No.DOC1116365-3

Operation Manual

PRODUCT NAME

Air Management System

MODEL/ Series/ Product Number

AMS20X-X2044
AMS20X-X2045
AMS30X-X2044
AMS30X-X2045
AMS40X-X2044
AMS40X-X2045
AMS60X-X2044
AMS60X-X2045

SMC Corporation

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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution," "Warning"** or **"Danger."** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

Danger	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
Warning	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Caution	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



Safety Instructions

⚠ Caution
SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries. **Use in non-manufacturing industries is not allowed.** Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country. The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.[*2)]
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

■Operator

♦This Operation Manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment.

Only those persons are allowed to perform assembly, operation and maintenance.

♦Read and understand this Operation Manual carefully before assembling, operating or providing maintenance to the product.

■Safety Instructions

⚠Warning
■Do not disassemble, modify (including the replacement of printed circuit boards) or repair. Otherwise, an injury or failure can result.
■Do not operate the product outside of the specifications. Do not use the product with flammable or harmful fluids. Fire, malfunction, or damage to the product may result. Check the specifications before use.
■Do not use in an environment where flammable, explosive or corrosive gases are present. Otherwise, fire, explosion or corrosion may occur. The product is not designed to be explosion proof.
■Do not use the product with flammable fluid Fire or an explosion may result. Only air is an applicable fluid.
■Do not use the product in a place where static electricity is a problem. Otherwise failure or malfunction of the system can result.
■If using the product in an interlocking circuit •Provide a double interlocking system, for example a mechanical system. •Check the product regularly for proper operation. Otherwise malfunction can result, causing an accident.
■The following instructions must be followed during maintenance •Turn off the power supply. •Stop the air supply, exhaust the residual pressure in piping and verify that the air is released before performing maintenance work. Otherwise an injury can result.

⚠Caution

■Do not touch the terminals and connectors while the power is on.
Otherwise electric shock, malfunction and damage to the product can result.

■After maintenance is complete, perform appropriate functional inspections and leak test.
Stop operation if the equipment does not function properly or there is leakage of fluid.
When leakage occurs from parts other than the piping, the product itself may be damaged.
Cut off the power supply and stop the fluid supply.
Do not apply fluid if the system is leaking.
Otherwise, an unexpected malfunction may occur and it will become impossible to ensure safety.

■Handling Precautions

○Follow the instructions given below for selecting and handling.

●The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must be followed.

∗Product specifications

•The power is supplied from the circuit reinforced or double-insulated fromMAINS.
•The direct current power supply used should be UL approved as follows.
UL1310 Class 2 power supply unit or UL61010-1 LIM (Limited Energy Circuit).
•All external circuits should also be connected to a circuit that is reinforced or double-insulated from the MAINS and free from risk of electric shock and fire hazard.
•If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
•Do not mount the product with the display facing upward.
•Use only the specified voltage.
Otherwise failure or malfunction can result.
Insufficient supply voltage may not drive a load due to a voltage drop inside the product.
Check the operating voltage of the load before use.
•Do not apply a load that exceeds the max. load voltage or current.
This may cause damage or shorten the lifetime of the product.
•Data stored by the product is not deleted, even if the power supply is disconnected.
(Limit to rewrite: 1,500,000 times)
•The applicable fluids for this product is dry air.
The operating fluid temperature range is 0 to 50 °C.
•Before designing piping confirm the pressure loss (Characteristic data) at the sensor from the pressure loss graph. Confirm pressure loss of the sensor from the characteristics data.
•For details of the compressed air quality, refer to JIS B 8392: 2012[6: 6: 4] or ISO8573-1:2010[6:6:4].
Use an air filter with 5μm or less filtration rating on the inlet side.
•Use within the specified measurement flow rate and operating pressure.
Otherwise it will not be able to perform proper measurement due to delivery delay of the fluid.
•Allow space for maintenance.
Design the system allowing the required space for maintenance.
•Do not remove any nameplates or labels.
This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product. It may also result in non-conformity to safety standards.
•Beware of the inrush current when the power supply is turned ON.
Some connected loads can apply an initial charge current which will activate the over current protection function, causing the unit to malfunction.

●Product handling

＊Mounting

•Do not drop, hit or apply excessive shock to the product.
Otherwise damage to the product can result, causing malfunctions.

•Do not install the product in areas of high humidity or temperature.
Operation outside of the product specification range may cause damage to the product or operation failure or shorten the product life.

•Connect the product ensuring the direction of "1" (IN) and "2" (OUT) for air direction by following the arrow indicated on the product.
Incorrect connections may cause malfunction.

•Install with adequate space for maintenance around the product.
Refer to the dimensional drawings for necessary space.

•Tighten the two set screws on the spacer with bracket and spacer evenly.
Tighten them to the recommended tightening torque. Insufficient tightening may cause loosening or sealing failure, and excessive tightening may cause damage to the screws.

Recommended tightening torque

Applicable models	AMS20	AMS30	AMS40	AMS60
Part No. of spacer with bracket	Y200T-2-D	Y300T-2-D	Y400T-1-D	Y600T-2-D
Part No. of spacer	Y200-D	Y300-D	Y400-D	Y600-D
Tightening torque	0.36±0.036	1.2±0.05	1.2±0.05	2.0±0.1

•When the air management system is fixed on a wall with hexagon socket head cap screws, a hexagonal driver is recommended as a tool.
Tighten screws with the corresponding applicable screw size to the recommended tightening torque shown in the table below.

Applicable model	Applicable screw size	Tightening torque
AMS20	M6	2.6±0.26 N•m
AMS30	M6	2.6±0.26 N•m
AMS40	M8	6.2±0.62 N•m
AMS60	M10	12.5±1.25 N•m

•Ground the pipes and brackets.
Do not share the connected grounding with a component that generate strong electromagnetic noise, a component that generates high frequency, or the like.

