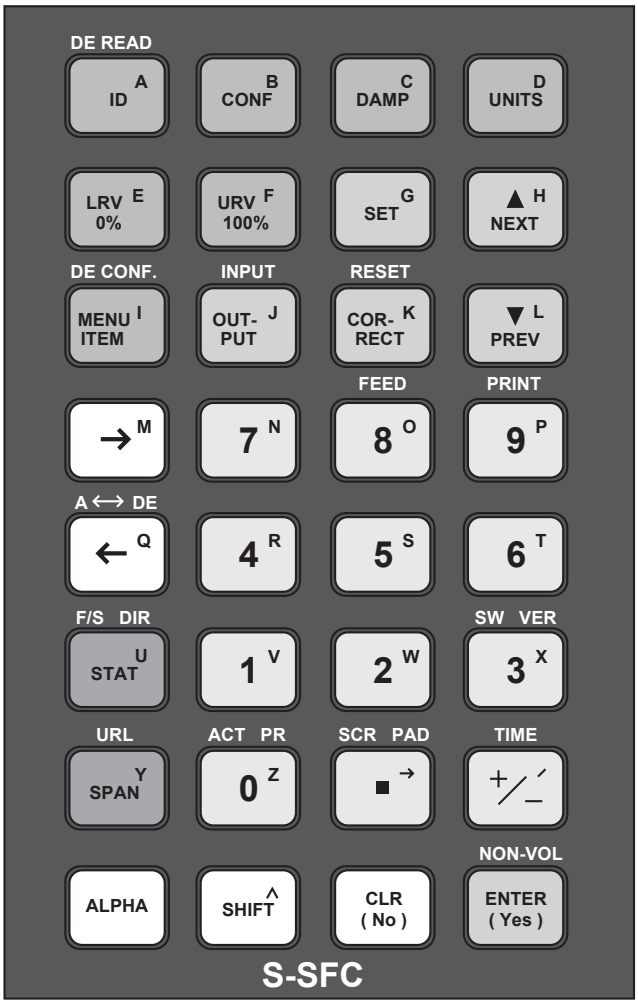


Figure 5-2 SFC keyboard

Key	Description	
	Press key	Press SHIFT + key
DE READ A ID	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 conversion output is DE. Has the same function as ID.
B CONF	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 Function" in Chapter 2 or Chapter 3, for details.	No effect
C DAMP	DAMP: Press this key to display or change the damping time constant of the converter.	No effect
D UNITS	UNITS: Press this key to display or set the engineering units of the flow rate measured using the converter.	No effect
LRV E 0%	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 become 0% (4mA DC in the case of analog output).	No effect
URV F 100%	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% (20mA DC in the case of analog output).	No effect
DE CONF. MENU I ITEM	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.

SFC keyboard (3)

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	No effect	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- J PUT	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- K RECT	CORRECT: Press this key to adjust the zero point of the converter. This operation is available while INPUT (input) is being read.	No effect
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.

SFC keyboard (4)

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.

SFC keyboard (5)

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.

Before communicating using 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. This section explains the functions of the SFC organized by purpose.

⚠ CAUTION
Be sure to use the SFC with software version 7.0 or newer. Using earlier versions may fail to operate the SFC correctly.

Check during operation

The following functions are used while the converter is in operation.

- Starting communication: DE READ / ID A (ID) key
- Displaying flow rate measured value: INPUT / OUT-PUT J (INPUT) key
- Displaying transmitting output: INPUT / OUT-PUT J (OUTPUT) key
- Displaying self-diagnostics result: F/S DIR / STAT U (STAT) key

Data printing

The SFC with a printer has the following printing functions.

- Printing internal data: PRINT / 9 P key
- Continuous printing of response results: ACT PR / 0 Z key

Setting and changing

The following functions are used to set or change the internal data of the converter.

- Setting detector constant: “EX(mA)” function
- Setting detector type: “TYPE=” function
- Setting diameter of detector: “DIAMETER=” function
- Entering TAG No.: DE READ / ID A key
- Switching between digital output and analog output: A ↔ DE / ← Q key
- Setting output range: URV F / 100% key
- Setting engineering units: D / UNITS key
- Setting specific gravity: “_.__Spec Gray” function
- Changing flow rate display: “DISP=” function
- Setting/changing damping time constant: C / DAMP key
- Setting or changing low flow cutoff: “CUT-OFF=” function
- Deciding fail-safe direction: “F/S SET UP” function

Status check

The following functions can be used to check the status of the SFC.

• Displaying software version: SW VER / 3 X key

• Displaying self-diagnostics result: F/S DIR / STAT U key

Functions of SFC

Introduction

The functions available with the SFC include functions directly assigned to the respective keys and CONFIG functions that are entered by pressing the CONF B key.

Key assigned functions

The following are the functions directly assigned to the SFC keys.

DE READ / ID A	ID/DE READ : Starts communication.
INPUT / OUT- PUT J	INPUT : Reads the real measured value of flow rate and sets the specific gravity.
INPUT / OUT- PUT J	OUTPUT : Reads the output of the converter in percentage or outputs a constant current from the converter.
F/S DIR / STAT U	STAT : Displays self-diagnostics result of the converter.
PRINT / 9 P	PRINT : Prints out internal data of the converter.
ACT PR / 0 Z	ACT PR : Continuously prints out response result.
A ↔ DE / ← Q	A ⇔ DE : Switches between digital and analog outputs.
DE CONF. / MENU I ITEM	DE CONF : Selects an output format of digital signal.
LRV E 0%	LRV, URV, SPAN : Displays or sets the output range or sets specific gravity.
URV F 100%	
URL / Y SPAN	
D UNITS	UNIT : Sets engineering units or sets specific gravity.
C DAMP	DAMP : Sets a damping time constant.
SW VER / 3 X	SW VER : Displays the software version.

CONFIG functions

The CONFIG functions that are entered by pressing the CONF key include the following 16 sub-functions.

