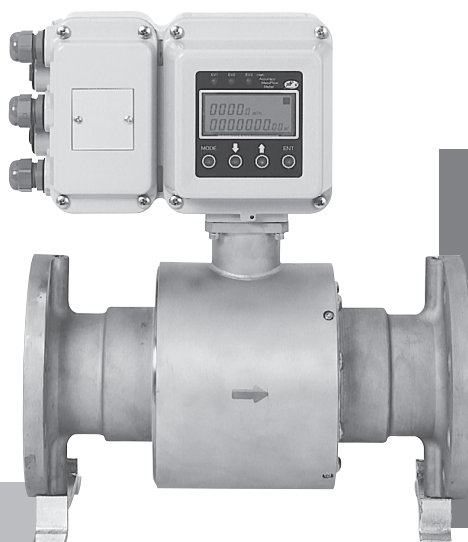




CML 050/080/100/150 High-Flow Mass Flow Meter User's Manual



Thank you for purchasing an Azbil Corporation product.

This manual contains information for ensuring the correct use of this product. It also provides necessary information for installation, maintenance, and troubleshooting.

This manual should be read by those who design and maintain equipment that uses this product. Be sure to keep this manual nearby for handy reference.

Azbil Corporation

NOTICE

"Natural gas" in this document refers to city gas in Japan.

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact the azbil Group.



In no event is Azbil Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

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The μ F™ is a trademark of Azbil Corporation in Japan.

Conventions Used in This Manual

- The safety precautions explained in the following section aim to prevent injury to the operator and others, and to prevent property damage.

	WARNING	Warnings are indicated when mishandling this product might result in death or serious injury.
	CAUTION	Cautions are indicated when mishandling this product might result in minor injury to the user, or physical damage to the product.

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



Use caution when handling the product.



The indicated action is prohibited.



Always follow the indicated instructions.



Handling Precautions:

Handling Precautions indicate items that the user should pay attention to when handling the CML.



Note:

Notes indicate information that might benefit the user.



This indicates the item or page that the user is requested to refer to.

(1) (2) (3):

Numbers within parentheses indicate steps in a sequence or parts of an explanation.

5-02

This indicates 7-segment indication on the setup display.

MODE



key

This indicates a key on the display.

Safety Precautions

WARNING



If this device is used with a flammable gas such as natural gas 13A, propane, or butane, install it on the upstream side of the safety shutoff valve.

If air somehow enters the piping, resulting in an explosive mixture, and the sensor makes a spark due to some cause like a lightning strike, an explosion could occur inside the pipe.



Do not use this device or the connected pipes as a step. Doing so can damage the device or pipes, and if you lose your footing you could be injured.



The mass of this device is 14 to 45 kg or more. When moving or transporting it, use equipment such as a dolly or use 2 or more people. Carelessly hoisting the device and accidentally dropping it can cause injury or damage.

CAUTION



Do not mount with the display facing down. Doing so might cause measurement error or device failure.



Do not flush out the pipes with this device installed. If foreign matter enters the device, it may give faulty measurements or break down.



To prevent leakage from the pipes, tighten bolts to the specified torque.



Be sure the load connected to the output terminals does not exceed the rated values given in the specifications. An excessive load can damage this device.



After wiring and before turning the power on, be sure to check that the wiring, the polarity of the power, etc., are correct. Incorrect wiring can cause malfunction or damage.



Be sure that the operating gas temperature does not fall to -25°C . At -25°C and below, the O-ring may crack, allowing gas to leak out.



After the piping work is complete, remove the temporary support brackets. Otherwise someone might bump into them and be injured.



Be sure to use this device within the flow-rate range stipulated in the product specifications. To prevent excessive flow, use a suitable means to control the supply pressure or use a throttle valve or the like to control the flow rate.

If the flow rate exceeds the high limit, both the flow rate display and the output voltage/ current may indicate considerably lower values than the actual flow rate.





If loss or damage could result from the abnormal functioning of this device, include appropriate redundancy in the system design.

Unpacking

Check the following items when unpacking:

1. Check the model number to make sure you received the correct product.
2. Check for any obvious damage.
3. Check the contents of the package against the packing list to make sure that all items are included.

Items included in the CML are shown below. Handle the CML and its accessories with care to prevent damage or loss of parts. If there is any problem with your order, please contact your dealer immediately.

Name	Model No.	Q'ty	Remarks
Flowmeter	CML _ _ _ _	1	 See ■ Model selection table (P. 1-2)
 User's Manual	CP-SP-1161E	1	This manual
Fuse	250 V 3 A	1	This is a replacement part. (A fuse has already been installed in the terminal box fuse holder.)
Waterproof gland		2	Used for the wiring ports.
Inspection report		1	A report on the results of inspection of this device

Contents

Conventions Used in This Manual

Safety Precautions

Unpacking

Chapter 1. OVERVIEW	1-1
■ Overview	1-1
■ Features	1-1
■ System configuration example	1-1
■ Model selection table	1-2
■ Gas types and flow rate ranges	1-2
Chapter 2. NAMES AND FUNCTIONS OF PARTS	2-1
Chapter 3. INSTALLATION AND WIRING	3-1
■ Installation location	3-2
■ Behavior when the flow rate greatly exceeds the measurement range	3-3
■ Notes on piping	3-3
■ Pipe installation	3-8
■ Wiring	3-11
Chapter 4. OPERATION	4-1
■ Flow rate indication	4-1
■ Temperature and pressure indication	4-1
■ Totalized flow display and totalized count reset function	4-1
■ How to set up functions	4-1
■ Function setup item list	4-2
■ Parameter setup	4-4
■ Parameter setup table	4-5
Chapter 5. TROUBLESHOOTING	5-1
Chapter 6. SPECIFICATIONS	6-1
■ Specifications	6-1
■ External dimensions	6-3
■ Pressure loss (flow rate and pressure loss characteristics)	6-4
■ Filters	6-7

Terms and Conditions

Chapter 1. OVERVIEW

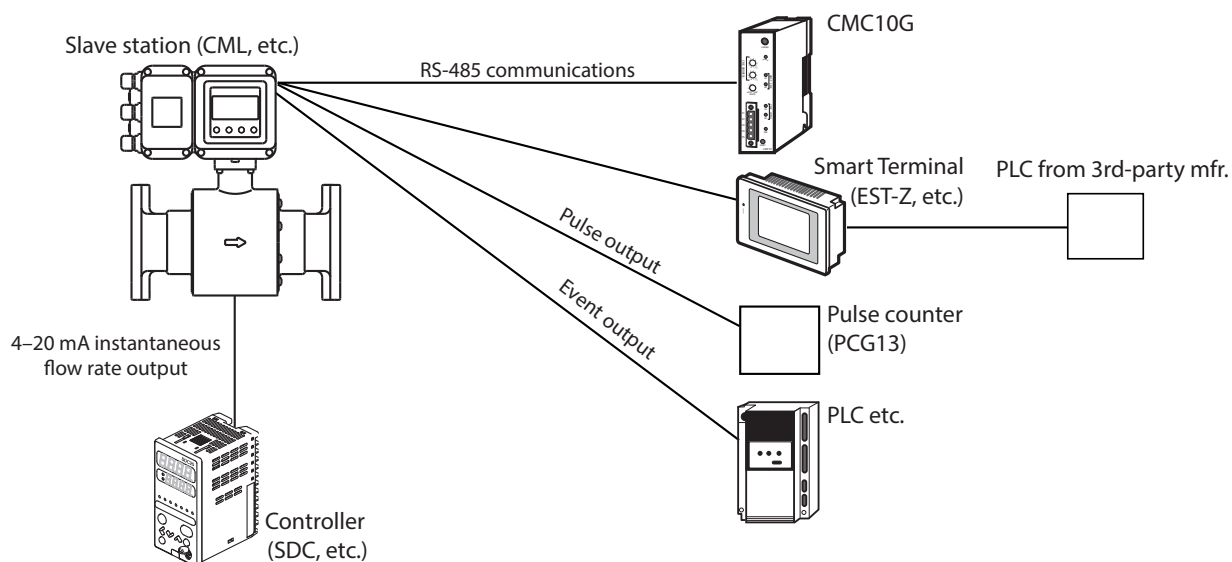
■ Overview

The CML High-Flow Mass Flow Meter features high accuracy and high rangeability, which are made possible by Micro Flow thermal mass flow sensors (hereafter, μF sensors) developed by Azbil Corporation.

■ Features

- This thermal mass flow meter does not need temperature and pressure compensation. Since expensive temperature and pressure compensation equipment is not required, substantial cost reduction is possible.
- The CML incorporates μF sensors made with silicon micromachining and thin-film technology. Each of the μF sensor's sides is only 1.7 mm long, and it is just 0.5 mm thick. Four of these highly sensitive and fast-responding flow speed sensors are built into the flowmeter.
- To cover high and low flow rate ranges, two sensors of each type are mounted 90° apart on the wall of the gas flow path. By switching alternately the sensor groups according to the flow rate range, the CML can achieve high accuracy ($\pm 2\%$ rdg. at 5% FS or more in the measurement range) and high rangeability (160:1 for all models) in flow rate measurement.
- To meet a variety of requirements, the CML's functions include an LCD display, analog output (4–20 mA), display of totalized flow, totalized pulse output (open collector), and instantaneous flow alarm output. In addition, since a communication function is a standard feature, dramatic cost reduction in instrumentation is possible when data is transferred to the host system.
- Thanks to built-in photoelectric touch sensors, settings can be changed without opening the case.
- A flow rectifying mechanism is built into the flow path of the device, allowing shorter straight pipe sections. Even if this device is mounted downstream from an elbow, it can be used without a straight pipe section.

■ System configuration example



■ Model selection table

Basic model No.	Pipe size	Model	Gas-contacting material	Connection method	Gas type	Output	Power source	Communication	Mounting orientation	Option		Suffix	Description
										1	2		
CML													High-flow mass flow meter
	050												50 A (2B)
	080												80A (3B)
	100												100 A (4B)
	150												150 A (6B)
		0											Operating pressure range: 0 to less than 1 MPa
			S										Material of major parts: SUS304/SCS13
				J									JIS 10K RF flange
					N								Air/nitrogen (The setting can be changed to another standard compatible gas.*1)
					S								Oxygen*3
						0							4–20 mA output + totalized pulse output
							F						Flexible, from 85 to 264 V AC (50/60 Hz)
								1					RS-485 communications
									0				Horizontal (flow direction: left to right)*2
									1				Horizontal (flow direction: right to left)*2
									2				Vertical (flow direction: upward)*2
									3				Vertical (flow direction: downward)*2
										0			None
										1			Degreasing for gas-contacting parts
											D		With inspection report
											Y		Inspection report + traceability certificate
											K		Inspection report + traceability certificate + calibration report
												0	Product version

*1. Standard compatible gases are air/nitrogen, natural gas 13 A (LNG), argon, butane, propane, and carbon dioxide (CO₂). The setting can be changed using the display panel keys.

*2. Specify when ordering. The selection cannot be changed after delivery.

*3. If gas type S is selected, be sure to specify 1 (degreasing) for option 1.