•Before piping is connected, the product should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and solid foreign material from inside the piping.
Contamination of piping may cause damage or malfunction.

•When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealant do not get inside the pipe. When a sealant tape is used, leave 1.5 to 2 threads exposed.

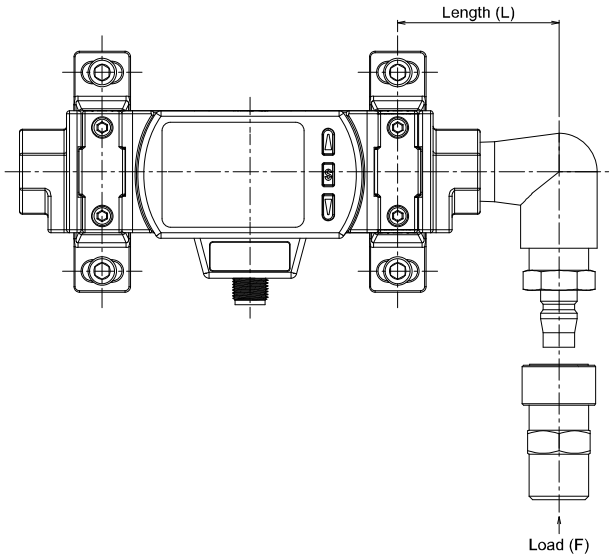
•Connect piping/fittings using the recommended torque while holding the female thread side tightly.
Insufficient tightening torque leads to loosening or sealing failure, and excessive tightening leads to damage of the threads. Tightening without holding the female thread applies an excessive force to the piping bracket directly, leading to damage.

Recommended tightening torque

Unit: N•m

Thread size	1/8	1/4	3/8	1/2	3/4	1
Tightening torque	3 to 5	8 to 12	15 to 20	20 to 25	28 to 30	36 to 38

•Do not apply torsion or bending moment other than the weight of the product itself.
External piping needs to be supported separately as it may cause damage.
If moment applied to the equipment is unavoidable during operation, the moment should be lower than the maximum moment shown below.
Non-flexible piping like steel tube is susceptible to excessive moment load or vibration. Insert flexible tubes to prevent this.



Body size	20	30	40	60
Max. Moment (M) N•m	14.5	16	19.5	28

Max. Moment (M) = Length (L) x Load (F)

•If a commercially available switching power supply is used, be sure to connect the frame ground (FG) terminal to ground.
•Do not drop, hit or apply excessive shock to the product.
Otherwise damage to the internal components may result, causing malfunction.
•Do not pull the lead wire forcefully or lift the product by the lead wire.
(Tensile strength 49 N or less)
Hold the product by the body when handling to prevent damage.
•Do not mount the product with the display facing upward.
Retention of air can cause an inability to measure accurately.
•Do not insert metal wires or other foreign matter into the flow path.
This can damage the sensor causing failure or malfunction
•Never mount the product in a place that will be used as a foothold during piping.
The product may be damaged if excessive force is applied by stepping or climbing onto it.
•If there is a risk of foreign matter entering the fluid, install a filter or mist separator at the inlet to avoid failure and malfunction.
Otherwise it can cause damage or malfunction. Or the flow switch will become unable to measure accurately.
•If the fluid flow on the IN side (entry side) of the product is unstable, correct measurement will not be possible.
If a valve is used on the IN side (entry side) of the product, the fluid may be unstable due to the change of the effective area, and there may be an error in the flow measurement results.
•Avoid installing a lubricator on the inlet side of the digital flow switch as it may cause oil inflow and damage internal parts.

∗Wiring (Including connecting/ disconnecting of the connectors)

•Do not pull hard on the lead wire. Especially never lift the product equipped with fitting and piping by holding the lead wires.

Damage to the connector, circuit board, cover or internal components may result, causing failure or malfunction.

• Avoid repeatedly bending, stretching or applying excessive force to the lead wire.

Repetitive bending stress or tensile stress can cause the sheath of the wire to peel off, or damage of the wire.

If the lead wire can move, secure it close to the body of the product.

The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.

Replace a damaged lead wire with a new one.

•Wire correctly.

Incorrect wiring may cause malfunction or damage to the product.

•Do not perform wiring while the power is on.

Otherwise damage to the internal components may result, causing malfunction.

•Do not route wires and cables together with power or high voltage cables.

Route the wires of the product separately from power or high voltage cables to prevent noise and surge from entering the product.

•Confirm correct insulation of wiring.

Poor insulation (interference with other circuits, poor insulation between terminals etc.) can apply excessive voltage or current to the product causing damage.

•Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.

Do not use a cable longer than 20 m.

Wire the DC(-) line (blue) as close as possible to the power supply.

•Take appropriate measures against noise, such as using a noise filter, when the Air Management System is incorporated into equipment.

Otherwise noise can cause malfunction.

∗Operating environment

•Do not use the product in an environment where the product is constantly exposed to water splashes.
Otherwise failure or malfunction can result. Take measures such as using a cover.

•Do not use the product in an environment where corrosive gases or fluids splashes can occur.
Otherwise damage to the internal parts can result, causing malfunction.

•Do not use the product in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires).

•Do not use in an area where surges are generated.
When there are machines or equipment that generate large surges near the product (magnetic type lifter, high frequency inductive furnace, motor, etc.), this can result in deterioration and damage of the internal components. Take protective measures to isolate the surge sources, and prevent the lines from coming into close contact.

•Do not use a load which generates a surge voltage.
When a surge-generating load such as a relay or solenoid is directly driven, use the product with built in surge protection.

•The product is CE/UKCA marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.

•Mount the product in a location that is not affected by vibration or impact.
Otherwise it can cause damage or malfunction.