16 sub-functions of CONFIG functions

[CUT-OFF]	: Setting of low flow cutoff
[DISP=]	: Setting of flow rate display
[EX(mA)]	: Setting of detector constant
[TYPE]	: Setting of detector type
[DIAMETER=]	: Setting of detector diameter
[F/S SET UP]	: Setting of fail-safe direction
[DIGITAL I/O]	: Setting of contact input/output function
[INIT DATA RECOV]	: Initialization of internal data
[GAIN CALIB]	: Gain calibration
[CORRECT DAC]	: Analog output calibration
[UNIT]	: Selection of unit system and setting of specific gravity
[READ TOTAL]	: Reads flow rate counter value
[PULSE OUTPUT]	: Displays pulse output value
[SET TRIP VALUE]	: Sets counter preset value
[PULSE CONFIGURE]	: Sets pulse output parameter
RESET TOTALIZE	: Resets flow rate counter

Hierarchical structure of CONFIG functions

Hierarchical structure chart

The CONFIG functions form a hierarchical structure. Before using the CONFIG functions, check the positions of the respective sub-functions with the supplied hierarchic structure chart.

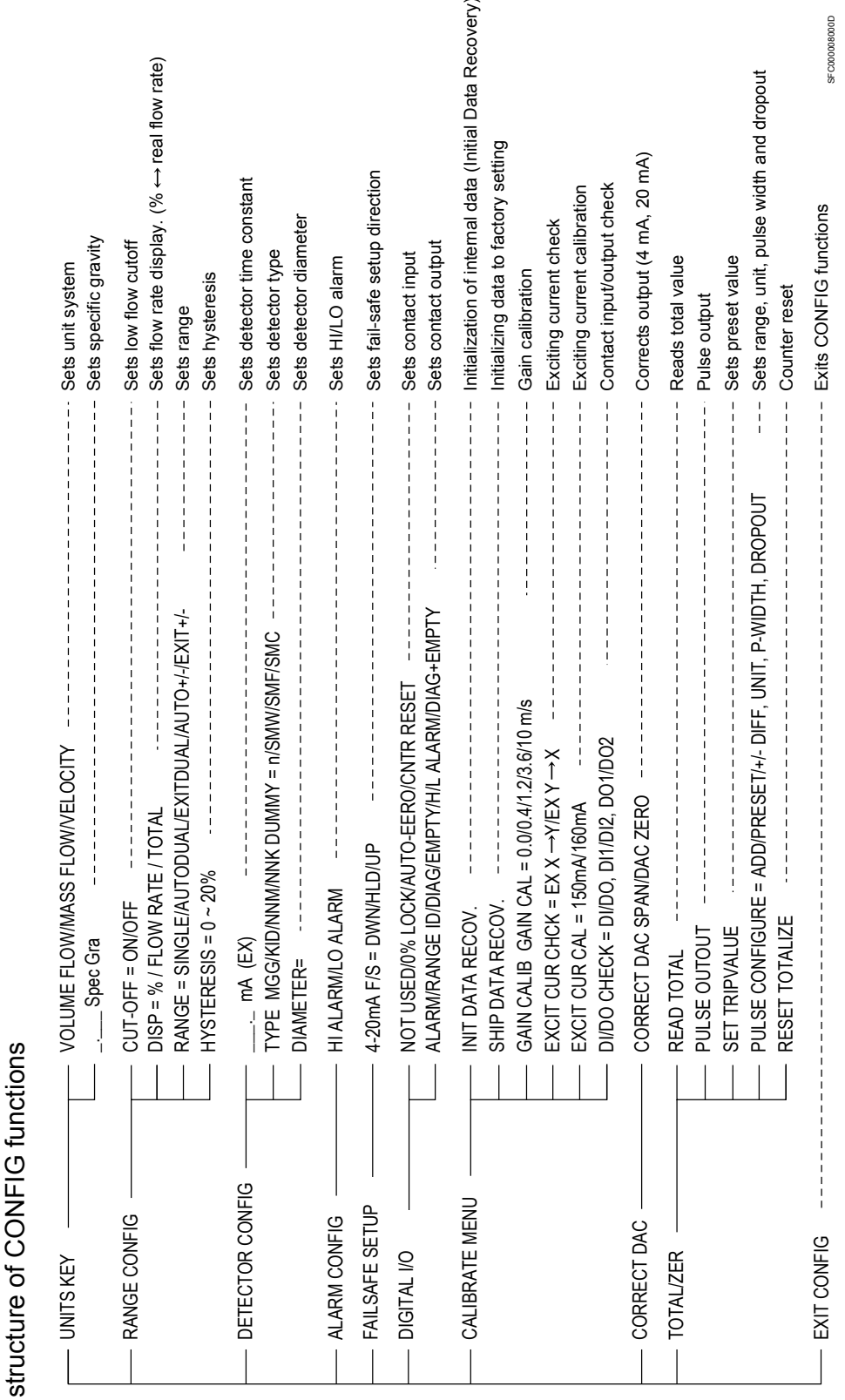
The SFC screen displays only two lines, and so if it is not clear which hierarchy is shown, see the hierarchy chart on page 5-14.