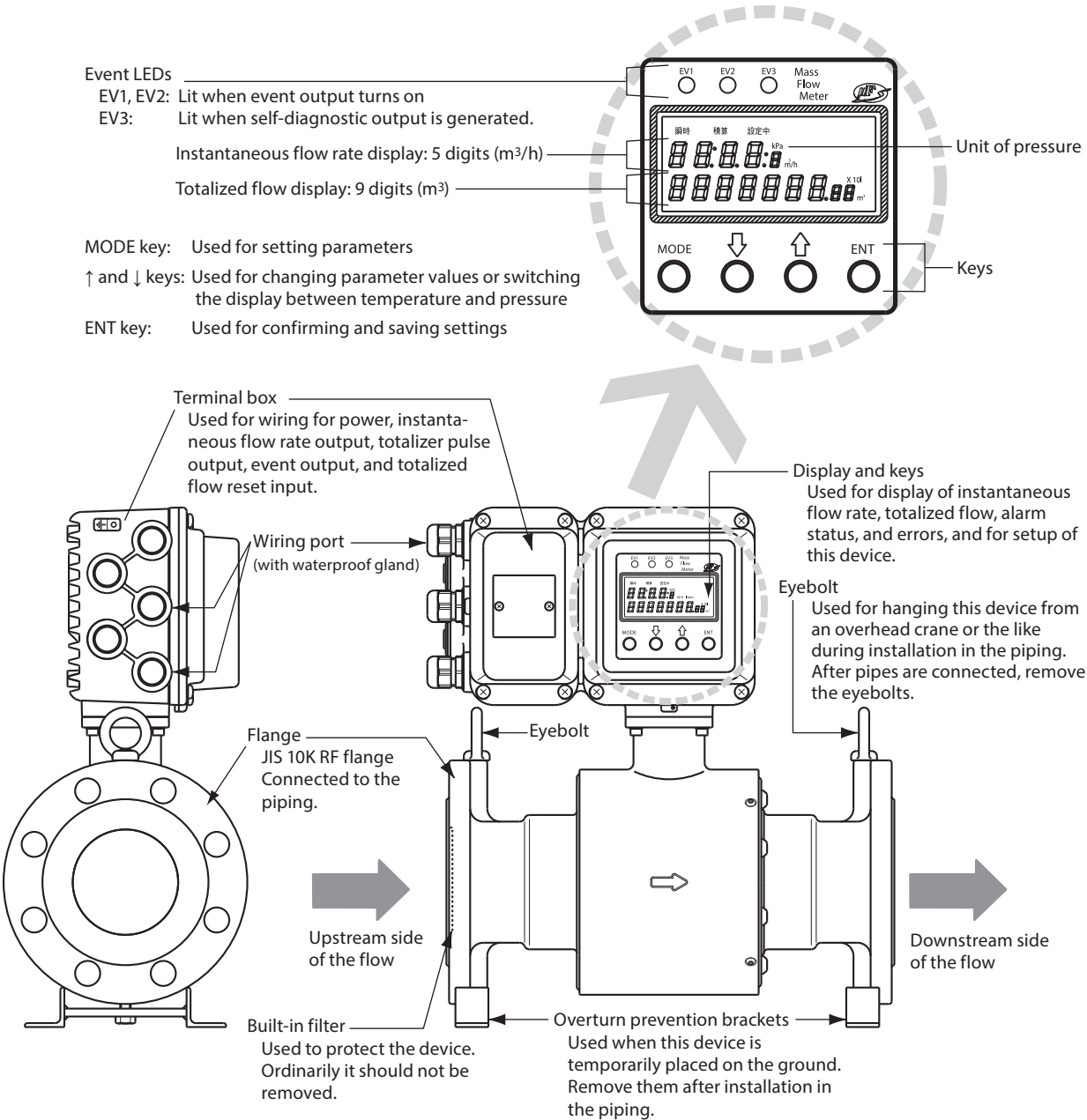
■ Gas types and flow rate ranges

Gas type	Gas type setting 5-08	Flow range [m ³ /h (normal)]			
		CML050	CML080	CML100	CML150
Air/Nitrogen	00	0 to 160	0 to 400	0 to 650	0 to 1600
Oxygen	01*1	0 to 160	0 to 400	0 to 650	0 to 1600
Carbon dioxide (CO ₂)	02	0 to 120	0 to 300	0 to 480	0 to 1200
Argon	03	0 to 160	0 to 400	0 to 650	0 to 1600
Natural gas13A (46MJ)*2	04	0 to 160	0 to 400	0 to 650	0 to 1600
Butane*2	05	0 to 50	0 to 120	0 to 190	0 to 480
Propane*2	06	0 to 60	0 to 140	0 to 220	0 to 500
Natural gas13A (45MJ)*2	09	0 to 160	0 to 400	0 to 650	0 to 1600

*1. "01: Oxygen" can be selected only for oxygen models.

*2.  Chapter 6. SPECIFICATIONS. (P. 6-2)

Chapter 2. NAMES AND FUNCTIONS OF PARTS



Note: There are three wiring ports. Only one waterproof gland is attached before shipment, to the top port. The other two waterproof glands are included with the CML. The figure shows the flowmeter when all three glands are attached to the wiring ports.

-MEMO-

Chapter 3. INSTALLATION AND WIRING

WARNING



If this device is used with a flammable gas such as natural gas 13A, propane, or butane, install it on the upstream side of the safety shutoff valve.

If air somehow enters the piping, resulting in an explosive mixture, and the sensor makes a spark due to some cause like a lightning strike, an explosion could occur inside the pipe.



Do not use this device or the connected pipes as a step. Doing so can damage the device or pipes, and if you lose your footing you could be injured.



The mass of this device is 14 to 45 kg or more. When moving or transporting it, use equipment such as a dolly or use 2 or more people. Carelessly hoisting the device and accidentally dropping it can cause injury or damage.

CAUTION



Do not mount with the display facing down. Doing so might cause measurement error or device failure.



After the piping work is complete, remove the temporary support brackets. Otherwise someone might bump into them and be injured.

Handling Precautions

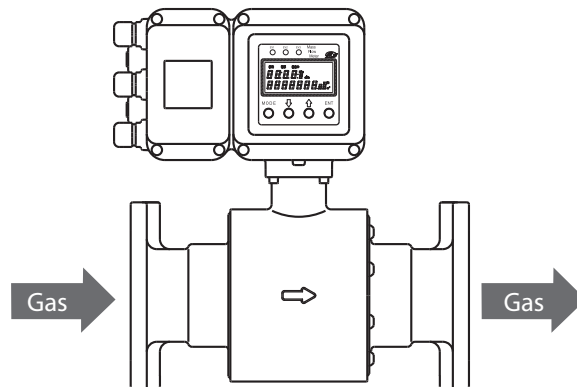
- This device is a precision instrument. Do not drop it or subject it to shock. Doing so might damage the device.
- When connecting pipes to this device, be sure that the pipes are not on a slant or misaligned. Failure to do so could cause leakage or other problems.
- When installing, fasten firmly to prevent vibration.
- When used outdoors, protect the device from direct sunlight.
- If there is a possibility of rust, oil mist, dust, etc. entering the piping, be sure to provide an upstream strainer so that foreign matter does not enter the device. Foreign matter can cause faulty operation.
- When wiring, take care not to pull on the display. The internal connections may be damaged.
- Be sure to run the wiring for 4–20 mA output, open collector output, and communication separately from high voltage lines and power lines. Do not put them in the same conduit. Doing so might cause malfunction.
- Be sure to mount a switch for shutoff of the main power to this unit within reach of the operator.
- With the exception of supply power and relay contact output, the I/O common mode voltage with respect to the ground should be 33 Vrms max., 46.7 V peak max., and 70 V DC max.
- After the piping work is complete, remove the eyebolts.
- Gas must flow through the meter in the direction of the arrow on the side of the flow channel. Flow in the opposite direction cannot be measured accurately.

■ Installation location

Avoid installing the device where it will be subject to conditions such as the following.

- Ambient temperature colder than -25°C or hotter than $+60^{\circ}\text{C}$
- Humidity higher than 90%RH
- Sudden temperature fluctuations causing dew condensation
- Corrosive gas or flammable gas atmosphere
- Large amounts of dust, salt, iron powder or other conductive substances
- Direct vibration or shock
- Direct sunlight
- Splashing by fluids (e.g. oil, chemicals)
- Strong magnetic or electrical fields

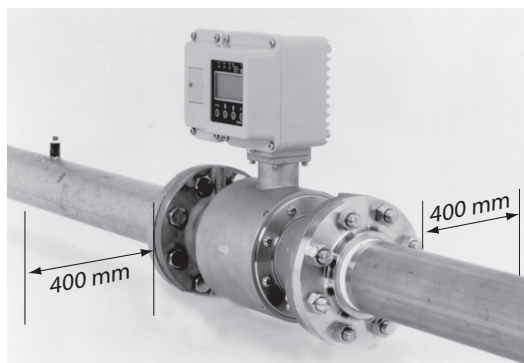
Gas flow



Note: Make sure that the gas flows in the direction of the arrow on the side of the body. If the gas flows in the opposite direction, it cannot be measured accurately.

! Handling Precautions

- This device may be installed outdoors, but it is advisable to shield it from direct sunlight. In direct sunlight its temperature will rise, possibly causing malfunction or device failure.
- To facilitate maintenance, leave enough space to access the terminal box, as shown in the illustration below.



■ Behavior when the flow rate greatly exceeds the measurement range



Be sure to use this device within the flow-rate range stipulated in the product specifications.

To prevent excessive flow, use a suitable means to control the supply pressure or use a throttle valve or the like to control the flow rate.

If the flow rate exceeds the high limit, both the flow rate display and the output voltage/current may indicate considerably lower values than the actual flow rate.



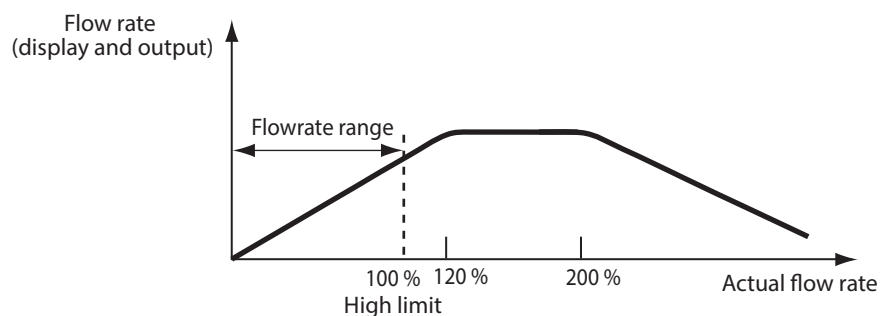
If loss or damage could result from the abnormal functioning of this device, include appropriate redundancy in the system design.

If the flow rate exceeds the high limit for measurement, the correct value may not be displayed or output. Be sure to use the device within the measurement range stated in the specifications.

If the actual flow rate exceeds the upper limit of the range by 120 % or more, any further increase will not be indicated by the flow rate display or the output voltage/current. Furthermore, if the flow rate exceeds the limit by 200 %, both the flow rate display and the output voltage/current will begin to decrease as if they were within the measurement range.

Also, take care because if there is a sudden excessive flow rate (200 % or more) for a very short period, a flow rate within the normal range may be displayed and output, with no display or output of the flow rate upper limit.

Especially when this device is used for flow control, make sure to take appropriate measures, such as controlling the supply pressure or using a throttle valve, so that even at maximum control output, the flow rate does not exceed 120 % of the high limit of the range.



■ Notes on piping

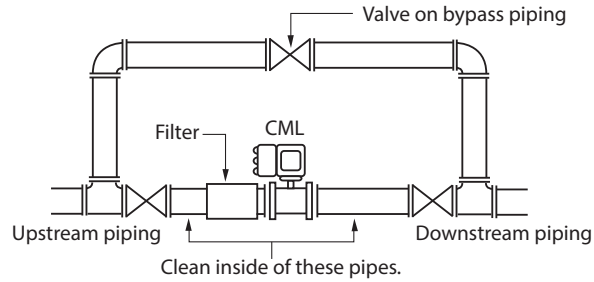
● Precautions for piping work

This device is a precision instrument. If foreign matter like dust, moisture, or oil mist enters the device, measurement error or device failure may result.

During piping work, follow the instructions below to keep foreign matter out of the device.

- Before installing the device, thoroughly flush the inside of piping that is upstream and downstream of this device to remove welding fumes and dust.

- Thoroughly clean the inside of piping that is directly connected to the device.
- When installing, be sure to provide bypass piping as shown in the figure below. Also, valves both before and after the device should be of a type that does not disturb the gas flow, such as ball valves




- Refer to the drawings below for the straight pipe length on the upstream side. D represents the pipe's internal diameter. If the flowmeter and the pipe on the downstream side have the same internal diameter, no straight pipe section is necessary. If the device and the pipe on the downstream side have different pipe sizes, provide a straight pipe section whose length is twice the pipe diameter.

Upstream side	
<p>FC filter (made by Azbil Kimmon)</p> <p>No straight pipe section is needed.</p>	<p>MFF300-L filter</p> <p>No straight pipe section is needed.</p>
<p>MFF300-Y filter</p> <p>No straight pipe section is needed.</p>	<p>MFF100* (made by Azbil Corporation)</p> <p>No straight pipe section is needed.</p>
<p>90° bend</p> <p>No straight pipe section is needed.</p>	<p>Reducer with an angle of 15° or more (if less than 15°, it can be regarded as a straight pipe section)</p> <p>5D min.</p>
<p>Tee</p> <p>5D min.</p>	<p>Reducer (regarded as straight pipe section)</p> <p>5D min.</p>
<p>Fully open gate valve</p> <p>5D min.</p>	<p>Other valves</p> <p>5D min.</p>

* Straight pipe section not needed. However, at the filter exit, screws, a flange adapter, or DIN-JIS flange adapter is needed.

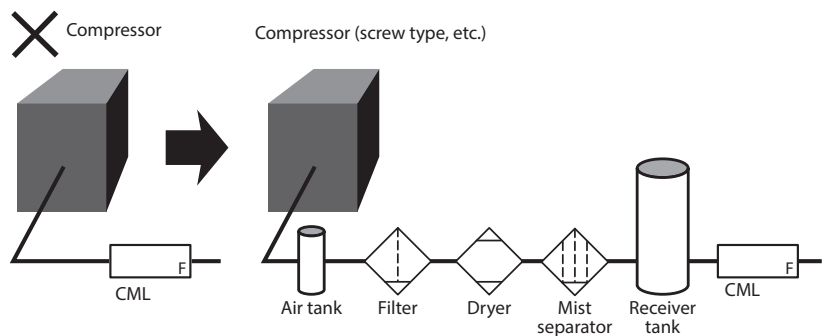
- If oil, moisture, or dust is contained in the fluid, install a device that can remove them. If the fluid contains oil, moisture, or dust, measurement error or device failure may result.
- Remove moisture using a dryer to prevent condensation in the pipe.
- If a dust-removing filter is used, its mesh size must be 1 μm or smaller.
- If a mist separator is used to remove oil, the concentration of residual oil content must be 0.01 mg/m^3 or less.

 Azbil Corporation's Specification sheet CP-SS-1824 (in Japanese)(for mist separators)

- Do not install the device where it is subject to a pulsating flow.
- Do not install the device near the outlet of a compressor. Near a compressor outlet there is a strong pulsating flow and, depending on the compressor type, possibly dispersion of iron powder, etc., which can result in failure of this device.

Note

- As shown in the diagram below, if the CML is downstream from a compressor, install devices between the compressor and the CML to eliminate foreign matter like oil, moisture, and iron powder. As a countermeasure for a pulsating flow, install the CML after a receiver tank or the like.