•Do not use the product in the presence of a magnetic field.
Malfunction can result.

•Do not let foreign matter, such as wire debris, get inside the product.
Otherwise it can cause damage or malfunction.

•Do not use the product in an environment that is exposed to temperature cycle.
Heat cycles other than ordinary changes in temperature can adversely affect the internal components of the product.

•Do not expose the product to direct sunlight.
If using in a location directly exposed to sunlight, protect the product from the sunlight.
Failure or malfunction may occur.

•Keep the product within the specified ambient temperature range.
The ambient temperature range is 0 to 50 °C.
Operation under low temperature may lead to damage or operation failure due to frozen moisture in the fluid or air.
Protection against freezing is necessary.
Mounting of an air dryer is recommended for elimination of drainage and water.
Avoid abrupt temperature changes even within the specified temperature range.

•Do not operate close to a heat source, or in a location exposed to radiant heat.
Insufficient air quality may cause operation failure.

∗Adjustment and Operation

•Perform settings suitable for the operating conditions. Incorrect setting can cause operation failure.

•Please refer to the PLC manufacturer's manual etc. for details of programming and addresses. For the PLC protocol and programming refer to the relevant manufacturer's documentation.

•Connect the load before turning the power supply on.

•Do not short-circuit the load.

Although an error is displayed when the product load has a short circuit, the generated over current may lead to damage to the product.

•Do not press the setting buttons with a sharp pointed object.

This may damage the setting buttons.

•Supply power under no flow conditions.

•If using the product to detect very small flow differences, warm up the product for 10 to 15 minutes before use.

There will be a drift on the display of approx. 2 to 3% for 10 minutes after the power supply is turned on.

•Perform settings suitable for the operating conditions.

Incorrect setting can cause operation failure.

•During the initial setting, the product will switch the measurement output according to the condition before setting.

Check the effect on the equipment before setting.

Stop the control system for setting, if necessary.

•Do not touch the LCD during operation.

The display can vary due to static electricity.

∗Maintenance

•Perform regular maintenance and inspections.

There is a risk of unexpected failure of components due to the malfunction of equipment and machinery.

•Before performing maintenance, turn off the power supply, stop the air supply, exhaust the residual compressed air in the piping, and verify the release of air.

Otherwise, unintended malfunction of system components can result.

• Maintenance and checks should be carried out according to the procedure in this operation manual. Incorrect handling of the product may cause damage or operation failure of the equipment or device.

•Remove the condensate periodically.

If condensate enters the secondary side, it can cause operation failure of pneumatic equipment.

•Do not use solvents such as benzene, thinner etc. to clean the product.

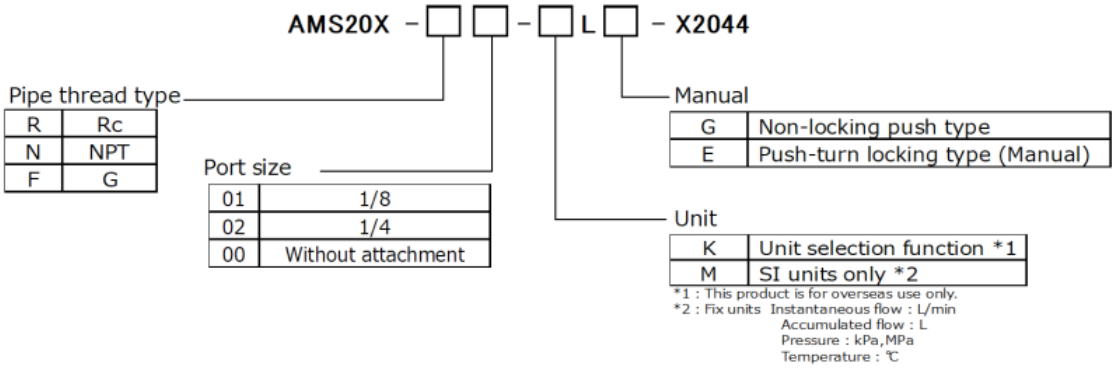
This may damage the surface of the body or erase the markings on the body.

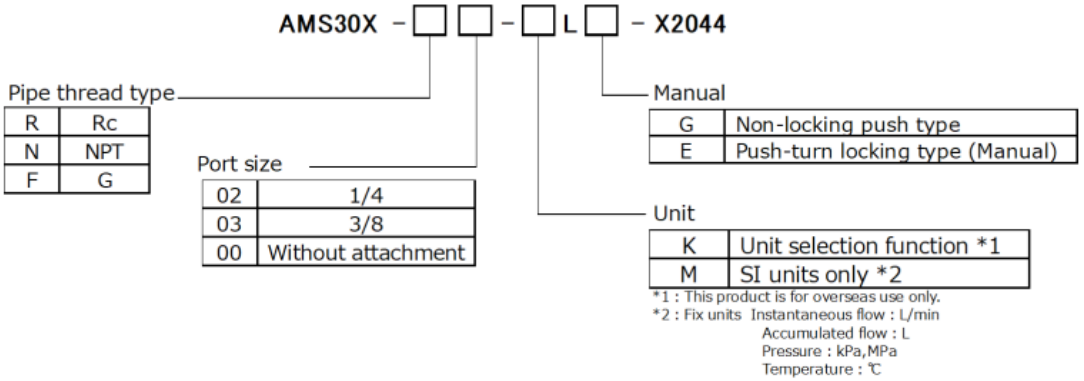
Use a soft cloth to remove stains.