⚠ CAUTION

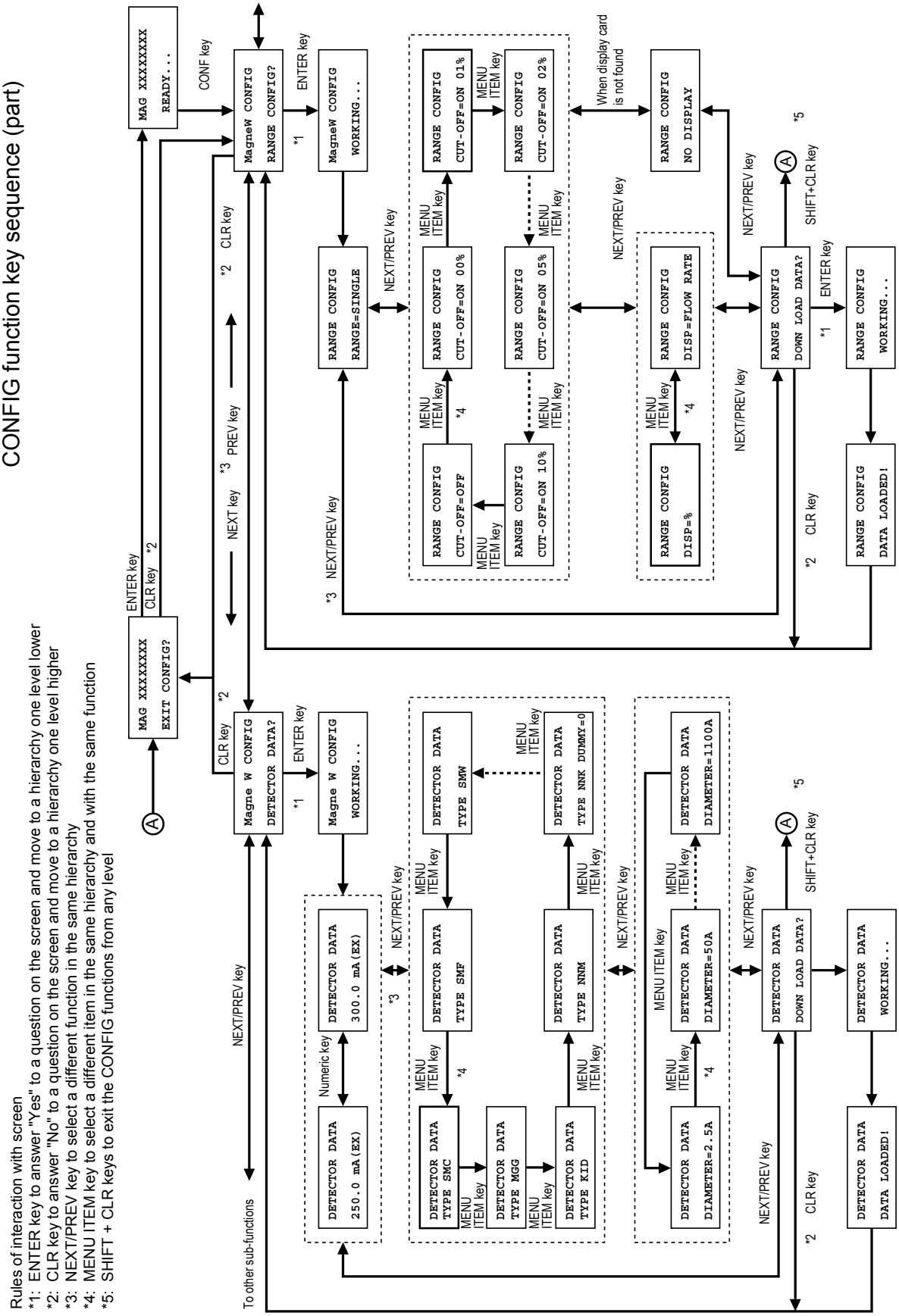
- Do not operate the following screen from the calibration menu. Operating this screen will erase all data entered in the electromagnetic flow meter.

- For the following screens in the calibration menu, see the section of calibration in the respective converter user's manuals.
- Analog output calibration
- Gain calibration

Hierarchical structure of CONFIG



Example of key sequence



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 → M / A ↔ DE ← Q 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 ITEM I 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 action" on page 5-51.

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.

Procedure

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

Check during operation

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.

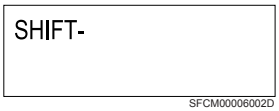
Procedure

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.

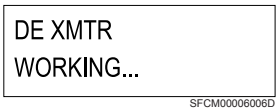
Step	Key	Procedure	SFC screen
1		Check that the converter has been started. If not started yet, start the converter with reference to “Starting converter” in the user's manual of each model number of the MagneW3000 Smart Electromagnetic Flowmeter.	
2		Make sure the wiring between the converter signal line and SFC is correct.	
3	DE READ ID A	Turn to the SFC on. **Result:** • The SFC executes self-diagnostics and the screen to 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

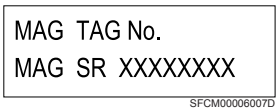
<table>
<tr><th>Step</th><th>Key</th><th>Procedure</th><th>SFC screen</th></tr>
<tr><td>4</td><td> 


</td><td>• In the case of a system with digital output, press the 

key here.
 

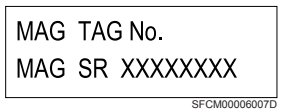
SFCM00006002D
Press the 

key.
 

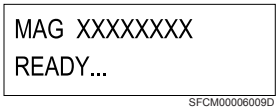
SFCM00006006D
 

SFCM00006007D</td><td>• In the case of a system with analog output, press the 

key here.
 

SFCM00006008
 

SFCM00006007D</td></tr>
<tr><td colspan="4"><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 no TAG No. has been entered in the converter yet, the TAG No. shows up 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.” on page 2-26.
If there is no need to enter a TAG No., go to step 6.</td></tr>
<tr><td>6</td><td> 
</td><td colspan="2">Press the 

key. The following screen appears.
 

SFCM00006009D</td></tr>
</table>

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 (INPUT) key. **Result:** • The instantaneous flow rate value appears as shown here to 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 transmitting output: OUTPUT key

Procedure

Use the following procedure to be able to read the current output value from 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 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 here to the right.	OUTPUT XXXXXXXX 25.00 % SFCM00006011D
3	CLR (No)	After checking the current output value, press the CLR (No) key to return to at step 1. • The current output value appears as shown here to the right.	

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.

Procedure

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.	

Data printing

Overview of printing function

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”.

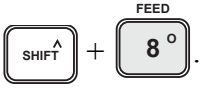
Action printout (continuous printout):

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 

.

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 

key is pressed.

To cancel the feed function, press the 

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, or low flow cutoff.