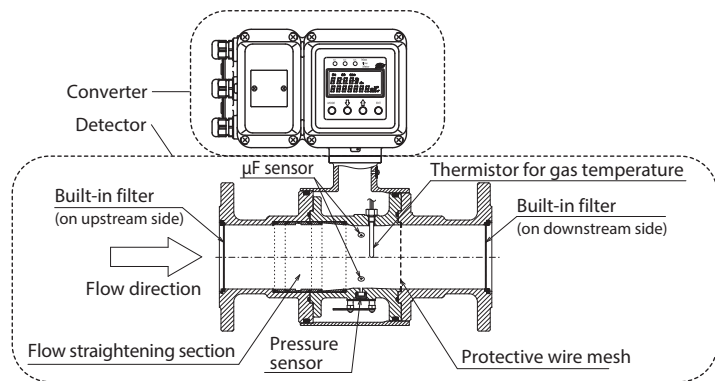
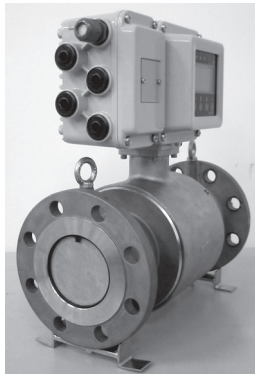


- Take sufficient countermeasures if the CML is installed near a pump. If the CML is installed near a pump, pulsations may affect the device. In this case, install a receiver tank, etc. between the pump and the CML to minimize the influence of pulsation.

Handling Precautions

- If foreign matter cannot be fully eliminated by flushing or wiping, or if the regular presence of foreign matter can be expected, be sure to install a filter. If dust, oil, or moisture adheres to the metallic mesh or to the Micro Flow sensor chip inside the CML, measurement error or device failure may result.

● Built-in filter



The CML is equipped with built-in filters on the upstream side and downstream side as a standard feature.

Their purpose is to temporarily protect the CML from dust during piping work. If a large amount of dust enters the filter, pressure loss could become great enough to stop the gas flow.

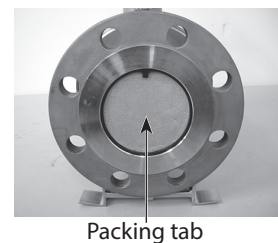
! Handling Precautions

- If a large amount of dust enters the filters, or if there is a possibility of dust regularly entering the gas flow, be sure to install a permanent filter on the upstream side. Azbil Corporation's Specification sheet CP-SS-1824 (in Japanese) (for permanent filter). In addition, since the built-in filters cannot eliminate moisture or oil, be sure to install an external filter to remove such foreign matter.

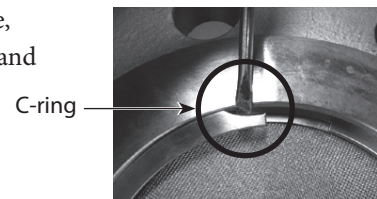
The built-in filter causes pressure loss as shown in the graphs on page 6-4 and 6-5. If no dust enters the filter at all, and if less pressure loss is desired, remove the built-in filter so that pressure loss is reduced as shown in the graphs on page 6-6.

How to remove the built-in filters

- (1) For the built-in filter on the upstream side, pull the tab on the packing that holds the filter, and remove the packing.



- (2) For the built-in filter on the downstream side, hook the C-ring with a flathead screwdriver and remove it.



- (3) Remove the built-in filter. If it is hard to remove the filter, use adhesive tape to remove it as shown in the bottom photo.



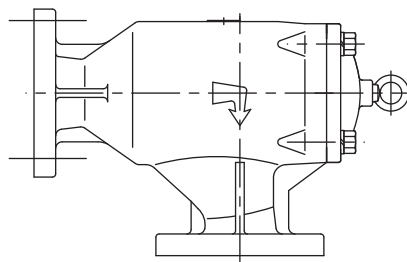
● Filter installation

If foreign matter in the gas adheres to one of the CML's sensors, it may cause faulty operation or measurement error. If a filter is needed, be sure to select a filter from the following.

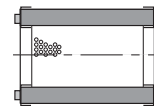
1. Filters for natural gas

- FC filter (manufactured by Azbil Kimmon)
Operating pressure range: 0 to 0.3 MPa
Filter element: Built-in

FC filter (manufactured by Azbil)



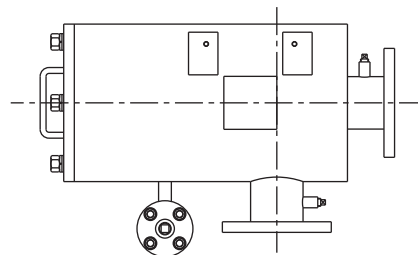
Spare filter element for FC filters (manufactured by Azbil Corporation)



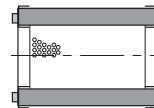
Pipe size	Part No.
50A	80394037-001
80A	80394038-001
100A	80394039-001
150A	80394040-001

- FDSNC type filter (Manufactured by Azbil Kimmon)
Operating pressure range: 0 to 0.98 MPa
Filter element: Built-in

FDSNC filter (manufactured by Azbil Corporation)

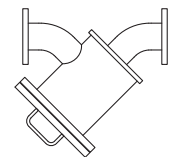


Spare filter element for FDSNC filters (manufactured by Azbil Corporation)

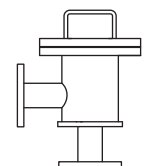


Pipe size	Part No.
50A	80394057-001
80A	80394057-002
100A	80394057-003
150A	80394057-004

- MFF300-Y filter
Operating pressure range: 0 to 0.98 MPa
Filter element: Built-in




- MFF300-L filter
Operating pressure range: 0 to 0.98 MPa
Filter element: Built-in



2. Filters for gas that always contains oil mist, such as compressed air, propane, or butane

Model No.: MFF100NAG/MFF100NSG

For detailed specifications:  Azbil Corporation's Specification sheet CP-SS-1824 (in Japanese).



■ Pipe installation

 **WARNING**



The mass of this device is 14 to 45 kg or more. When moving or transporting it, use equipment such as a dolly or use 2 or more people.

Carelessly hoisting the device and accidentally dropping it can cause injury or damage.

 **CAUTION**



Do not flush out the pipes with this device installed. If foreign matter enters the device, it may give faulty measurements or break down.



To prevent leakage from the pipes, tighten bolts to the specified torque.



Purge and thoroughly clean the inside of piping that is upstream and downstream of this device to remove welding fumes and dust. Failure to do so might cause the flowmeter to break down due to entry of foreign matter.

 **Handling Precautions**

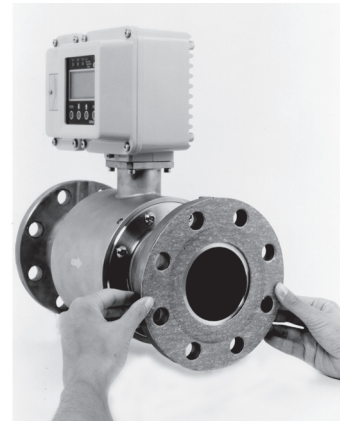
- Be sure to flush the inside of the pipe before installation of this device to eliminate any foreign matter which might be inside the pipe.

● **Gasket installation**

A gasket is required for flange connections.

Refer to the table below to determine the gasket's inner diameter.

Pipe size	Gasket inner diameter (reference value)
50 A	61 mm
80 A	90 mm
100 A	115 mm
150 A	167 mm

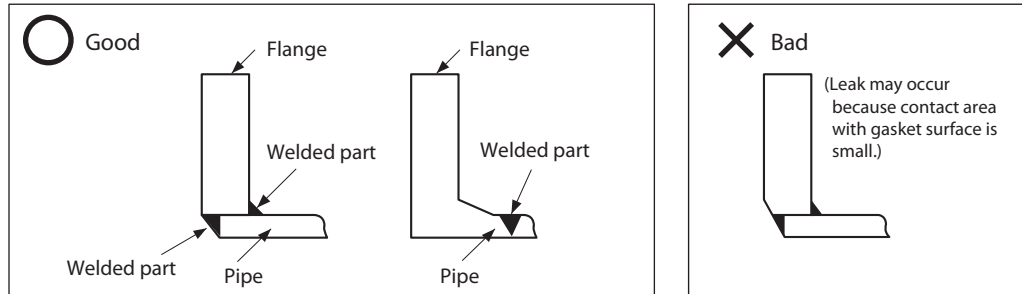


 **Handling Precautions**

- If the inner diameter of the gasket is too small, it might disturb the flow velocity distribution, affecting the measurement accuracy.
- If the inner diameter of the gasket is too large, it might cause leakage.

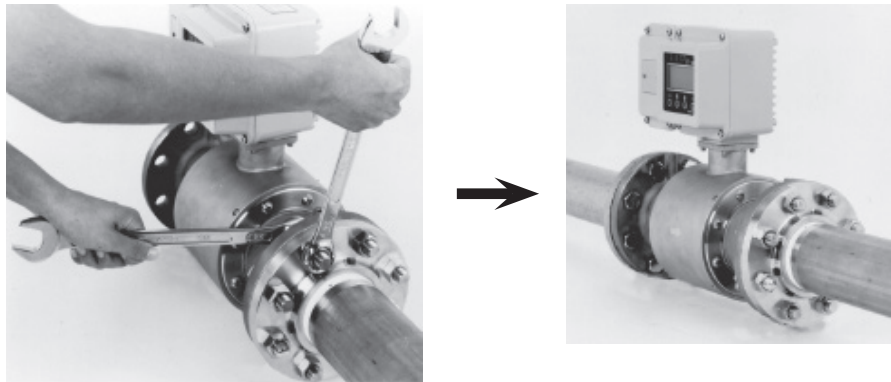
● **Flange type**

Use a flange that has a large area of contact with the gasket.



● **Flange connection**

Tighten the flange bolts.



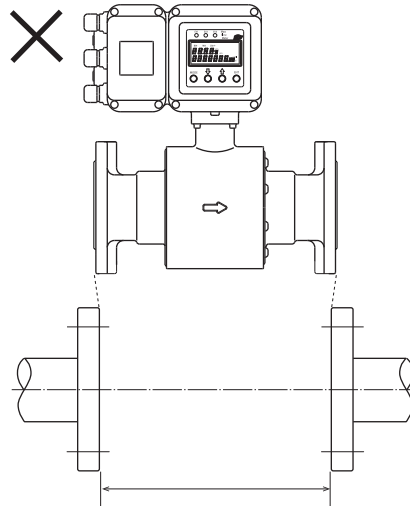
Tightening torque

Pipe size	Torque Unit: N·m (kgf·cm)
50 A	37 to 47 (378 to 480)
80 A	26 to 36 (265 to 367)
100 A	32 to 42 (327 to 429)
150 A	64 to 74 (653 to 755)

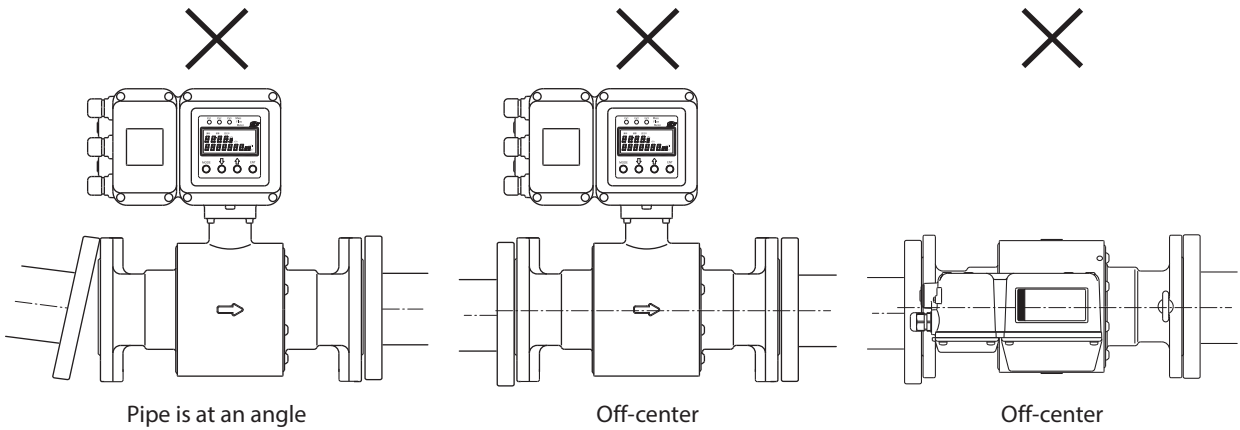
(The value in parentheses indicates reference.)

! Handling Precautions

- Tighten bolts uniformly. If leakage does not stop after the bolts have been tightened, tighten them further little by little.
- Tighten bolts to the specified torque. Doing otherwise may result in damage.
- Do not force the CML into a narrow space between flanges. Doing so might cause leakage or damage.



- Do not allow pipes to slant or to become misaligned during installation.



■ Wiring

CAUTION



Be sure the load connected to the output terminals does not exceed the rated values given in the specifications. An excessive load can damage this device.



After wiring and before turning the power on, be sure to check that the wiring, the polarity of the power, etc., are correct. Incorrect wiring can cause malfunction or damage.

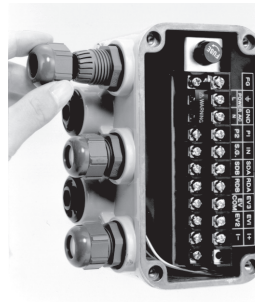
● Opening the terminal case

A Phillips-head screwdriver is required.

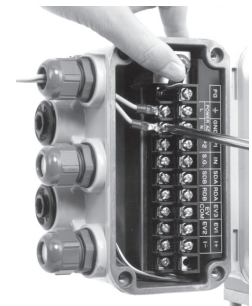
(1) Loosen the 4 screws on the terminal box using a Phillips-head screwdriver.