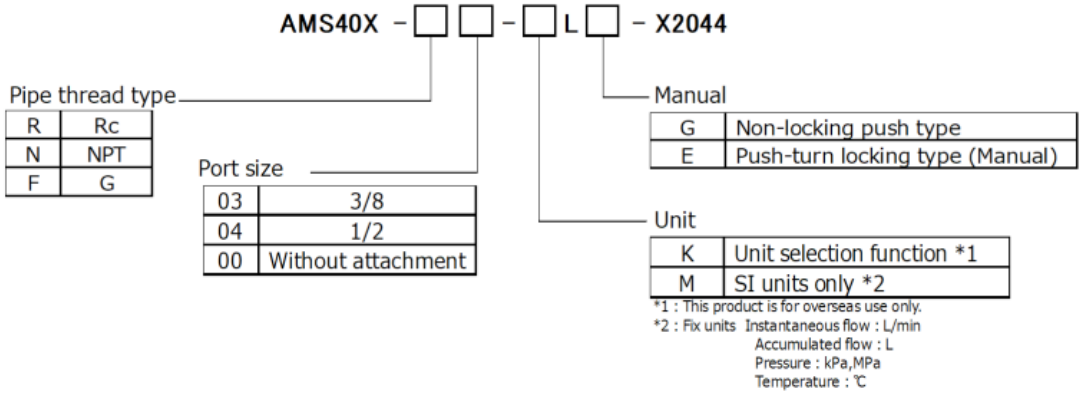
For heavy stains, use a damp cloth that has been soaked with diluted neutral detergent and fully squeezed, then wipe the stains again with a dry cloth.

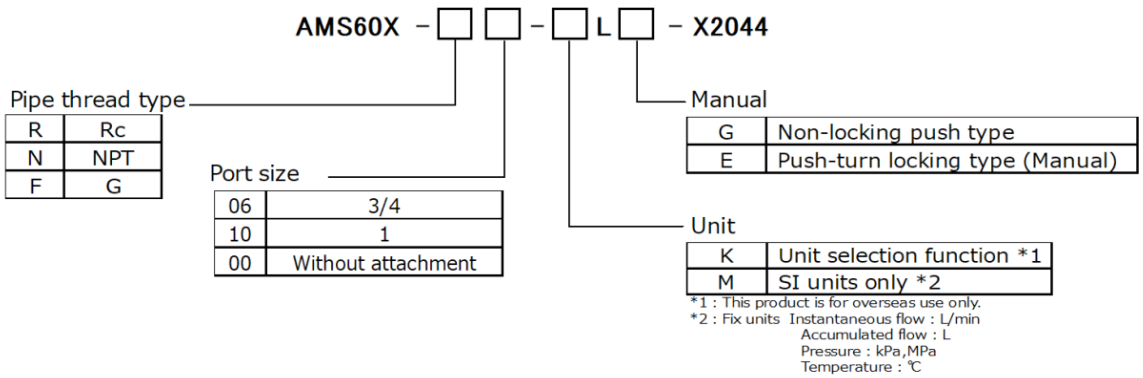
Model Indication and How to Order

Air Management System (Standby regulator type)









Air Management System (Residual Pressure Relief Valve type)

AMS20X – □ □ – □ L □ – X2045

Pipe thread type

R	Rc
N	NPT
F	G

Port size

01	1/8
02	1/4
00	Without attachment *3

*3 : Fixed pipe thread type : R

Manual

G	Non-locking push type
E	Push-turn locking type (Manual)

Unit

K	Unit selection function *1
M	SI units only *2

*1 : This product is for overseas use only.
*2 : Fix units Instantaneous flow : L/min
Accumulated flow : L
Pressure : kPa,MPa
Temperature : ℃

AMS30X – □ □ – □ L □ – X2045

Pipe thread type

R	Rc
N	NPT
F	G

Port size

02	1/4
03	3/8
00	Without attachment *3

*3 : Fixed pipe thread type : R

Manual

G	Non-locking push type
E	Push-turn locking type (Manual)

Unit

K	Unit selection function *1
M	SI units only *2

*1 : This product is for overseas use only.
*2 : Fix units Instantaneous flow : L/min
Accumulated flow : L
Pressure : kPa,MPa
Temperature : ℃

AMS40X - □ □ - □ L □ - X2045

Pipe thread type

R	Rc
N	NPT
F	G

Port size

03	3/8
04	1/2
00	Without attachment *3

*3 : Fixed pipe thread type : R

Manual

G	Non-locking push type
E	Push-turn locking type (Manual)

Unit

K	Unit selection function *1
M	SI units only *2

*1 : This product is for overseas use only.
*2 : Fix units Instantaneous flow : L/min
Accumulated flow : L
Pressure : kPa,MPa
Temperature : ℃

AMS60X – □ □ – □ L □ – X2045

Pipe thread type

R	Rc
N	NPT
F	G

Port size

06	3/4
10	1
00	Without attachment *3

*3 : Fixed pipe thread type : R

Manual

G	Non-locking push type
E	Push-turn locking type (Manual)

Unit

K	Unit selection function *1
M	SI units only *2

*1 : This product is for overseas use only.
*2 : Fix units Instantaneous flow : L/min
Accumulated flow : L
Pressure : kPa,MPa
Temperature : ℃

Digital Flow Switch

PF3A 8 □ H - □□ - □□ - □ -X105

Type

Symbol	Type
8	Pressure/Temperature

Rated flow range (Flow range)

Symbol	Flow range	Air combination
R5	5 to 500 L/min	AC20-D
01	10 to 1000 L/min	AC30-D
02	20 to 2000 L/min	AC40-D
04	40 to 4000 L/min	AC50-D/AC60-D

Large flow type

Output specification

Symbol	OUT1	OUT2
L2	IO-Link/Switch output (N/P)	Switch output (N/P)

Options

Symbol	Content
Nil	With lead wire with M12 connector (3 m) *1
N	No lead wire
Q	With lead wire with M12-M12 connector (3 m) *2

*1: Accessory is not assembled with the product, but shipped together.
*2: One end has an M12 (female) connector and the other end has an M12 (male) connector.