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” on page 2-10.	
2	CLR (No)	Make sure that the SFC is set to “READY“. If it is not, press the CLR (No) key 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 (PRINT) 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
		Tag No. XXXXXXX	Tag no.
		'01-01-01 10:00	Date and time when printed
	Detector	: 50 A	Diameter
	TYPE	: MGG	Type
*	DUMMY	: 2	Number of dummies (for model NNK only)
	EX	: 300.0 mA	Detector constant
	RANGE E	: SINGLE	Transmitter type (EXT, DUAL, AUTO DUAL, SINGLE, EXT, +/-, AUTO +/-)
	ANA/DE	: ANALOG XMTR	Communication mode (ANALOG XMTR, DE XMTR)
	DI	: DI NOT USED	Setting of contact input
	DO	: DO NOT USED	Setting of contact output
	SW VER	: 3.1	S/W version
	DAMP	: 3.0 SECONDS	Damping constant
	SPAN1	: 7069 mA3/h	Span 1
*	SPAN2	: 20.00 mA3/h	Span 2 (for dual range only)
**	IOUT	: AUTO	Selection of current output (AUTO, WIDE) (for other than single range)*1
	GRAVITY	: 1.000	Specific gravity
**	COEFF	: 1.5000	Correction coefficient
*	HYS	: 05%	Auto-switching hysteresis width (for AUTO range only)
*	ALRM H	: 40%	Upper range limiter (when DO is "ALARM" only)
*	L	: 10%	Lower range limiter (when DO is "ALARM" only)
*	ALRM H1	: 110%	Upper range limiter 1 (when DO is "HH/LL ALARM" only)
*	H2	: 100%	Upper range limiter 2 (when DO is "HH/LL ALARM" only)
*	L1	: 10%	Lower range limiter 1 (when DO is "HH/LL ALARM" only)
*	L2	: 10%	Lower range limiter 2 (when DO is "HH/LL ALARM" only)
	LOFCUT	: OFF	Low flow cutoff
	F/S I	: DOWN	FAIL/SAFE direction current output (DOWN, HOLD, UP)
*	DO	: CLOSE	FAIL/SAFE direction contact output (CLOSE, OPEN)
*	P	: STOP	FAIL/SAFE direction pulse output (with pulse card only) (STOP, HOLD)
*	PULSE		Pulse information (with pulse card only)
*	CONF	: ADD	Setting of built-in counter (ADD, PRESRT, +/- DIFF)
*	PRESET	: 0123456789	Preset value (for preset counter setting only)
**	PRESET	: 9876543210	Reset value
*	WEIGHT	: 196.36 cm2/p	Pulse weight
*	WIDTHT	: 30 MS	Pulse width
*	DROP	: 02%	Dropout value
***	INPUT	: -0.909 MA3/h	Input value (If the transmitter is in CRITICAL state, "CRITICAL STAT" is printed)
***	OUTPUT	: -6.62%	Output value (when set to dual range, the range number is printed at the 23rd character)
***	STATUS CHECK= OK		Transmitter status (normal time. In the event of an error, statuses are printed out one by one)

~ Note ** Printed out only when set.*

~ Note *** When an unsupported transmitter is connected, this item shows "no printout".*

~ Note **** When the transmitter gross status is NON-CRITICAL, "#" is printed out at the end of the bottom line.*

Continuously printing response result: ACT PRINT key

Used when

Action printout (continuous printout) is used to continuously print out results of responses from the converter to key operations from the SFC and 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” on page 2-10.	
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 ACT PR 0 Z (ACT PR) key.	MAG XXXXXXXX ACTION PRINT ? SFCM00006017D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** Action printout starts by printing: * ACTION PRINT * START TAG No. FIC-123 '95-12-18 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 (ACT PR) 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 that of 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 + NON-VOL ENTER (Yes) keys

C DAMP keys

URL Y SPAN

LRV E 0%

SHIFT ^ + 0 + CLR (No) keys

Printing example of corresponding action printout

```
* ACTIONPRINT    * START
     TAG. No. TAG-0001
 '01. 07. 10 16:11

 DAMP     TAG-0001
 0.0      s

 SPAN     TAG-0001
 300.0    mm

 LRV      TAG-0001
 0.000    mm


 * ACTION PRINT   * END
```

Setting and changing

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 show the screen here to 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 here to the right.	MagneW CONFIG WORKING... SFCM00006020D DETECTOR DATA 300.0 mA (EX) SFCM00006021D
5		Press numeric keys to set the detector constant.	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 at 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 show the screen at the right.	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
8	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen at 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.

Used when:

This function is used to set a correct detector type when only the detector has been changed to one of a different 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 show the screen here to 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 show the screen here to the right.	DETECTOR DATA TYPE MGG SFCM00006027D

Step	Key	Procedure	SFC screen
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.	
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen at 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 show the screen (DOWN LOAD).	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
9	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen here to 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 show the screen here 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 show the screen here to the right.	DETECTOR DATA DIAMETER = 2.5 mm SFCM00006028D
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 A up to 1100.	DETECTOR DATA DIAMETER = 40 mm SFCM00006029D

Step	Key	Procedure	SFC screen
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen at 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 show the screen (DOWN LOAD) to the right.	DETECTOR DATA DOWNLOAD DATA ? SFCM00006024D
9	NON-VOL ENTER (Yes)	**Result:** • The screen to 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.	

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 "Starting SFC" on page 2-10.	LOOP IN MANUAL ? PRESS ID SFCM00006005D
2	CLR (No) SHIFT ^ + DE READ ID A	Carry out the following operation according to the output format of the SFC used. **Branch:** • In the case of analog output, press the DE READ ID A key. • In the case of digital output, press the SHIFT ^ + DE READ ID A keys.	MAG TAG No. MAG SR XXXXXXXX SFCM00006007D (For digital output) MAG TAG No. MAG SR XXXXXXXX SFCM00006007D (For analog output)
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 to display the "□"cursor.* • *To enter numerals, press the ALPHA key again to 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 digital output) MAG DE TAG No. MAG SR FIC-123 SFCM00006030D (For analog output)

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.

⚠ 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 ^	Press the SHIFT ^ key.	SHIFT- SFCM00006002D
3	A ↔ DE ← Q	Press the A ↔ DE ← Q key. **Result:** • If digital output is currently set, the screen to the right appears. • If analog output is currently set, the screen to the right appears.	MAG XXXXXXXX CHNG TO ANALOG ? SFCM00006031D (For digital output) MAG XXXXXXXX CHNG TO DEGITAL ? SFCM00006032D (For analog output)
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Branch:** • To stop switching of the output format, press the CLR (No) key. The screen at step 1 appears.	MAG XXXXXXXX ARE YOU SURE !? SFCM00006033D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MAG XXXXXXXX WORKING... SFCM00006006D MAG XXXXXXXX ANALOG XMTR SFCM00006034D MAG XXXXXXXX DE XMTR SFCM00006035D

Setting output range: 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 m3/h) on the screen.