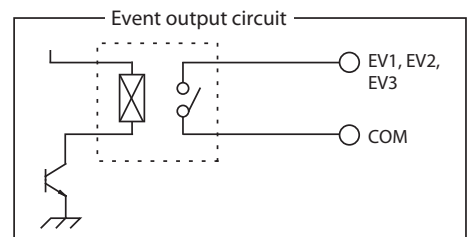
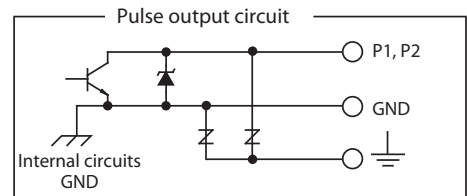
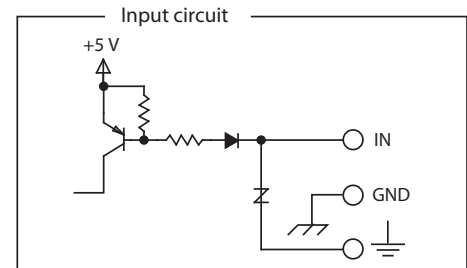
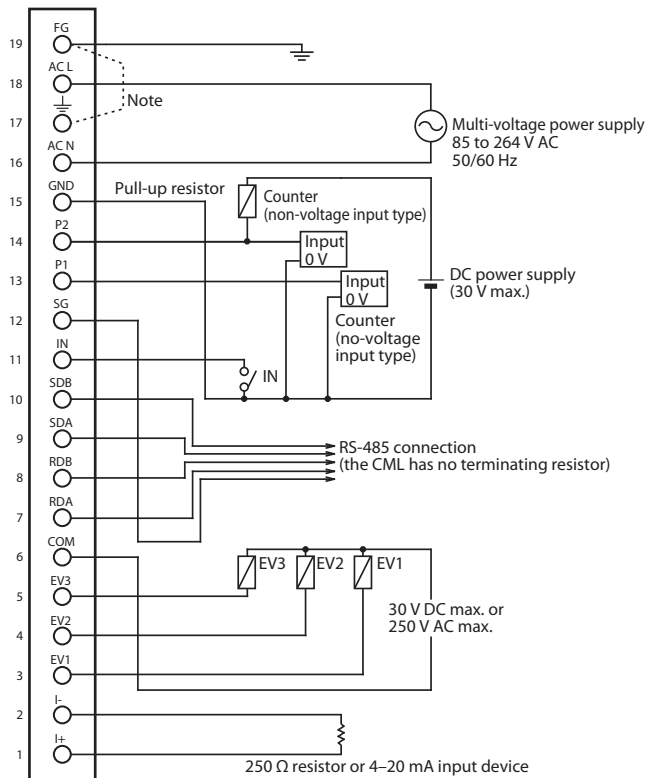
(2) Remove the lid from the terminal box.



(3) Wire the terminals.

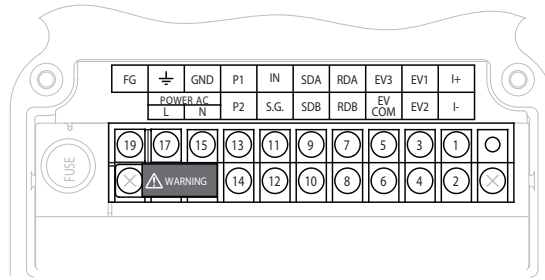


● Example of wiring (AC power source)



Note: Terminals 17 and 19 are connected with a jumper.

● Terminal arrangement



Terminal No.	Signal name	Description
1	I+	4–20 mA instantaneous flow rate output (+)
2	I–	4–20 mA instantaneous flow rate output (–)
3	EV1	Instantaneous flow rate high limit
4	EV2	Event 2 output
5	EV3	Self-diagnostic output
6	COM	Event output common
7	RDA	RS-485 communications
8	RDB	RS-485 communications
9	SDA	RS-485 communications
10	SDB	RS-485 communications
11	IN	Totalized flow reset input
12	SG	RS-485 communications
13	P1	Totalizer pulse output 1
14	P2	Totalizer pulse output 2
15	GND	Totalizer output, reset input common
16	ACN	Power source
17	⏏	Internal GND (wiring not required)
18	ACL	Power source
19	FG	Ground

! Handling Precautions

- Securely connect wires to terminals using crimp terminals or the like to ensure electrical contact.
- Use crimp terminals compatible with M3.5 terminal screws.
- The tightening torque for terminal screws is 0.8 N·m or less.
- Except for RS-485 wiring, use JIS C 3401 control cables (CVV etc.) 2.2 mm or less in outer diameter.
- Use twisted pair shielded cable for RS-485. Also, a terminating resistor (150 Ω, 1/2 W) must be used.
- There is no isolation between the pulse output and input circuit, and the GND terminal and the GND of the internal circuits are connected.
- The 4–20 mA instantaneous flow rate output is isolated.
- COM is used as a common terminal for event output and self-diagnostic output, and is isolated from the internal circuits.
- Terminals 17 and 19 are connected with a jumper.

● **Treatment on wiring connection port**

There are two methods of running the wires from the device.

- If a waterproof gland is used, the outer diameter of the cable should be 6 to 12 mm.
- If a flexible conduit is connected, remove the waterproof gland and then directly connect the conduit. For outdoor use, the conduit is recommended.

There are three wiring ports.

At the time of shipment, only one waterproof gland is attached to the top port.

If another wiring port is needed, remove the plug, attach the included waterproof gland, and pull the wires out.

 **Handling Precautions**

- The wiring ports have G1/2 female threads.

-MEMO-



Chapter 4. OPERATION

■ Flow rate indication

Details of the display vary depending on the function settings.

With the default settings, the upper 5-digit LCD display shows the instantaneous flow rate and the lower 9-digit LCD display shows the totaled amount of flow.

■ Temperature and pressure indication

If “5-02: Display mode” is set to 02 in the function setup menu, pressing the  key shows the pressure and pressing the  key shows the temperature.

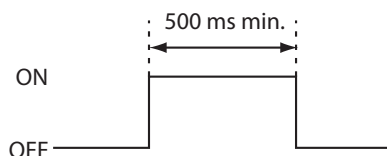
For display mode settings,  ■ Function setup item list (P. 4-2)

There are two types of settings for this device: function and parameter.



■ Totalized flow display and totalized count reset function

When “5-02: Display mode” is set to 01 or 02 in the function setup menu, the lower display shows the totalized flow in the range of 0 to 9999999.99 (m³).

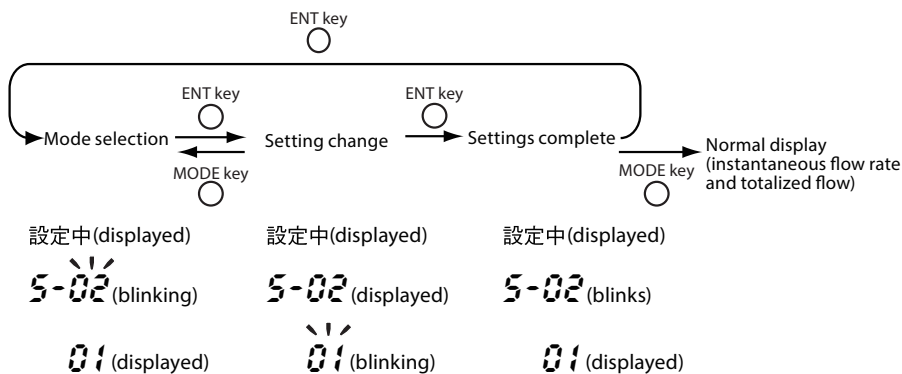
To reset the total, connect terminals IN (No. 11: totalized flow reset input) and GND (No. 15). When these terminals are connected, the reset input is ON. As shown below, keep the totalized flow reset input ON for 500 ms or longer. Doing so resets the totalized count to 0.












■ How to set up functions



- (1) While the display indicates the instantaneous flow rate or the totalized flow, press the  and  keys simultaneously for 3 s or longer.
- (2) The display shows “設定中,” the instantaneous flow rate display shows the function No., and the totalized flow display shows the last 2 digits of the current setting. At this time the function No. blinks.

Display example







- (3) Pressing the  key moves the function number forward by one, and pressing the  key moves it backward by one. While **S-32** is displayed, pressing the  key again returns the display to **S-01**. While **S-01** is displayed, pressing the  key moves the display to **S-32**.
- (4) When the desired function number is displayed and blinking, press the  key.
- (5) The desired function number stops blinking, showing that it has been selected, and the setting number blinks.
- (6) Press the  or  key to select the value desired as the last 2 digits of the totalized flow part of the display and then press the  key.
- (7) The setting will be saved and the blinking will stop.
- (8) To continue setup, press the  key again and repeat steps (3) to (7).

Handling Precautions

- If the  key is pressed in step (2), (3), or (7), display of the instantaneous flow rate resumes.
- If the  key is pressed in step (5) or (6), the display returns to its state in step (2).


■ Function setup item list

Function No.	Function	Setting	Description	Default	Notes
S-01	Keylock	00 01	Off On	00	If keys are locked, other modes and parameters cannot be viewed.
S-02	Display mode	00 01 02	Instantaneous flow rate only Instantaneous flow rate and totalized flow Instantaneous flow rate, totalized flow, pressure, and temperature	01	To display the temperature or pressure, press the  or  key.
S-04	Event 2 selection (EV2)	00 01	Instantaneous flow rate low limit event Pressure drop event	00	If instantaneous flow rate low limit is selected, enter the setting in P-02 . If pressure drop is selected, enter the setting in P-12 .
S-05	On-delay (EV1)*1	00 01	Disable Enable	00	EV1 is instantaneous flow rate high limit output.
S-06	On-delay (EV2)*1	00 01	Disable Enable	00	EV2 is instantaneous flow rate low limit output or pressure drop event.
S-07	Event standby	00 01	Disable Enable	00	Only for EV2
S-08	Gas type selection*2	00 01 02 03 04 05 06 09	Air/nitrogen Oxygen Carbon dioxide (CO ₂) Argon Natural gas 13 A (46 MJ) Butane Propane Natural gas 13 A (45 MJ)	00 (01)*2	For oxygen models, the default setting is  : Oxygen.  can be selected only on oxygen models. If a default setting is specified when ordering, that setting is displayed.

Function No.	Function	Setting	Description	Default	Notes
5-12	Low flow cutoff	00 01 02 03	Disable low flow cutoff $Q_{\max} \times (1/1280)$ $Q_{\max} \times (1/320)$ $Q_{\max} \times (1/160)$	01	Q_{\max} is the maximum value in the flow rate range.
5-14	Pulse weight	00 01 02	10 L/pulse 100 L/pulse 1000 L/pulse	02*3	Used for setting totalizer pulse output 1 (P1). The pulse weight for totalizer pulse output 2 (P2) is fixed at 1 L/pulse. If a default setting is specified when ordering, that setting is displayed.
5-15	Burnout	00 01	Downscale Upscale	00	Setting for 4–20 mA output for when a measurement error ($E28$ or $E90$) occurs. If downscale is selected, approx. 1.0 mA is output. For upscale, the amount set in parameter setup P-15 is output.
5-30	Communication address	00 01 to 7F	Communication disabled Communication address (hexadecimal)	00	If 0 is set for the address, communication is disabled. Set a unique address for each slave station.
5-31	Transmission speed selection	00 01	9600 bps 4800 bps	01	Set the same transmission speed as that of the partner device.
5-32	Communication parameters	00 01	8 bits, even parity, 1 stop bit 8 bits, no parity, 2 stop bits	01	Set the same transmission speed as that of the partner device.

*1. For details on on-delay,  ■ Parameter setup table (P. 4-5).

*2. The gas type change function allows the user to change the kind of gas that is used. If the gas type is changed, the flow measurement range varies according to the thermal diffusion coefficient, etc. of the newly selected gas type.

 ■ Gas types and flow rate ranges (P. 1-2)

If the customer specified a default setting when ordering, that value will be displayed.

*3. If the customer specified a default setting when ordering, that value will be displayed.

Handling Precautions

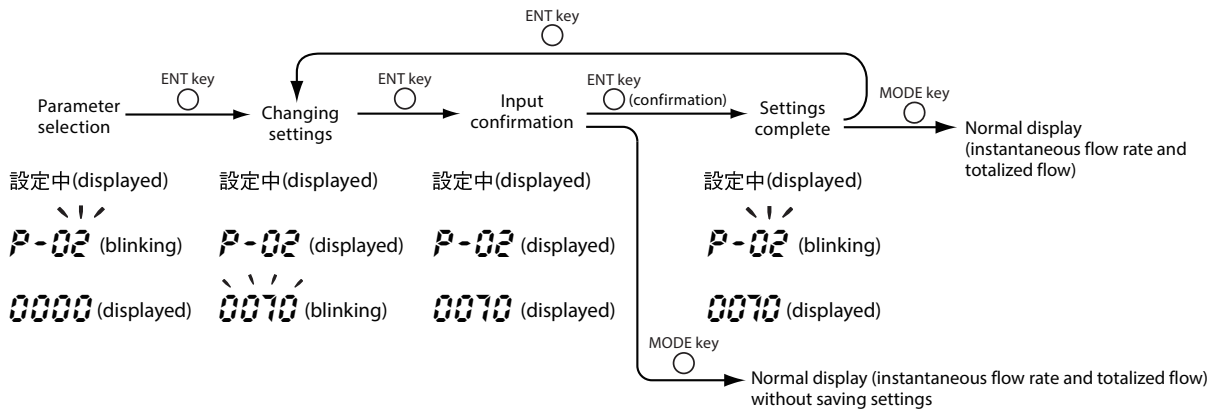
- If 5-01 (keylock) is set to 01 (ON), 5-02 to 5-32 cannot be displayed or configured. Be careful, because parameters P-01 to P-16 also cannot be displayed or configured.
- If the setting for 5-01 is changed to 00 (OFF), all function setup items can be displayed and configured. Even if the keylock is repeatedly turned on and off, the function settings and parameters remain unchanged.