Uit specification

Symbol	Content
Nil	Units selection function *3
M	SI unit only *4

*3: Since the unit for Japan is fixed to SI due to new measurement law, this option is for overseas.
*4: Fixed unit: Instantaneous flow: L/min
Accunulated flow: L
Pressure: kPa, MPa
Temperature: °C

Calibration certificate (Flow rate/Pressure only)

Symbol	Content
Nil	Without calibration certificate
A *5	With calibration certificate

*5: Certificate in both Japanese and English.
*: Made to Order.

Flow direction

Symbol	Content
Nil	Left → Right
R	Right → Left

Optional Parts numbers

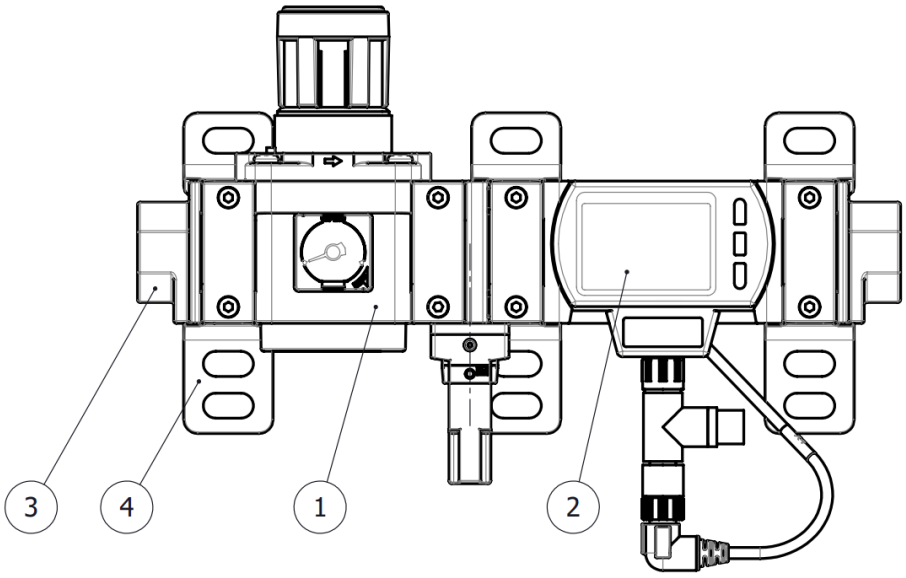
If an accessory is required for maintenance purposes, order the following parts number.

Product name	Parts number	Note
Spacer with bracket	Y200T-2-D	For body size 20
	Y300T-2-D	For body size 30
	Y400T-1-D	For body size 40
	Y600T-2-D	For body size 60
Piping adapter	E200-##-D *1	For body size 20
	E300-##-D *1	For body size 30
	E400-##-D *1	For body size 40
	E600-##-D *1	For body size 60
M12 connector cable (220 mm)	EXA1-AC002-SAPA-X4	For wiring PF3A to each device
Branch connector	LEC-CGD	For wiring PF3A to each device

*1: "#" is required to complete the thread and piping specification. Please refer to AC-D series catalogue for details.

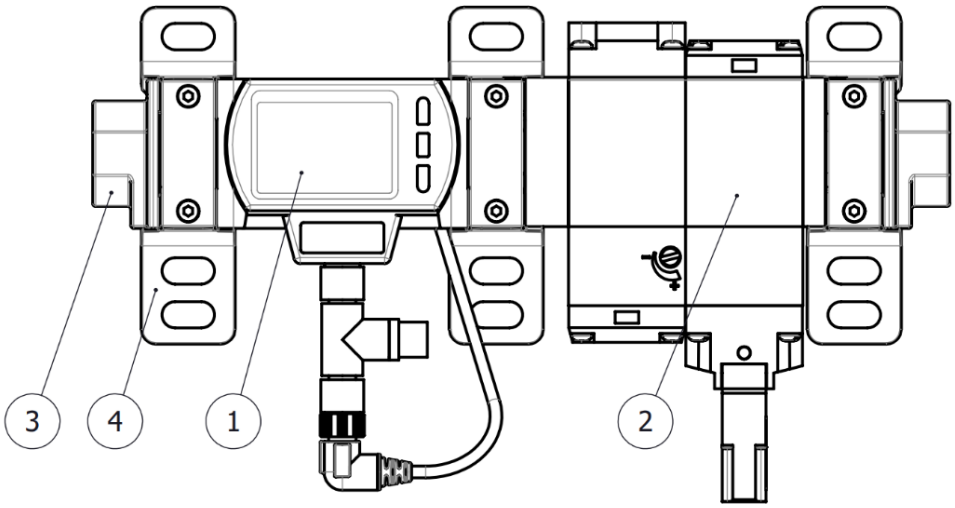
Names and Functions of Individual Parts

Air Management System(Standby regulator type)