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. **Result:** • 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. **Result:** • The changed setting is written into the database of the converter and is displayed on the screen.	URV XXXXXXXX WORKING... SFCM00006038D UNIT XXXXXXXX t/h SFCM00006039D
5	CLR (No)	Press the CLR (No) key to return to 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, cm^3/min, m^3/day, GPD, kGPD, BPD, m^3/s GPH=gals/hr, GPM=gals/min, GPD=gals/day, kGPD=1000XGPD, BPD=barrels/day	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 here to the right.	UNIT XXXXXXXX t/h SFCM00006039D
3	▲ H NEXT or ▼ L PREV 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

Step	Key	Procedure	SFC screen
4	NON-VOL ENTER (Yes)	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) NON-VOL ENTER (Yes) CLR (No)	Press the NON-VOL ENTER (Yes) key. When the screen as shown here to 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 specific gravity: "_.__Spec Gray" function

Introduction

If the engineering unit set by the converter is a mass flow rate, it is possible to set the specific gravity.

Procedure

Use the following procedure to set or change the specific gravity.

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 UNITS KEY ? SFCM00006043D
3	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	
4	DE CONF. MENU I ITEM	Press the DE CONF. MENU I ITEM key.	UNITS KEY MASS FLOW SFCM00006044D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen to the right appears and the set unit system is confirmed.	UNITS KEY ENTERED IN SFC SFCM00006045D
6	▲ H NEXT	Press the ▲ H NEXT key to open the specific gravity setting screen. Press numeric keys to set specific gravity.	UNITS KEY 1.0000 Spec Gra SFCM00006046D
7	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen at right appears and the set specific gravity is confirmed.	UNITS KEY ENTERED IN SFC SFCM00006045D

Step	Key	Procedure	SFC screen
8	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV key to show the screen (DOWN LOAD) as shown to the right.	UNITS KEY DOWN LOAD DATA ? SFCM00006047D
9	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. • The screen to the right appears and the changed setting is written into the database of the converter. The screen returns to step 2.	UNITS KEY WORKING... SFCM00006048D UNITS KEY DATA LOADED ! SFCM00006049D
10	SHIFT ^ + CLR (No)	To exit this setting function, press the SHIFT ^ + CLR (No) keys.	

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.

This function has no effect in the converter not provided with a display panel.

Operation using display panel

Flow rate display can also be set from the display panel provided for the converter. For details on the method of operation, see the user's manuals of the MagneW3000 Flowmeter Smart Electromagnetic Flow Meter of the respective model numbers.

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 show this screen.	RANGE CONFIG DISP = FLOW RATE SFCM00006050D
5	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen to 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=% and DISP=FLOW RATE alternately. Display the screen that you want to set.	RANGE CONFIG DISP = % SFCM00006052D

Step	Key	Procedure	SFC screen
7	DE CONF. MENU / ITEM	Press the NON-VOL ENTER (Yes) key. Result: The screen to the right appears and the set flow rate display is confirmed.	RANGE CONFIG DISP = % SFCM00006052D
8	▲ H NEXT or ▼ L PREV	Press the ▲ H NEXT key or ▼ L PREV keyto 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/changing damping time constant: DAMP key

Introduction

A damping time constant is set to cut a micro fluctuation component of a measured instantaneous flow rate value and transmit it to the control loop. The damping time constant can be set to 0.5 up to 199.9 sec. using numeric keys.

Operation using display panel

Flow rate display can also be set from the display panel provided for the converter. For details on the operation method, see the user's manuals of the MagneW3000 Flowmeter Smart Electromagnetic Flow Meter of the respective model numbers.

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		Or 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 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 with care.

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.	

Step	Key	Procedure	SFC screen
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 on the screen. **~ Note** *Once CUT OFF=OFF is set, the judgment function to judge whether a fluid is stationary or not will be bypassed by the converter after this setting.*	RANGE CONFIG CUT OFF = ON 1% SFCM00006059D
6	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key. **Result:** • The screen to 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. • 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
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.	

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. There are three directions as shown below.

- Failsafe up (UP): Causes the readout of a signal from the converter to swing fully in the direction of a maximum value.
- Failsafe down (DWN): Causes the readout of a signal from the converter to swing fully in the direction of a minimum value.
- Hold (HLD): Keeps the output immediately to the value before the error occurence.

The default factory setting is fail-safe down.

⚠ 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.

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 F/S SETUP ? SFCM00006060D
4	NON-VOL ENTER (Yes)	Press the NON-VOL ENTER (Yes) key.	MagneW CONFIG WORKING... SFCM00006020D

Step	Key	Procedure	SFC screen
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 setting of the fail-safe direction, 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	Pressthe ▲ 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. • The screen to 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
9	SHIFT ^ + CLR (No)	To exit the F/S SET UP function, press the SHIFT ^ + CLR (No) keys.	
10	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 one in step 1.	

Status check

Displaying software version: SW VER key

Procedure

Use the following procedure to confirm the software version of 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 SW VER 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.	

Displaying self-diagnostics result: STAT key

Introduction

It is possible to sequentially display self-diagnostics results of the converter from the SFC. It is useful if this function is used in combination with action printout.

Procedure

Use the following procedure to display self-diagnostics results.

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	F/S DIR U STAT	Press the F/S DIR U STAT key. **Result:** • When no error has occurred, the message to the right is displayed. • If an error has occurred, a "#" appears at the end of the bottom line of the display window of the SFC.	MAG XXXXXXXX WORKING... SFCM00006006D STATUS CHECK=OK SFCM00006067D MAG XXXXXXXX OUTPUT MODE # SFCM00006014D
3	CLR (No)	After checking the self-diagnostics result, press the CLR (No) key to return to the screen at 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 here to 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. Press numeric keys to enter the value of a signal current to be generated in percentage.	OUTPUT XXXXXXXX WORKING... SFCM00006068D
3		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 makes 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

Error messages and action

Stopping converter

If an error message “A major fault. Stop the electromagnetic flow meter” in the table below appears, turn OFF the power to the conversion section to stop the electromagnetic flow meter.

Troubleshooting

Whenever problems occurs while the electromagnetic flow meter is in operation, use the STAT (diagnostics) key of the SFC to read the error message and self-diagnostics result and take action according to the table below.