Parameter setup

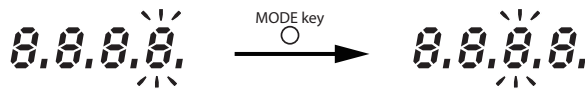
To set up parameters, the function settings must meet the conditions for parameter setup.

- (1) Be sure that **5-01** is set to **00** (keylock off).
- (2) Press the **MODE** key and **↓** key for 3 seconds or longer to change to parameter setup mode.
- (3) In parameter setup mode, "**P-__**" is displayed. The instantaneous flow rate part of the display shows the parameter item No., and the totalized flow part of the display shows the current setting for the parameter. The parameter item No. will be blinking.

Display example



- (4) Pressing the **↓** key displays the next item No., and pressing the **↑** key displays the previous item No.
- (5) While **P-01** is displayed, pressing the **↑** key again displays **P-16**. While **P-16** is displayed, pressing the **↓** key again displays **P-01**.
- (6) Press the **ENT** key when the desired item No. is displayed.
- (7) The parameter item No. stops blinking, and the last digit of the parameter setting blinks.
- (8) Pressing the **MODE** key moves the blinking digit to the left.



- (9) Pressing the **↑** or **↓** key increases or decreases the value of the blinking digit. Set the value of each digit, using the **↑** or **↓** key.
- (10) After setting the desired value, press the **ENT** key.
- (11) The blinking digit in the parameter setting will stop blinking. In this state, the parameter setting has not been saved yet. Press the **ENT** key.
- (12) This finalizes the parameter setting, and the parameter item No. begins blinking. If the parameter setting was different from the previous one, it was saved.
- (13) To continue setup, repeat steps (3) to (12).

! Handling Precautions

- If the MODE key is pressed in step (2) to (5), or (11), display of the instantaneous flow rate resumes.

■ Parameter setup table

Parameter	Item	Default setting	Setting range	Notes
<i>P-01</i>	Instantaneous flow rate high limit event (EV1)	160 (CML050) 400 (CML080) 650 (CML100) 1600 (CML150)	0 to 9999 m ³ /h	Sets the instantaneous flow rate high limit event.
<i>P-02</i>	Instantaneous flow rate low limit event (EV2)	0	0 to 9999 m ³ /h	Sets the instantaneous flow rate low limit event. Enabled if <i>S-04</i> (event 2) is set to "00: Instantaneous flow rate low limit event" in the function setup menu.
<i>P-03</i>	EV1 hysteresis	0	0 to 100 m ³ /h	
<i>P-04</i>	EV2 hysteresis	1	0 to 100 m ³ /h or kPa	Applies to the event set for <i>S-04</i> (event 2) in the function setup menu.
<i>P-05</i>	EV1 on-delay	0	0 to 60 s	
<i>P-06</i>	EV2 on-delay	0	0 to 60 s	
<i>P-08</i>	Conversion factor (C.F.)	100.0	10.0 to 450.0 %	Multiplies the measured amount of the gas that is selected for <i>S-08</i> (gas type selection) in the function setup menu by the conversion factor.
<i>P-11</i>	Standard temperature	0	0 to 35 °C	
<i>P-12</i>	Pressure drop event (EV2)	0	0 to 1000 kPa	Sets the pressure drop event. Enabled if <i>S-04</i> (event 2) in the function setup menu is set to "01: Pressure drop event."
<i>P-15</i>	Burnout	125	0 to 125 %	0 % and 100 % represent 4 mA and 20 mA, respectively.
<i>P-16</i>	4–20 mA output span	0	0 to 9999 m ³ /h	If a default setting is specified when ordering, that setting is displayed.

P-01:

If the instantaneous flow rate exceeds the high limit, the event turns ON.

If the instantaneous flow rate is less than the high limit, the event turns OFF.

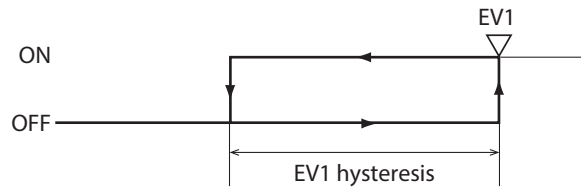
P-02:

This parameter is valid if *S-04* (event 2) is set to "00: instantaneous flow rate low limit event." If the instantaneous flow rate falls below the low limit, the event turns ON. If the instantaneous flow rate then rises to the low limit or exceeds it, the event turns OFF.

P-03:

After the instantaneous flow rate exceeds the high limit and the related event is turned ON, the event is turned OFF when the condition defined by this hysteresis setting is met.

$$[\text{Event OFF condition}] = [\text{Instantaneous flow rate high limit}] - [\text{EV1 hysteresis}]$$

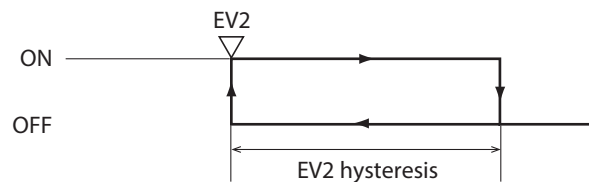


P-04:

After the instantaneous flow rate falls below the low limit and the related event is turned ON, the event is turned OFF when the condition defined by this hysteresis setting is met.

$$[\text{Event OFF condition}] = [\text{Value set for EV2}] + [\text{EV2 hysteresis}]$$

The “value set for EV2” is the value set for either the instantaneous flow rate low limit event or the pressure drop event low limit, depending on the selection for **5-04** in the function setup menu.



P-05:

Sets a time lag from when the instantaneous flow rate exceeds the high limit to when the event is turned ON.

P-06:

Sets a time lag from when the instantaneous flow rate falls below the low limit (or the setting for the pressure drop event) to when the event is turned ON.

P-08:

The gas conversion factor is set if a gas other than standard compatible gases is used. In this case, please contact the azbil Group for instructions.

P-11:

If this setting is changed, the maximum measurement range and the flow rate display range will change from the default ranges, which have a reference temperature of 0°C, to ranges that have been converted for the temperature set here. If the maximum flow rate that is converted in terms of 0°C is Q_{\max} and the temperature set here is t (°C), the maximum value $Q(t)$ can be calculated as follows:

$$Q(t) = Q_{\max} \times \frac{273 + t}{273}$$

P-12:

This setting is valid if **S-04** (event 2) is set to “**01**: Pressure drop event.”

If the pressure falls below the setpoint, the event turns ON. Then, if the pressure reaches the low limit or exceeds it, the event turns OFF.

P-15:

This setting is valid if **S-15** (burnout) is set to “**01**: Upscale”.

P-16:

- If the parameter is set to 0, the maximum measurable flow rate under the conditions specified by **S-08** (gas type) and **P-11** (reference temperature) is automatically set for 20 mA output.
- If the parameter is set between 1 and 1/16 of the maximum measurable air flow rate, the setting is invalid and the amount set for burnout is output.
- If the parameter is set between 1/16 of the maximum measurable air flow rate and 9999, 20 mA is generated when the flow rate reaches the setting. The output does not change even if the converted temperature is changed.
- If the customer specified a default setting when ordering, that value will be displayed.

! Handling Precautions

- If **S-01** is set to “**01**” in the function setup menu, **P-01** to **P-16** cannot be displayed or set. To set parameters, set **S-01** to “**00**”.

-MEMO-

Chapter 5. TROUBLESHOOTING

See the following table in case of abnormal operation of this device.

Error	Countermeasure
The display is blank.	Check that the correct voltage is being supplied. Check that the power is connected correctly.
<i>E21</i>	Low flow sensor 1 error*1
<i>E22</i>	High flow sensor 1 error*1
<i>E23</i>	Low flow sensor 2 error*1
<i>E24</i>	High flow sensor 2 error*1
<i>E25H</i>	A pressure sensor error occurred or the pressure exceeded the operating pressure range. If this error code is displayed within the operating temperature range and operating pressure range, there is a problem with a sensor. Contact the azbil Group and ask for repair.
<i>E25L</i>	A pressure sensor error occurred, or the pressure fell below the operating pressure range. If this error code is displayed within the operating temperature range and operating pressure range, there is a problem with a sensor. Contact the azbil Group and ask for repair.
<i>E26H</i>	A temperature sensor error occurred, or the fluid temperature exceeded +70°C. If this error code is displayed within the operating temperature range and operating pressure range, there is a problem with a sensor. Contact the azbil Group and ask for repair.
<i>E26L</i>	A temperature sensor error occurred, or the fluid temperature fell below –30°C. If this error code is displayed within the operating temperature range and operating pressure range, there is a problem with a sensor. Contact the azbil Group and ask for repair.
<i>E27</i>	Problem with low flow sensors 1 and 2*2
<i>E28</i>	Problem with high flow sensors 1 and 2*2
<i>E90</i>	Memory error Contact the azbil Group and ask for repair.
There is no flow, but the display indicates a flow and output is generated.	Check for gas leaks from the piping.
The flow rate is not correct.	<ul style="list-style-type: none"> • Check for gas leaks from the piping. • Check for foreign matter such as dust or oil in the piping or connection ports. If oil or dust, etc. is found, contact the azbil Group and ask for repair. • Check that the wiring is correct. • Check that the flow rate does not fluctuate widely within a few seconds or greatly exceed the measurement range.

*1. Even if *E21*, *E23*, *E22*, or *E24* occurs, measurement can be maintained by the backup function.

If *E21* or *E23* occurs while the flow is stopped, there may have been a temporary reverse flow. If so, the error will be automatically corrected as soon as the gas flows again in the correct direction.

However, if *E21*, *E22*, *E23*, or *E24* is displayed for a long time, the error may be caused by a sensor malfunction rather than a reverse flow. Measurement can continue, but the accuracy stated in the specifications cannot be guaranteed under these circumstances. Contact the azbil Group and ask for repair.

*2. If the instantaneous flow rate is negative when *E27* or *E28* is displayed, the flow direction may have reversed. Check the flow direction. If the flow direction is correct, there is a problem with a sensor. Contact the azbil Group and ask for repair.

-MEMO-

Chapter 6. SPECIFICATIONS

■ Specifications

Item	Description						
	CML050	CML080	CML100	CML150			
Compatible gases	Air/nitrogen, city gas 13A (LNG* ¹), propane,* ² carbon dioxide, oxygen, butane,* ³ and argon Note: The gas must not contain corrosive components (chlorine, sulfur, or acid).						
Flow rate range (for air/nitrogen)	160 m ³ /h (normal)	400 m ³ /h (normal)	650 m ³ /h (normal)	1600 m ³ /h (normal)			
	Normal refers to the flow rate normalized for 0°C and 101.325 kPa (atmospheric pressure).						
Measurement accuracy (overall accuracy including repeatability)	Flow rate accuracy varies depending on the measurement range: X m ³ /h (normal).						
	1.0 ≤ X < 8.0 ±3%RD	2.5 ≤ X < 20.0 ±3%RD	4.0 ≤ X < 32.5 ±3%RD	10.0 ≤ X < 80.0 ±3%RD			
	8.0 ≤ X ≤ 160.0 ±2%RD	20.0 ≤ X ≤ 400.0 ±2%RD	32.5 ≤ X ≤ 650.0 ±2%RD	80.0 ≤ X ≤ 1600.0 ±2%RD			
	Test conditions: 23 ±3°C ambient temperature and fluid temperature, at atmospheric pressure						
Temperature characteristics	0.05%RD/°C (-25 to +60°C)						
Pressure characteristics	0.2%RD/0.1 MPa (0.0 to 1.0 MPa)						
Operating pressure range	0.0 to less than 1.0 MPa						
Pressure resistance	1.5 MPa						
Sampling cycle	160 ms ±10%						
Instantaneous flow rate output	4 to 20 mA DC (allowable load resistance: 600 Ω max.) Burnout output: 1 mA max. (downscale), 24.0 mA max. (upscale)						
Event outputs (3)	Specifications	SPST relay contacts (shared common terminal) Contact rating: 250 V AC/30 V DC, 3 A max. (resistive load) Minimum ON/OFF load: 100 μA, 100 mV					
	Functions	Event No.	Function	Setting range	Operating differential	ON delay	Event standby
		EV1	Instantaneous flow rate high limit	0 to 9999 m ³ /h	0 to 100 m ³ /h (variable)	0 to 60 s (variable)	-
		EV2	Specify either output in function 5 - 04 .				
			Instantaneous flow rate unit	0 to 9999 m ³ /h	0 to 100 m ³ /h	0 to 60 s (variable)	Yes
Pressure drop event	0 to 1000 kPa	0 to 100 kPa					
EV3	Self-diagnostic output	Generates output when an error occurs ("EXX" is indicated).					
Totalizer pulse outputs (2)	Pulse output 1 (P1)	NPN open collector contact rating: 30 V DC, 50 mA max. Pulse weight: 10 L/pulse, 100 L/pulse, 1000 L/pulse (selectable using keys) Pulse frequency: 0.0003 to 60 Hz. Pulse width: 8.3 to 1000 ms (duty ratio is fixed at 50 %)					
	Pulse output 2 (P2)	NPN open collector contact rating: 30 V DC, 50 mA max. Pulse weight: 1 L/pulse (fixed) Pulse frequency: 0.0003 to 601 Hz. Pulse width: 0.83 to 1000 ms (duty ratio is fixed at 50 %)					
Totalized flow reset input (1)	Specifications	Circuit type of other device: Non-voltage contacts or open collector Terminal voltage (contacts OFF): 3.5 ±1 V Terminal current (contacts ON): approx. 2.5 mA (current to contacts) Allowable ON contact resistance: 500 Ω max. Allowable OFF contact resistance: 5 kΩ min. Allowable ON residual voltage: 0.8 V max. (for open collector) Allowable OFF leakage current: 0.8 mA max. (for open collector)					
Communications	RS-485 interface, 5-wire type, cable length: 300 m max., transmission speed: 9600/4800 bps Communication with Azbil Corporation products (EST240Z, CMC10G, WEB100).						