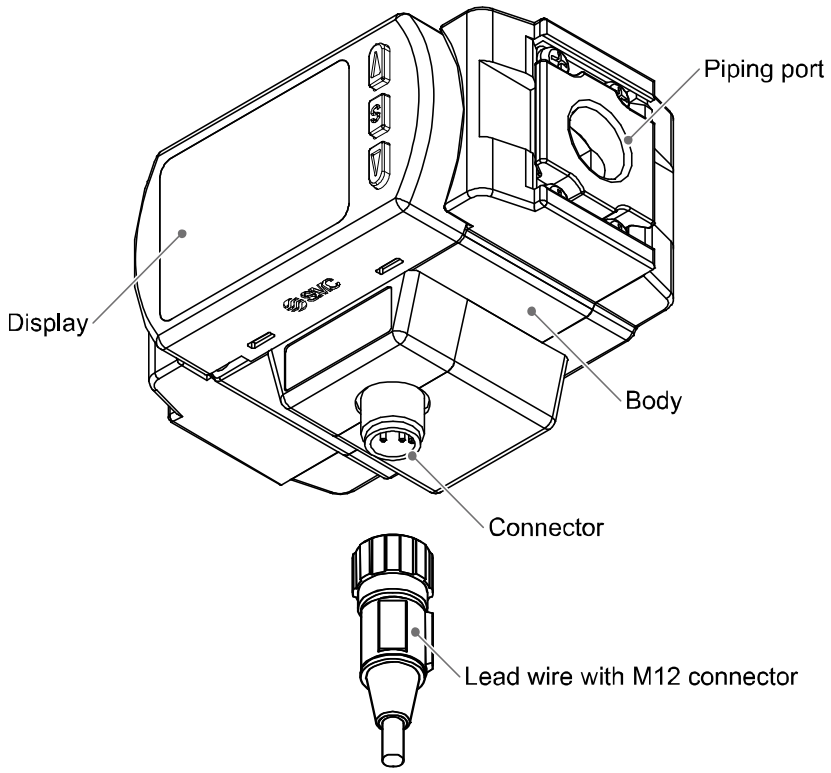
No.	Name	Function
1	Standby regulator	Control air pressure manually according to electrical signals from the Digital Flow Switch.
2	Digital Flow Switch	Manage overall Air Management System devices, communication to IO-Link master.
3	Piping adapter	Adapter for piping connection.
4	Spacer with bracket	Bracket that connects each module of the air management system and for installing to a wall.

Air Management System (Residual Pressure Relief Valve type)

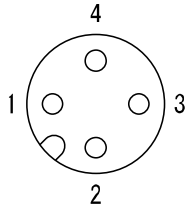


No.	Name	Function
1	Digital Flow Switch	Manage overall Air Management System devices, communication to IO-Link master.
2	Residual Pressure Relief Valve	According to orders from the Digital Flow Switch, stop providing pressure and exhaust outlet pressure. Soft start feature: a module for the valve is used to gradually raise the initial pressure in an air system, starting with low-speed air.
3	Piping adapter	Adapter for piping connection.
4	Spacer with bracket	Bracket that connects each module of the air management system and for installing to a wall.

Digital Flow Switch



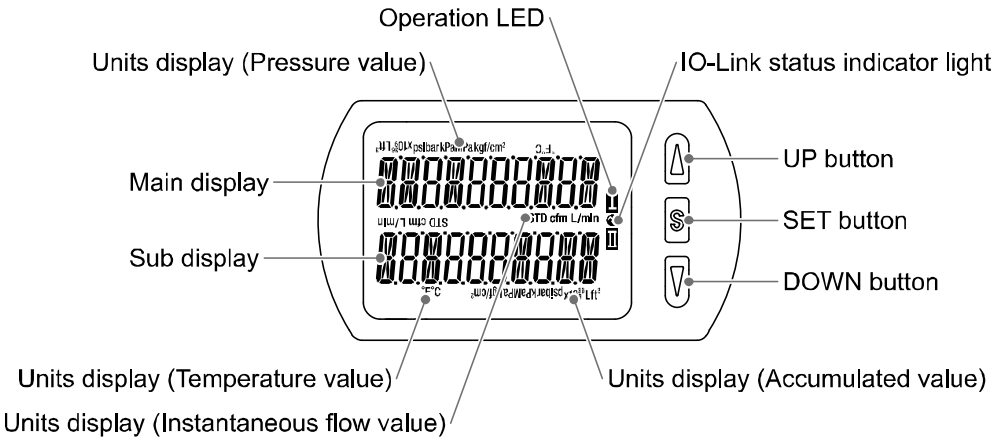
Connector pin numbers
(on the product)



1	DC(+)
2	OUT2
3	DC(-)
4	OUT1(C/Q)

Element	Description
Display	Refer to the Display on the next page.
Connector	M12 4-pin connector for electrical connections.
Piping port	For piping connections.
Body	The body of the product.

Display



Element	Description
Main display	Displays the instantaneous flow value, pressure value and error codes. (2 colour display)
Operation LED	Indicates the output status of OUT. When the output is ON: Orange LED is ON. When the accumulated pulse output mode is selected, the output display will turn off.
Sub display	Displays the accumulated flow, temperature value, set value, and peak/ bottom value when in measurement mode.
UP button	Selects the mode and the display shown on the Sub display, or increases the switch point.
SET button	Press this button to change the mode and to set a value.
DOWN button	Selects the mode and the display shown on the Sub display, or decreases the switch point.
Units display (Instantaneous flow value)	Indicates the flow measurement units currently selected.
Units display (Accumulated value)	Indicates the flow measurement units currently selected.
Units display (Pressure value)	Indicates the flow measurement units currently selected.
Units display (Temperature value)	Indicates the flow measurement units currently selected.
IO-Link status indicator light	LED is ON when OUT1 is used in IO-Link mode. (LED is OFF in SIO mode)

●IO-Link indicator light operation and display

Communication with master	IO-Link status indicator light	Status			Main screen display *1	Content
Yes	☀	IO-Link mode	Correct	Operate	ModE oPE	Normal communication status (Reading of measured value)
	◪			Start up	ModE Srt	When communication starts up.
				Preoperate	ModE PrE	
			Abnormal	Version does not match	Er 15 V 1.0	Version of master and IO-Link does not match *2
No				Communication shut-off	ModE Srt ModE PrE ModE oPE	Correct communication was not received for 1 second or more.
	○	SIO mode			ModE SIO	General switch output

LCD display: "○" OFF, "◪" Flashing, "☀" ON

*1: "ModE - - -" is displayed when selecting the modes on the main screen.