Step	Error message	Checkpoint and action
1	A/D FAULT	• A major fault. Stop the electromagnetic flow meter. • The A/D conversion function 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 the inquiry address given at the back of this user's manual.
2	BAD CONFIG DATA	• Some internal data is abnormal. • Check the setting with the display function of each setting or configuration printout.
3	CORRECTS RESET	• Re-correction is required to keep precision. • Set the CONFIG data. • Perform correction and zero point adjustment.
4	EMPTY PIPE?	• No fluid may be put in the detector. • Check whether the upstream valve is closed or not.
5	ENTRY > SENS RNG	• The flow rate measured value may exceed the upper range value. • Reset the output range.
6	ENTRY HEIGHT	• The set value of constant current generation exceeds the allowable range. • Reset the set value.
7	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.*

Step	Error message	Checkpoint and action
8	EXCIT COIL.FAULT	• A major fault. Stop the electromagnetic flow meter. • The detector coil may have wire breakage. • Check the connection between the detector and converter, measure the resistance of the coil and check whether there is any wire breakage.
9	FAILED COMM CHK	• It is not possible to communicate with the electromagnetic flow meter. • Check the SFC and communication loop.
10	HI RES / LO VOLT	• The load resistance of the loop is too large or the power supply voltage is too low.
11	ILLEGAL RESPONSE	• Not communicating with the electromagnetic flow meter normally. • Check the communication cable and load resistance.
12	IN LOCAL MODE	• The conversion section is currently being operated from the display panel. • At this time, it is not possible to communicate from the SFC.
13	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.
14	INVALID DATABASE	• A major fault. Stop the electromagnetic flow meter. • This error occurs because the converter database has not been set correctly when the power to the conversion section is turned ON. • Reenter the CONF data.
15	INVALID REQUEST	• The requested function cannot be performed. • Check the operation procedure of the SFC and press the F/S DIR STAT U key.
16	LOCAL MODE	• The converter is being operated. • At this time, it is not possible to communicate from the SFC.
17	NO XMTR.RESPONSE	• There is no response from the electromagnetic flow meter. • Check the communication cable and measurement loop.

Step	Error message	Checkpoint and action
18	NVM FAULT	• A major fault. 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 the inquiry address described on the back of this user's manual.
19	PRINTER FAIL!	• The printer does not operate.
20	RAM FAULT	• A major fault. 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 the inquiry address given at the back of this user's manual.
21	ROM FAULT	• A major fault. 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 the inquiry address given at the back of this user's manual.
22	SFC FAULT	• An SFC error. • Replace the SFC.
23	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.
24	TYPE-DIA ERROR	• This is a diameter or detector type mismatch. • Check the diameter or type of the detector.
25	>RANGE	• The calculation result of the SFC has exceeded the display range. • Restart the SFC.
26	:	• The SFC battery is running low. • Charge the SFC.
27	#	• A minor fault. • Press the F/S DIR STAT U (diagnostics) key and check the self-diagnostics result of the SFC.

Chapter 6: Maintenance

This chapter contains the maintenance and inspection procedures for the flowmeter. The model MGH10/14C requires regular calibration and the Excitation Current should be checked regularly to spot any possible problems.

~ Note *The 250V, 3A fuse cannot be replaced by the customer.*

Cleaning

Clean the outside of the converter and detector using a soft cloth and commercially available cleaner as needed.

Checking connections

To ensure uninterrupted operation of the system, terminal connections should be checked at least once every six months. If the converter is installed in an area with possible vibration, they should be checked more often.

Calibration

Although the model MGH10/14C is designed to provide stable operation over time, periodic calibration is advised to ensure accurate measurement.

⚠ CAUTION

Before performing auto zero calibration of the flowmeter, make sure the detector is properly grounded (grounding resistance must be less than 100 Ω), that the detector is filled with the fluid to be measured and that the fluid is in static condition. Zero adjustment is possible with a flow speed of 0.2 m/s (.656 ft./s) or less, but the flow speed should be 0.0 m/s (0.0 ft./s) for accurate adjustment. Output errors can result from improper zeroing.

Using the data panel

Calibration can be done using the data panel. See “Auto zero” on page 4-7.

Using a simulated signal

When trouble occurs with the flowmeter, use this method to judge whether the detector or the converter is responsible for the problem.

You can use a dedicated calibrator to generate the same signal as the flow rate signal from the detector. The converter function can be checked using this simulated signal.

You will need the value of the measuring range to perform this test. Calibrate the flowmeter according to the Calibrator’s Operating Manual (#CM2-MGZ100-2001).

Checking the excitation current

The Excitation Current should be checked periodically. See “Checking the excitation current” on page 4-50.

Chapter 7: Troubleshooting

If a problem occurs during start-up or operation, the following three causes should be considered:

- Inconsistency between the flowmeter's specifications and the actual operating conditions
- Incorrect settings or operation of the flowmeter
- Flowmeter malfunction

This chapter provides troubleshooting information for system startup, operation, and error codes that can appear on screen.

Errors at startup

When a problem occurs at start-up, perform the procedures listed in the following table. If the problem persists, the flowmeter may be damaged and you should contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 7-1 Startup Errors

Symptom	Check Points and Treatment
No display after power on.	• Check the converter power supply specification and ensure that the power supply being supplied meets these requirements. • Make sure the ambient temperature is not below -25 °C (13 °F).
No output after power-on.	• Verify that the signal line is correctly connected.

Operation errors

When a problem occurs during operation:

Check against the table on this page for symptoms of the error. If found, perform the steps indicated in the table. If the problem persists, the flowmeter may be damaged and you should contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 7-2 Operation Errors

Symptom	Check Points and Treatment
Output fluctuates excessively beyond the estimated flow rate range.	• Verify that the detector is properly grounded. • Verify that the converter is properly grounded. • Verify that the damping time constant is set correctly. If not, set the an appropriate damping time constant. • Clean the electrodes.
Flow rate exceeds the flow range	• Check the flow range setting and make sure it is set to match the detector and process flow. If not, set an appropriate RANGE. • Check that the flowmeter has been zeroed. If not, calibrate the flowmeter.
Output exceeds 100%.	• Verify that the set range is set correctly. • Verify that the span is set correctly. • Verify that the zero point is correctly adjusted. • Verify that the converter is correctly calibrated.
Output remains 0%.	• The pipe may be empty. Use the empty detection function to check whether or not the pipe is empty. (If it is empty, the empty detection function will be functioning.) • Verify that the signal cable is correctly connected. • Verify that the valves are open on the upper and lower sides. • Verify that the span is set correctly. • Verify that the converter is set to the constant current mode. • Verify that the flow rate is not in the low flow cutoff range.