Item		Description			
		CML050	CML080	CML100	CML150
Display	Flow rate indication	Instantaneous flow rate: 5-digit LCD Totalized flow: 9-digit LCD			
	Display range of instant flow rate	0.0 to 216.6	0.0 to 541.5	0.0 to 880.0	0.0 to 2166.1
		The display range is 1.2 times the maximum flow rate range at the standard temperature.			
	Totalized flow	Display unit	0.01 m ³		
		Display range	0 to 9999999.99 (7 + 2 digits)		
		Data storage	The totalized flow count is retained even if power is lost.		
	Pressure display	The approximate pressure inside the CML can be displayed. Display range: 0 to 1 MPa, resolution: 10 kPa, accuracy: ±50 kPa			
Temperature display	The approximate temperature inside the CML can be displayed. Display range: -20 to +60°C, resolution: 1°C, accuracy: ±3°C				
Status display	瞬時/積算/設定中 (Instantaneous/Integrated/Setting status)				
Setup unit	Four photoelectric touch sensors (used for various settings)				
Supply power	Flexible, 85 to 264 V AC (50/60 Hz). (24 V DC models require a special order.)				
Power consumption	10 VA max.				
Mounting orientation	Horizontal/vertical (depending on the model)				
Required straight pipe length	Upstream 5D, downstream 2D (D is pipe diameter). These requirements apply when there is an upstream elbow.				
Operating temperature	-25 to +60°C				
Storage temperature	-30 to +70°C				
Operating humidity	10 to 90%RH (without condensation)				
Connection rating	JIS10K RF				
Pipe size	50A (2B)	80A (3B)	100A (4B)	150A (6B)	
Body and gas-contacting materials	Body: SUS304/SCS13A Case: aluminum alloy O-ring: Viton				
Case coating material	Acrylic resin corrosion-resistant coating Color: light beige (Munsell 4Y7.2/1.3)				
Wiring port	G1/2 female threads with a waterproof gland				
Glass material	Tempered glass, 5 mm thick				
Protective structure	IP65 (JIS C 0920 and IEC 60529): waterproof and dust-proof structure premised on outdoor use				
Mass (kg)	14	24	29	45	

*1. In Japan, natural gas 13A is adjusted to either of the specifications shown below. If the composition of the natural gas that you use does not match either of these types, please contact the azbil Group.

Gas type (as used by Azbil Corporation)	Methane (%)	Ethane (%)	Propane (%)	Butane (%)
Natural gas 13A-46MJ	88	5.8	4.5	1.7
Natural gas 13A-45MJ	88.9	6.8	3.1	1.2

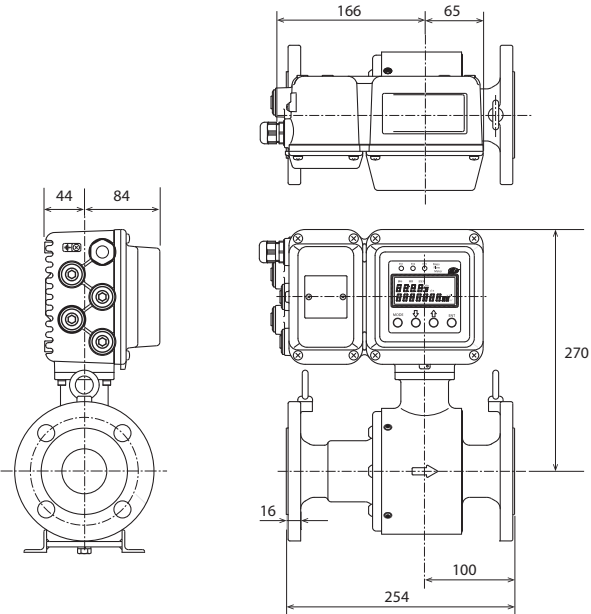
*2. If propane is selected, calibration is based on a reference gas of 98% propane and 2% isobutane. Propane with a different composition may require a change in the default settings. In this case, please contact the azbil Group.

*3. In the case of butane, calibration is based on a reference gas of 98% butane and 2% propane. Butane with a different composition may require a change in the default settings. In this case, please contact the azbil Group.

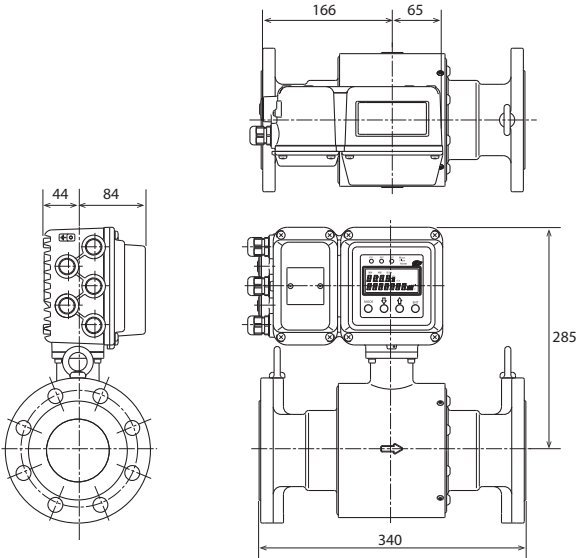
External dimensions

Unit: mm

• CML050

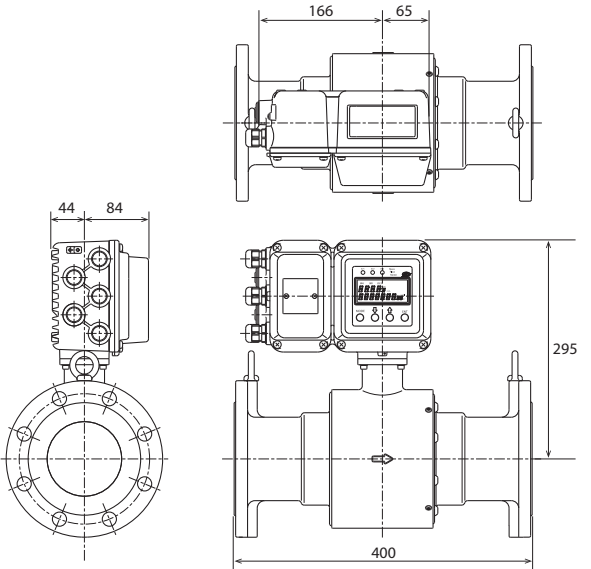


• CML080



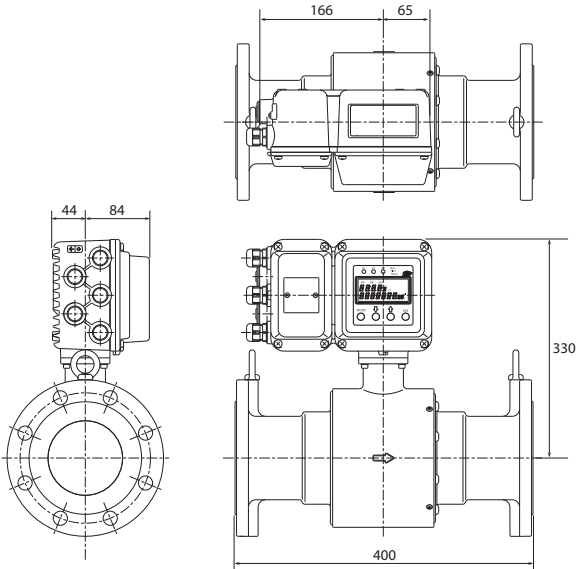
Note: The drawing on the left shows three waterproof glands attached to the wiring ports.

• CML100



Note: The drawing on the left shows three waterproof glands attached to the wiring ports.

• CML150

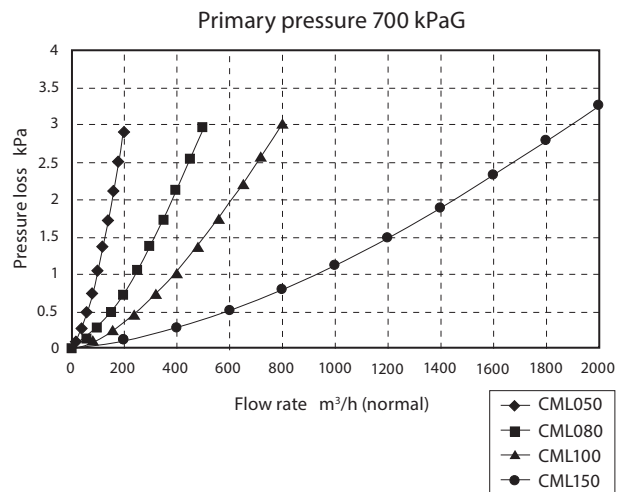
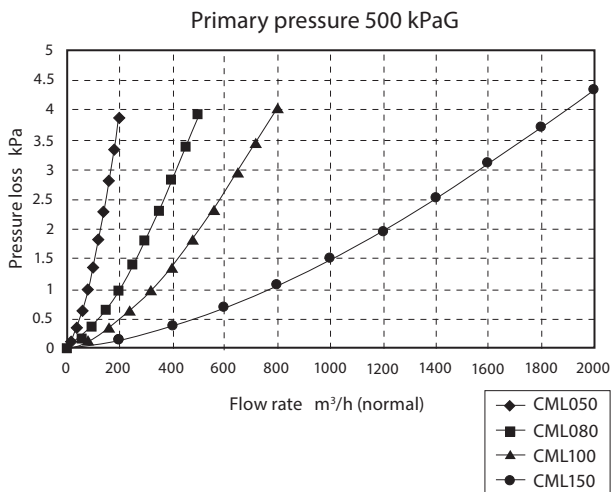
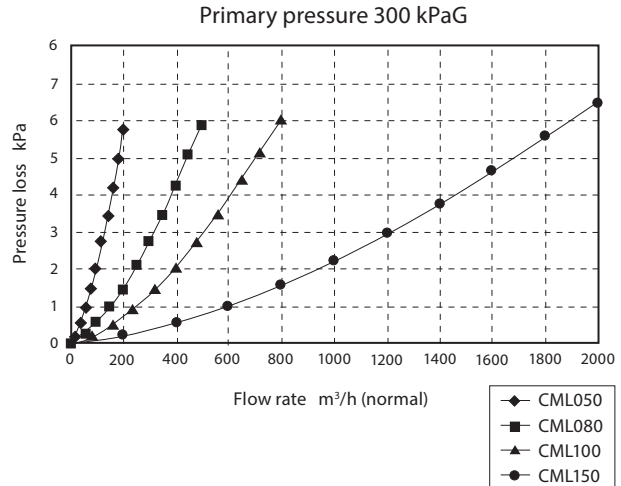
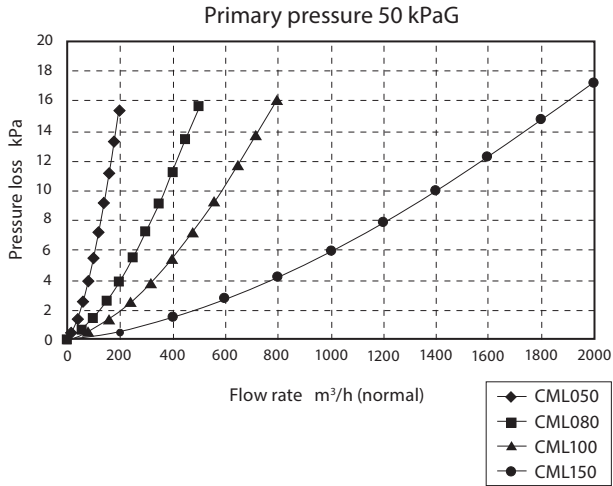


Note: The drawing on the left shows three waterproof glands attached to the wiring ports.

■ Pressure loss (flow rate and pressure loss characteristics)

● With built-in filters on both the upstream and downstream sides

The graphs below show the data for air.



If a gas other than air is used, multiply by the specific gravity in the table below.