*2: When the product is connected to the IO-Link master with version other than "V1.1", an error is generated.

■Definition and terminology

	Term	Definition
A	Accumulated flow	The total amount of fluid that has passed through the device. If an instantaneous flow of 100 L/min lasts for 5 minutes, the accumulated flow will be 5 x 100 = 500 L.
	Accumulated-value hold time	A function to store the cumulative flow value in the product's internal memory at certain time intervals. Reads the memory data when power is supplied. Accumulation of data begins with the value read at the moment power is supplied. The time interval for memorizing can be selected from 2 or 5 minutes.
	AMS	Air Management System.
B	Bottom value display (mode)	Shows the min. from when the power was supplied to the current time.
C	Chattering	The problem of the switch output turning ON and OFF repeatedly around the set point value at high frequency due to the effect of pulsation.
	Current consumption	Current which is necessary to operate each unit.
D	Delay time	•Standby ON Delay The setting time from when the measured flow rate under standby flow rate(threshold) to the set duration. If the standby input signal received and Standby ON Delay time reached, the AMS change to standby mode. •Standby OFF Delay The setting time from when the measured flow rate exceeds standby flow rate(Hysteresis) to the set duration. When the AMS returns to Operation mode, AMS shall be back to Standby mode without waiting for Standby ON Delay time.
	Digital filter	Function to add digital filtering to the fluctuation of the measured value. Smooth the fluctuation of displayed value for sharp start up or fall of the flow and pressure. When the function is valid, digital filtering is reflected to the ON/OFF of the switch output. The response time indicates when the set value is 90% in relation to the step input. Output chattering or flicker in the measurement mode display can be reduced by setting the digital filter.
	Display accuracy	Indicates the max. deviation between the displayed pressure value and the true value.
	Display colour	Indicates the color of the digital display.
	Display value fine adjustment (function)	Displayed pressure value can be adjusted within the range of ±5%R.D. (±5% of displayed value). It is used if the true pressure value is known, or to eliminate differences between the displayed values of different instruments that are measuring the same pressure.
E	Enclosure (IP)	Abbreviation of International Protection. Standard related to protection against extraneous matter, such as hand, steel ball, steel wire, dust particle or water, applied to the product.
	Error displayed	The error code number displayed, to identify the error detected by the self-diagnostic function of the Digital Flow Switch. Refer to the "Error display" on page 100 for details.
F	F.S. (full span/full scale)	Abbreviation of full span or full scale; difference between the min. and max. rated pressure values. means the max. fluctuation range of the pressure switch rated value. For example, when the rated pressure range is 0 to 1.000 [MPa]: F.S. = 1.000 - 0 = 1 [MPa] (Reference: 1%F.S. = 1 x 0.01 = 0.01 [MPa])
F	Function selection mode	A mode in which setting of functions is performed. It is a separate menu from the switch setting. If any function settings need to be changed from the factory default, each setting can be selected with "F*". The setting items are: digital filter, display reverse, zero cut-off display on/off, display value fine adjustment, use of display OFF mode, and use of security code.

	Term	Definition
H	Hysteresis	The difference between ON and OFF points used to prevent chattering. Hysteresis can be effective in avoiding the effects of pulsation.
I	Instantaneous flow	The flow passing per unit of time. If it is 10 L/min, there is a flow of 10 L passing through the device in 1 minute.
	Insulation resistance	Insulation resistance of the product. The resistance between the electrical circuit and the case.
	Isolation mode	The mode that Residual Pressure Relief Valve exhaust outlet pressure is intended to use during the machine stopped state.
K	Key-lock function	Function that prevents changes to the settings of the Digital Flow Switch (disables button operation).
M	Max. load current	The max. current that can flow to the output (output line) of the switch output.
	Measurement mode	Operating condition in which flow rate, pressure and temperature is detected and displayed, and the switch function is operating.
N	Normal condition	The flow which is converted into the volume at 0 °C and 101.3 kPa (absolute pressure). <nor> indicates that the product is in normal condition.
O	Operating fluid temperature	Range of fluid temperature that can be measured by the product.
	Operating humidity range	Humidity range in which the product can operate.
	Operating temperature range	Ambient temperature range in which the product can operate.
	Operation mode	Provide air pressure for the machine to operate.
	Output light	A light that turns on when the switch output is ON.
P	Peak value display (mode)	Shows the max. value from when the power was supplied to the current time.
	Pressure characteristics	Indicates the change in the display value when the fluid pressure changes.
	Proof pressure	Pressure limit that if exceeded will result in mechanical and/or electrical damage to the product.
R	Rated flow range	The flow range within which the product will meet all published specifications. Values outside of this range can be set as long as they are within the set flow range, but the specifications cannot be guaranteed.
	Rated pressure range	The pressure range within which the product will meet all published specifications. Values outside of this range can be set as long as they are within the set pressure range, but the specifications cannot be guaranteed.
	Rated temperature range	The temperature range within which the product will meet all published specifications. Values outside of this range can be set as long as they are within the set temperature range, but the specifications cannot be guaranteed.
	Repeatability	Reproducibility of the display value, when the measured quantity is repeatedly increased and decreased.
	R.D.	Current read value For example, when the display value is 1.000 [MPa], ±5%R.D. is ±5% of 1.000 [MPa], which becomes ±0.05 [MPa]. When the display value is 0.800 [MPa], ±5%R.D. is ±5% of 0.800 [MPa], which becomes ±0.04 [MPa].