Error messages

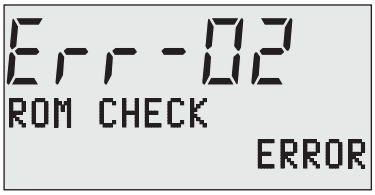
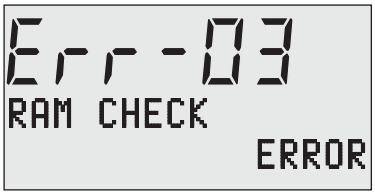
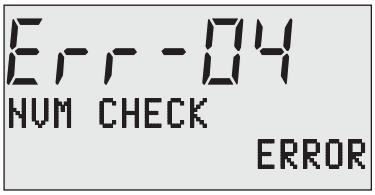
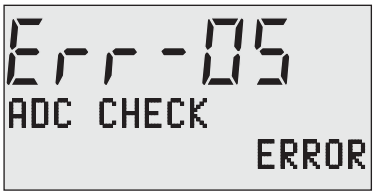
Error messages are grouped by the severity of the problem. There are messages for minor problems and for serious problems.

Error codes for serious problems

Serious problems can obstruct flowmeter operation and ultimately damage the flowmeter if not corrected. When serious trouble occurs during operation, an error message appears on the converter's display panel and the flowmeter continues to output the preset value in the abnormality treatment (fail-safe) direction. The error message and the self-diagnostic results are visible on the display panel.

The following table shows the possible error codes for serious problems and what to do. If the problem persists after trying these solutions, contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 7-3 Serious Errors

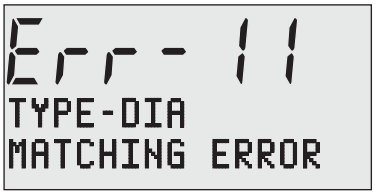
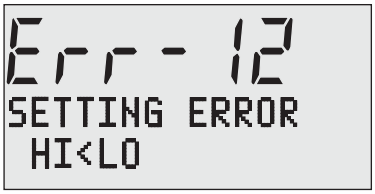
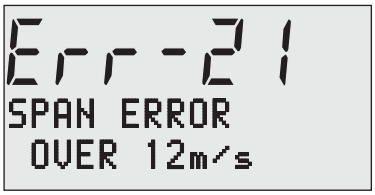
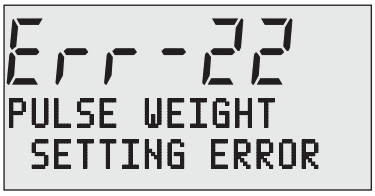
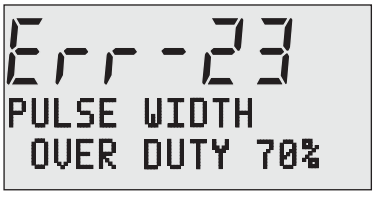
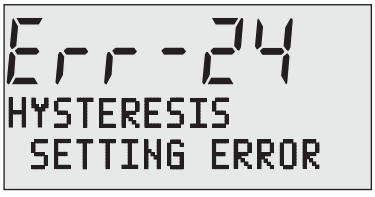
Error Screen	Error	Solution
	ROM check error	• Restore power. • Replace the ROM. • Replace the main card.
	RAM read after write error	• Restore power. • Replace the main card.
	NVM read after write error	• Restore power. • Replace the main card.
	ADC error A/D change error	• Restore power. • Replace the main card.

Error codes for minor problems

Minor problems do not seriously obstruct flowmeter operation. When an error occurs during operation and is regarded by the system as a minor problem, the flowmeter continues to output the flow rate.

The following table shows the possible error codes for minor problems and what to do. If the problem persists after trying these solutions, contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 7-4 Minor Errors

Error Screen	Error	Solution
	Detector type and diameter do not match.	• Check the setting for the detector diameter and enter the correct diameter.
	High/low limit alarm error. HI < LO	• Set HI > LO.
	The span setting is greater than 12 m/s.	• Check the SPAN setting. • Check the DIA setting. • Check the TYPE setting • Check the DUMMY setting.
	The pulse frequency is either too high or too low.	• Check the pulse weight setting. • Check the pulse frequency setting.
	Pulse width too large. Duty 70% or more at pulse frequency output.	• Check 1. Pulse width 2. Pulse weight and 3. Span setting
	Hysteresis exceeding 100% of range in normal/ reverse automatic range	• Check hysteresis setting.

Chapter 8: Replacement Parts

The figure below and the following table show all the available replacement parts for the model MGH10/14C. Refer to the part number when ordering.