Specific gravity of gases (air = 1.0)	
Argon	1.38
Carbon dioxide (CO ₂)	1.53
Natural gas 13A (88 % methane)	0.64
100 % propane	1.56
100 % butane	2.08

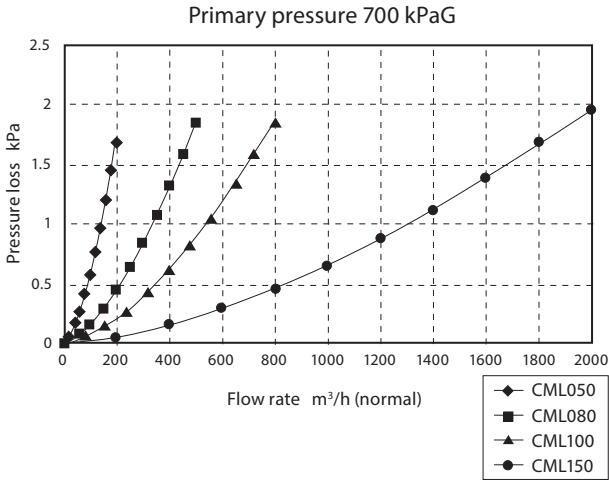
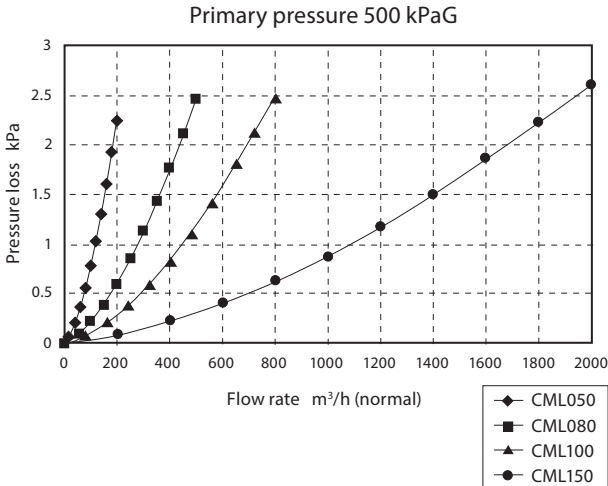
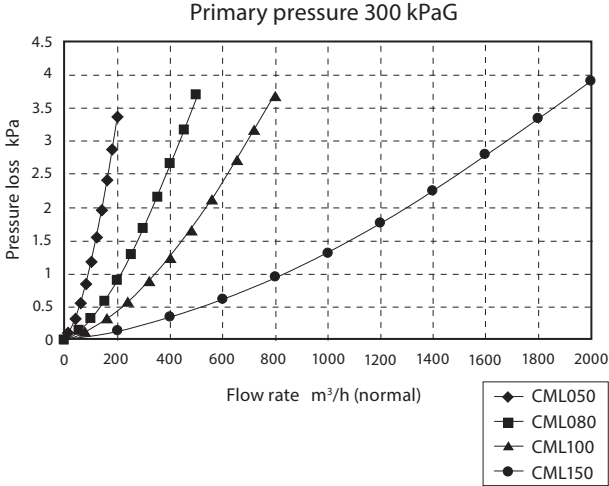
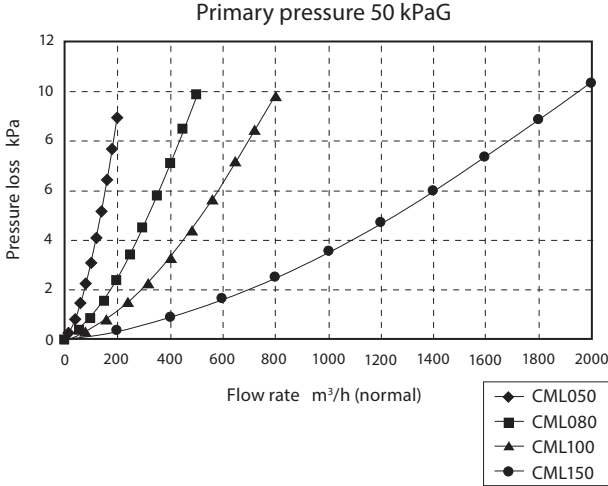
Example: How to calculate the pressure loss of the CML150 for natural gas 13A at an inlet pressure of 700 kPa and a flow rate of 1000 m³/h (normal).

In the "Inlet pressure 700 kPa-(G)" graph, the pressure loss for air is approx. 0.6 kPa when the flow rate is 1000 m³/h (normal).

The pressure loss for natural gas 13A is calculated as follows: 0.6 kPa × 0.64 (specific gravity) = 0.384 kPa.

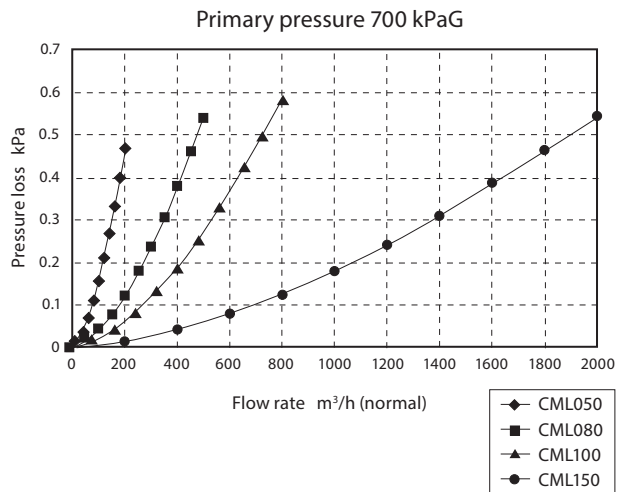
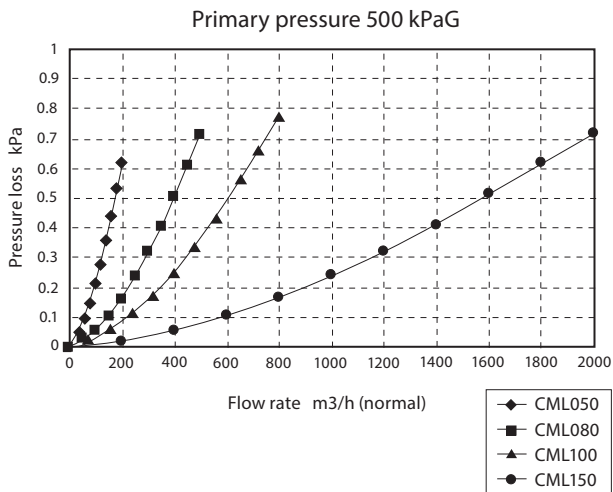
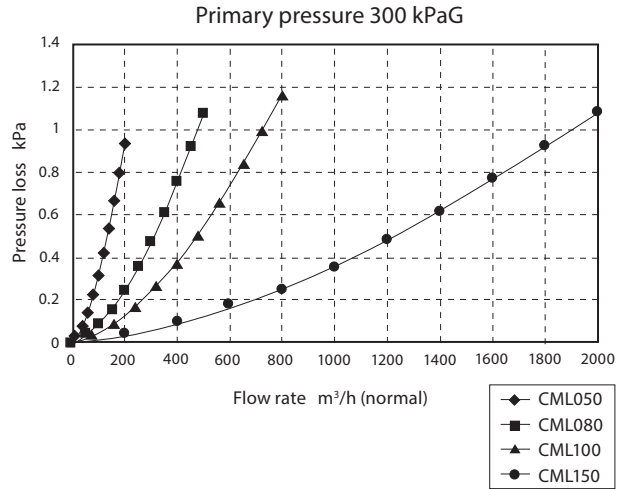
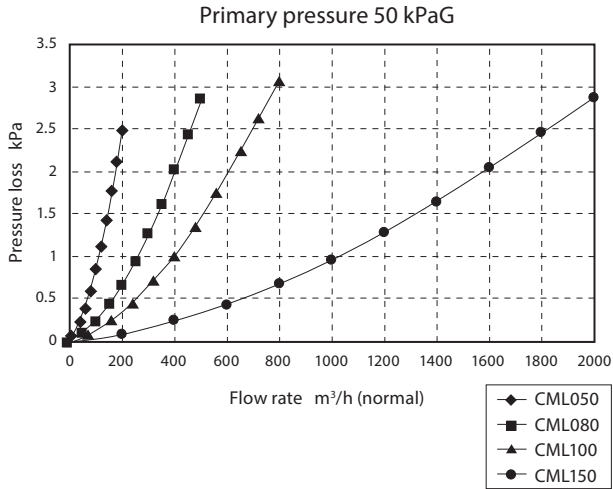
● With a built-in filter on the upstream side only

The graphs below show the data for air.



● With no built-in filter on the upstream or downstream side

The graphs below show the data for air.



If a gas other than air is used, multiply by the specific gravity in the table below.

Specific gravity of gases (air = 1.0)	
Argon	1.38
Carbon dioxide (CO ₂)	1.53
Natural gas 13A (88 % methane)	0.64
100 % propane	1.56
100 % butane	2.08

Example: How to calculate the pressure loss of the CML150 for natural gas 13A at an inlet pressure of 700 kPa and a flow rate of 1000 m³/h (normal).

In the "Inlet pressure 700 kPa-(G)" graph, the pressure loss for air is approx. 0.17 kPa when the flow rate is 1000 m³/h (normal).

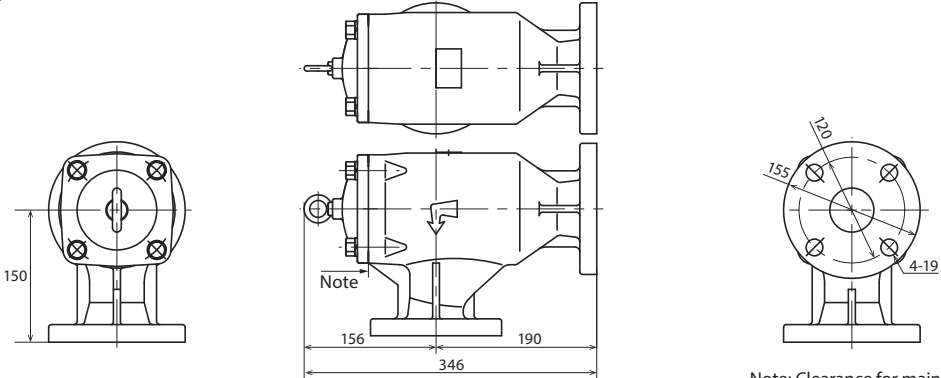
The pressure loss for natural gas 13A is calculated as follows: 0.17 kPa × 0.64 (specific gravity) = 0.11 kPa.

■ Filters

● FC filter (manufactured by Azbil Kimmon Co., Ltd.)

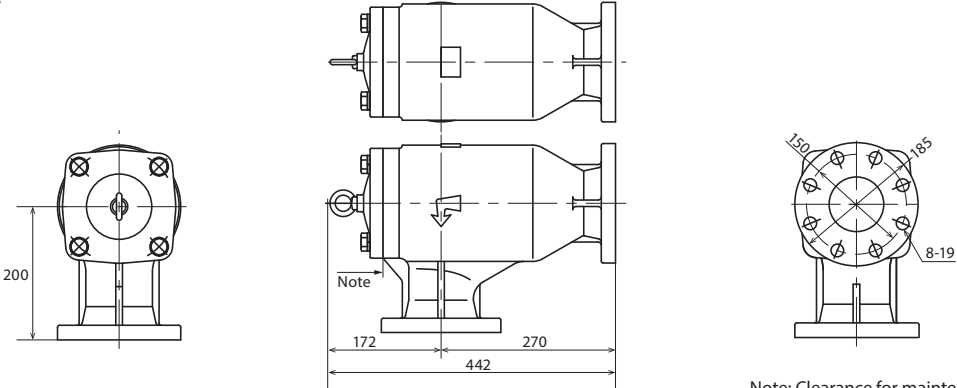
Unit: mm

● 50A



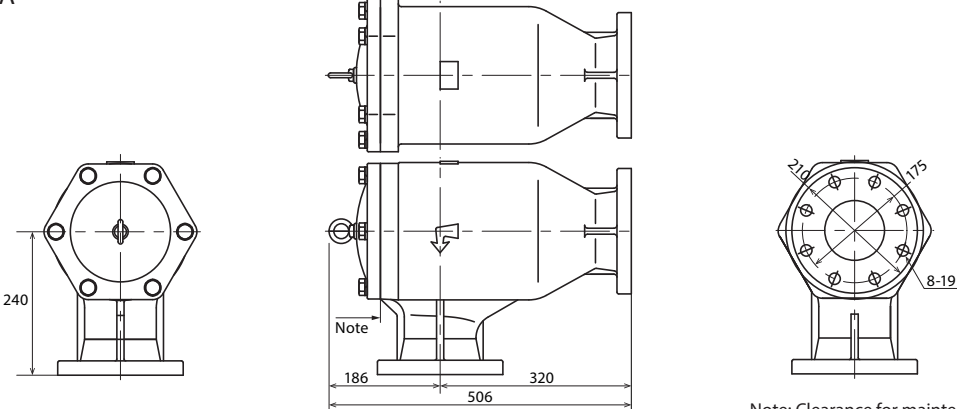
Note: Clearance for maintenance: at least 500

● 80A



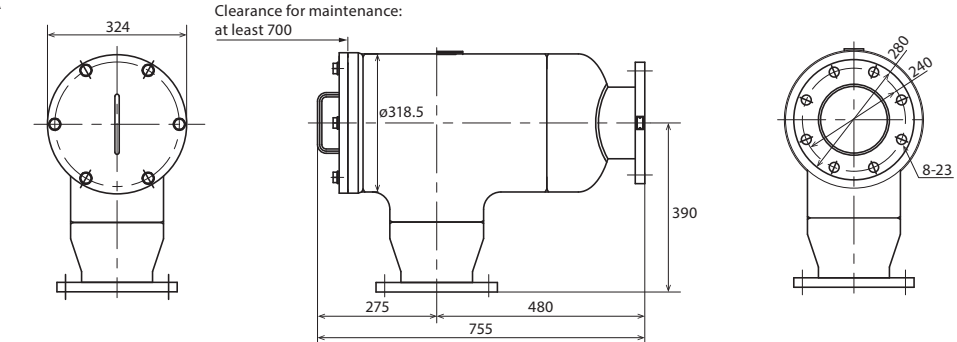
Note: Clearance for maintenance: at least 500

● 100A



Note: Clearance for maintenance: at least 500

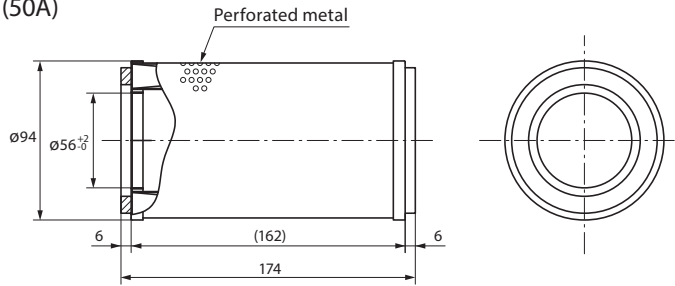
● 80A



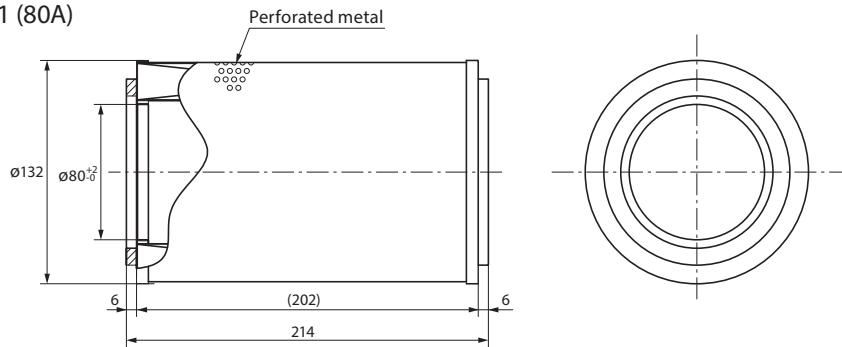
● Filter element for FC filters (manufactured by Azbil Corporation)

Unit: mm

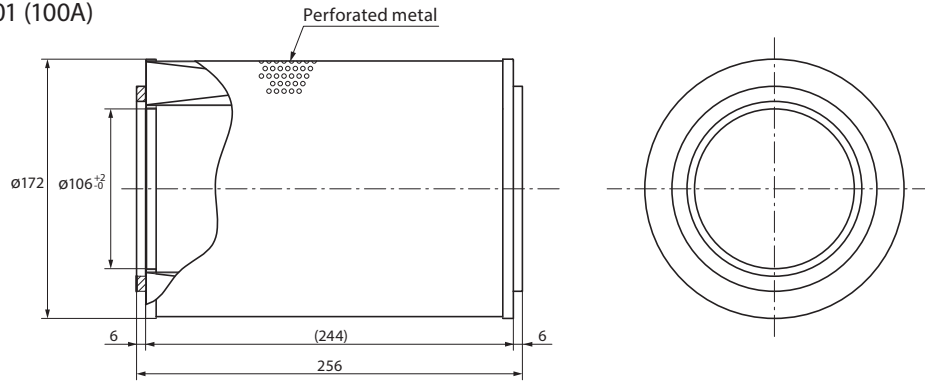
80394037-001 (50A)



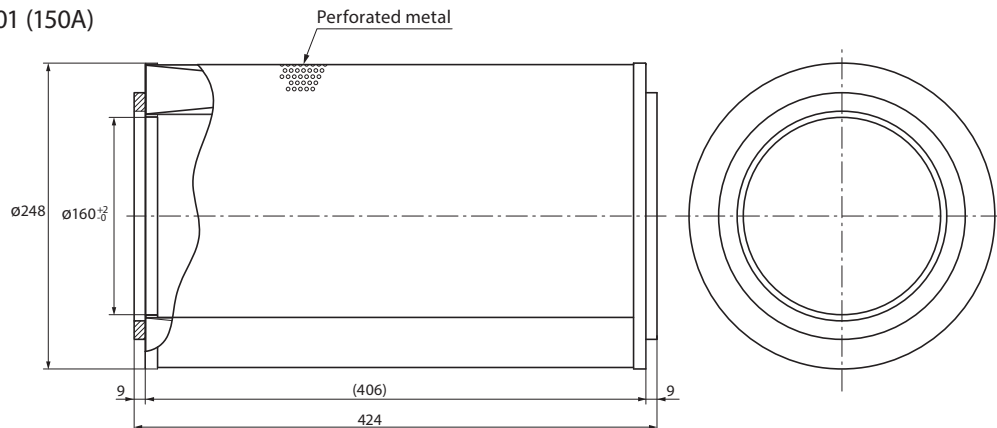
80394038-001 (80A)



80394039-001 (100A)



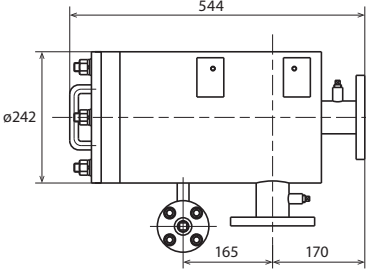
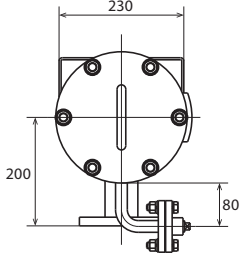
80394040-001 (150A)



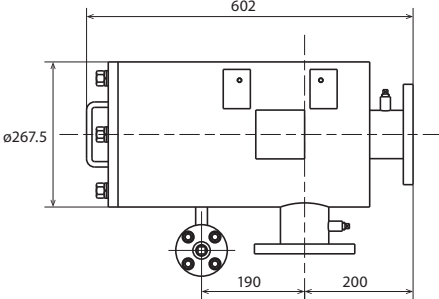
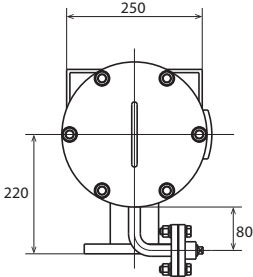
● FDSNC filter (manufactured by Azbil Kimmon Co., Ltd.)

Unit: mm

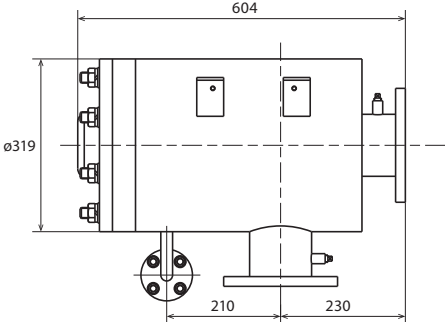
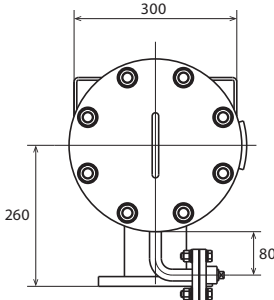
50A



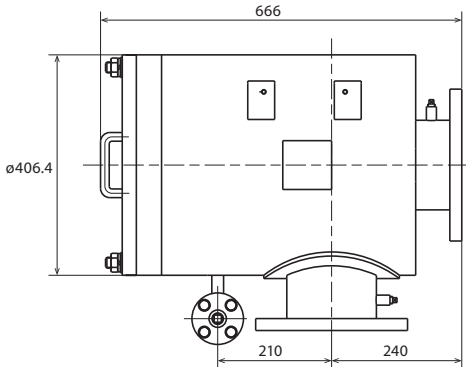
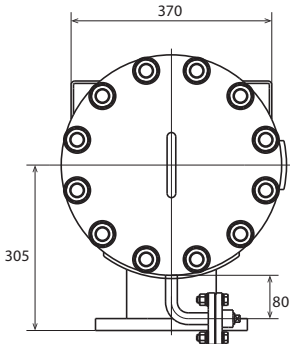
80A



100A



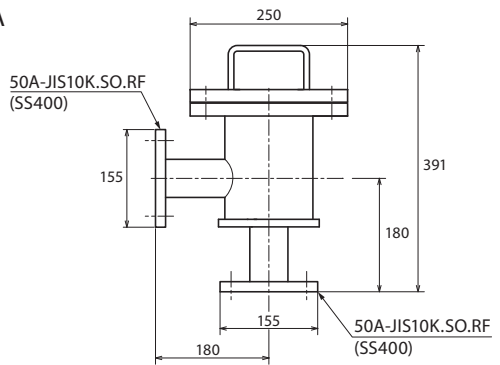
150A



● MFF 300-L type

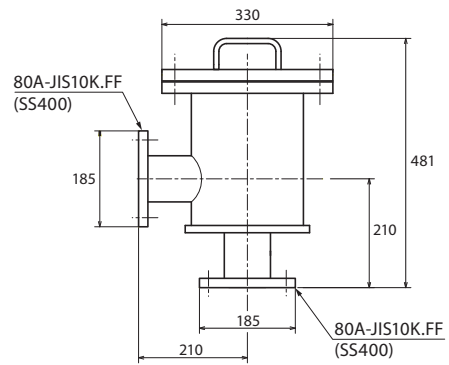
Unit: mm

50A



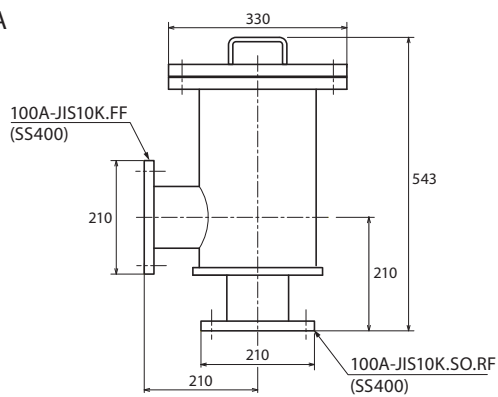
Mass: approx. 21 kg

80A



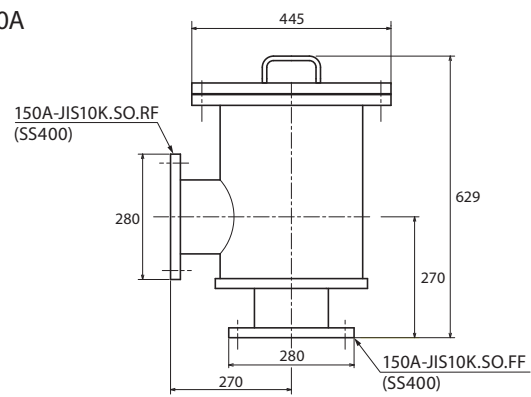
Mass: approx. 42 kg

100A



Mass: approx. 47 kg

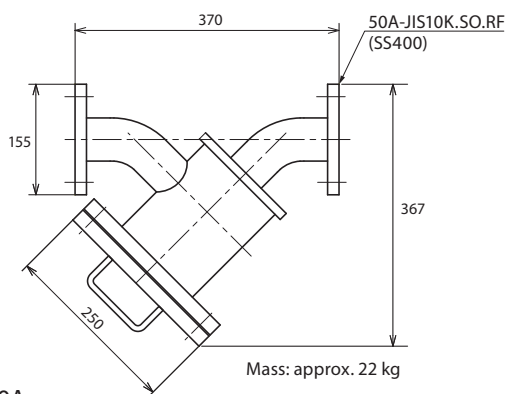
150A



Mass: approx. 90 kg

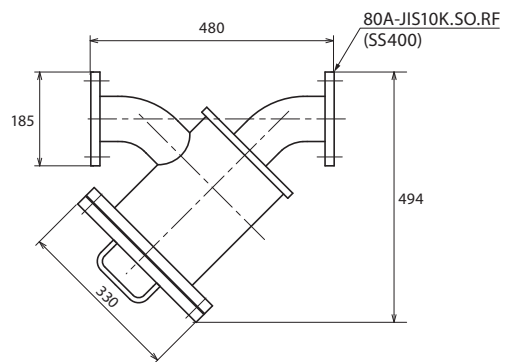
● MFF 300-Y type

50A



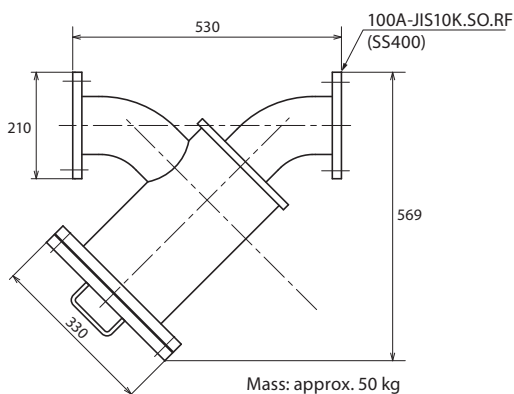
Mass: approx. 22 kg

80A



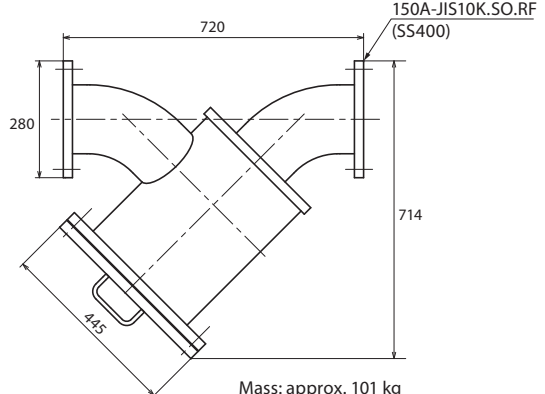
Mass: approx. 44 kg

100A



Mass: approx. 50 kg

150A



Mass: approx. 101 kg

Revision History of CP-SP-1161E

Date	Rev.	Revised pages	Description
Feb. 2004	1		
Mar. 2006	2		Overall revision.
Nov. 2008	3		Overall revision. 3rd ed = 19th Jp ed.
Apr. 2012	4		Company name changed.
Feb. 2018	5		Overall revision. 5th ed = 23rd Jp ed.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products. You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place.

Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.
You are required to provide your Equipment with safety design such as fool-proof design, *1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.

*2. A design that is safe even if the device fails.

*3. Avoidance of device failure by using highly reliable components, etc.

*4. The use of redundancy.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product.

However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

In addition,

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.

Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
 - * Nuclear energy/radiation related facilities
[For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
 - * Machinery or equipment for space/sea bottom
 - * Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment

- * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
 - * Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
 - (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
 - (5) Machinery or equipment that may affect human lives, human bodies or properties
 - (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety
4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.
 5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations. In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.
 6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.
 7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.
 8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.
 9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

 - (1) Installation, adjustment, guidance, and attendance at a test run
 - (2) Maintenance, inspection, adjustment, and repair
 - (3) Technical guidance and technical education
 - (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.



Azbil Corporation
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Kanagawa 251-8522 Japan

URL: <http://www.azbil.com>

Specifications are subject to change without notice. (09)

1st edition: Feb. 2004
5th edition: Feb. 2018 (F)