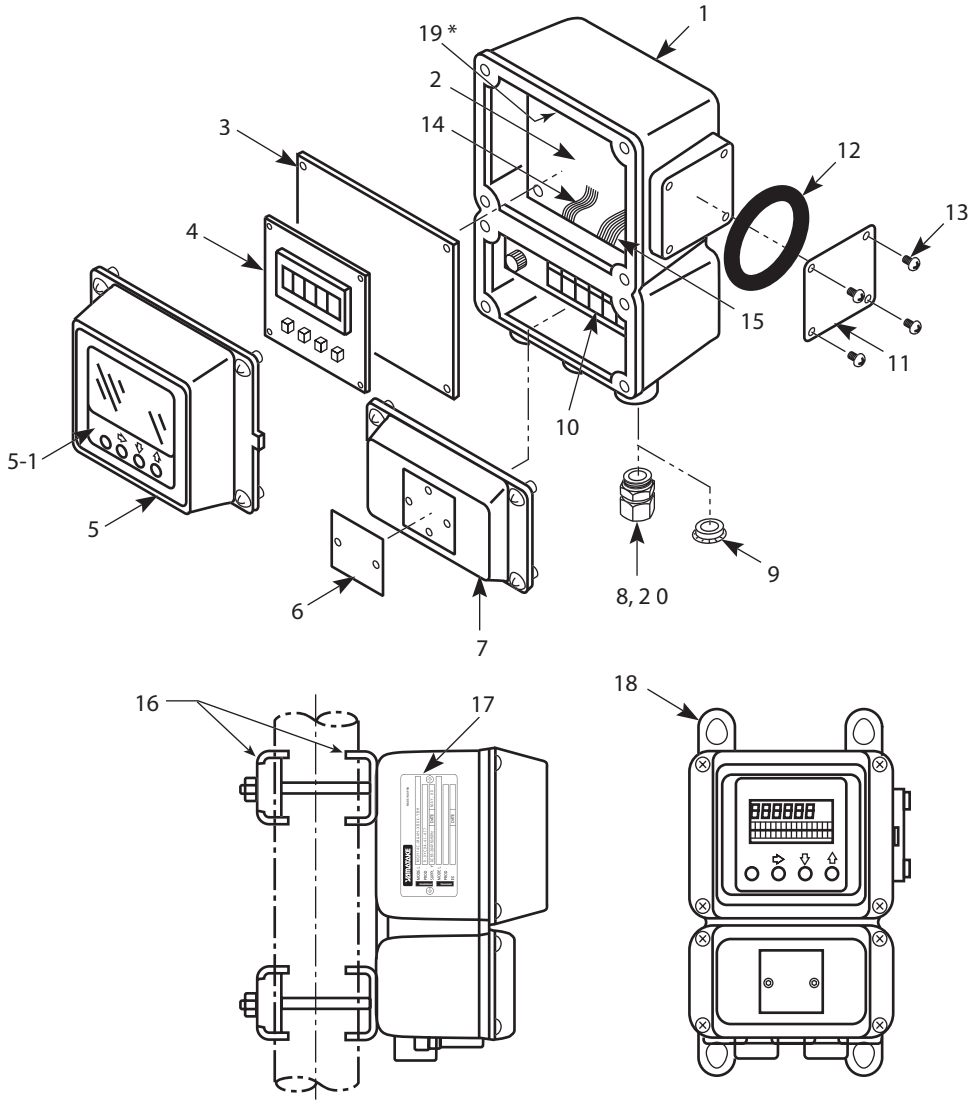


Figure 8-1 Replacement Parts

* Power unit is located behind No.2

Table 8-1 Replacement Parts

Key No.	Description	Qty.	Part Number	
1	Converter main body (Standard finish) (Corrosion-resistant finish) (Corrosion-proof finish)	 1 1 1	 80382026-00100 80382026-10100 80382026-20100	
2	Main card (for SFC communication) Main card (for HART communication)	1 1	80382001-00100 80382001-00300	
3	Display control card / Pulse output card	1	80381038-00100 (w/pulse) 80381038-00200 (w/o pulse) 80381087-00300 (for HART communication w/pulse) 80381087-00400 (for HART communication w/o pulse)	
4	Display panel	1	80381043-001	
5	Display cover assembly (W/ LCD)		MGH10C	MGH14C
	Horizontal and Integral model			
	(Standard finish)	1	80381004-00100	80381164-06100
	(Corrosion-resistant finish)	1	80381004-10100	80381164-16100
	(Corrosion-proof finish)	1	80381004-20100	80381164-26100
	Display cover assembly (W/O LCD)			
	Horizontal and Integral model			
	(Standard finish)	1	80381004-01100	80381164-07100
	(Corrosion-resistant finish)	1	80381004-11100	80381164-17100
	(Corrosion-proof finish)	1	80381004-21100	80381164-27100
	Display cover assembly (W/ LCD)			
	Vertical and integral, or remote model			
	(Standard finish)	1	80381004-00200	80381164-06200
	(Corrosion-resistant finish)	1	80381004-10200	80381164-16200
	(Corrosion-proof finish)	1	80381004-20200	80381164-26200
	Display cover assembly (W/O LCD)			
	Vertical and integral, or remote model			
	(Standard finish)	1	80381004-01200	80381164-07200
	(Corrosion-resistant finish)	1	80381004-11200	80381164-17200
	(Corrosion-proof finish)	1	80381004-21200	80381164-27200
5-1	Glass (W/ LCD) (W/O LCD)	 1 1	 80381009-00100 80381009-01100	 80381163-06100 80381163-07100
6	Tag no. plate	1	80381014-001	
7	Terminal box cover (Standard finish) (Corrosion-resistant finish) (Corrosion-proof finish)	 1 1 1	 80381010-00100 80381010-10100 80381010-20100	

Table 8-1 Replacement Parts

Key No.	Description	Qty.	Part Number
8	Watertight gland (Ni plated brass) (Plastic) (SUS304)	 1 1 1	 80356020-10100 80352997-00100 80356020-00100
9	Plug (W/ Air-purge hole) (W/O Air-purge hole)	 1 1	 80381089-00100 80381052-00100
10	Terminal assembly (90 to 264V AC)	 1	 80382014-00100
11	Cover	1	80381073-00100
12	O-ring	1	80020935-80700
13	Screw	4	HS311250-10000
14	ABC cable (signal cable)	1	80382010-00100
15	XY cable (excitation cable)	1	80381046-00100
16	Pipe mounting kit (for 2-inch pipe) (SPCC) (SUS304)	 1 1	 80279935-00200 80381130-00200
17	Name plate (model MGH14C) Name plate (model MGH10C)	1	80381162-00100 80381003-00100
18	Wall mounting kit (SPCC) (SUS304)	1	 80279935-00100 80381130-00100
19	Power unit (90 to 264V AC, 47 to 63 Hz)	 1	 80382012-00100
20	Adaptor assembly (1/2NPT) (CM20) (Pg13.5)	1	 80381077-00100 80381077-00200 80381077-00300

Document Number:	CM2-MGH210-2001
Document Name:	MagneW3000 FLEX/PLUS Smart Electromagnetic Flowmeter Converter Model MGH10/14C
Date:	Jul. 2004 (First issue)
Issued/Edited by:	Yamatake Corporation

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