	Term	Definition
S	Smallest settable increment	The resolution of set and display values. If the min. setting unit is 2 L/min, the display will change in 2 L/min steps, e.g. 30…..32…..34 L/min.
	Standard condition	The flow which is converted to the volume at 20 °C and 101.3 kPa (absolute pressure). <Std> indicates that the product is in standard condition.
	Standby input	Trigger input signal to change status to Standby mode.
	Standby mode	Air pressure controlled by a standby regulator during a machine stopped state.
T	Temperature characteristics	Indicates the change in the display value caused by ambient temperature changes.
U	Units selection function	A function to select display units other than the international unit (SI unit) specified in the new Japanese measurement law. The product is not equipped with this function.
W	Wetted part	A part that comes into physical contact with the fluid.
	Withstand voltage	A measure of the product's resistance to a voltage applied between the electrical circuit and case. Durability in withstanding voltage. The product may be damaged if a voltage above this value is applied. (The withstand voltage is not the supply voltage used to power the product.)
Z	Zero-clear function	This function is used to adjust the displayed pressure to zero.

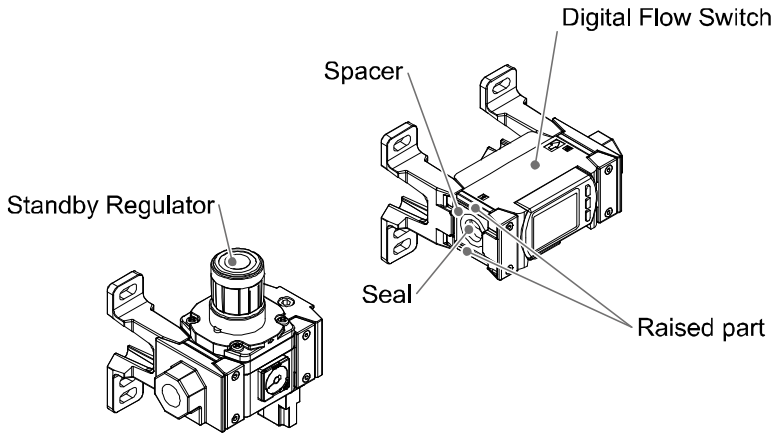
Mounting and Installation

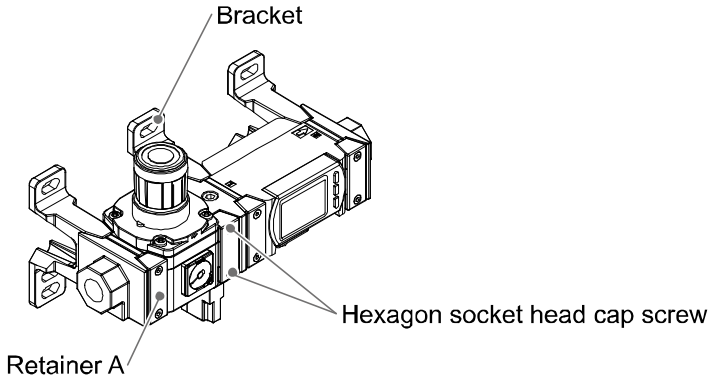
■Piping

⚠ Caution

•Before piping is connected, the product should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and solid foreign material from inside the piping.
•When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealant do not get inside the piping.
•Fit the raised part of the spacer to the recessed part (groove for the raised part) of the product.
•Tighten the retainer A with two hexagon socket head cap screws temporarily.
•Tighten the two hexagon socket head cap screws evenly using a hexagonal wrench.
•Refer to the table below for the tightening torque for the screws.

Applicable model	Hexagonal wrench socket size nominal value	Tightening torque
AMS20	2 mm	0.36±0.036 N•m
AMS30	3 mm	1.2±0.05 N•m
AMS40		
AMS60	4 mm	2.0±0.1 N•m





■Wiring

Connection

•Connections should only be made with the power supply turned off.

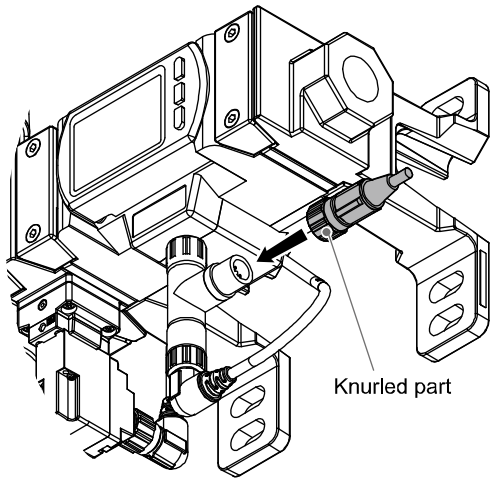
•Use a separate route for the product wiring and any power or high voltage wiring. If wires and cables are routed together with power or high voltage cables, malfunction may result due to noise.

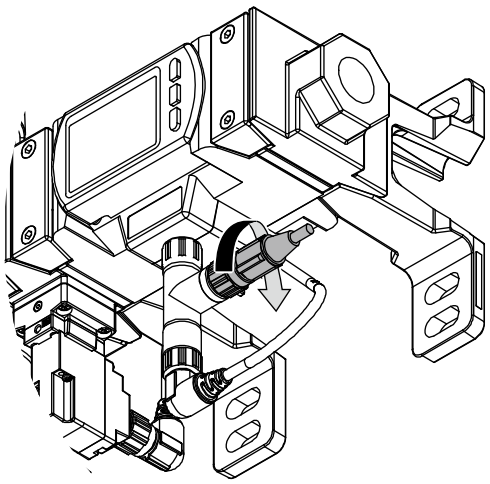
•If a commercially available switching power supply is used, be sure to ground the frame ground (FG) terminal. If the product is connected to the commercially available switching power supply, switching noise will be superimposed and the product specifications will not be satisfied. In that case, insert a noise filter such as a line noise filter/ ferrite between the switching power supplies or change the switching power supply to the series power supply.

Connecting/Disconnecting

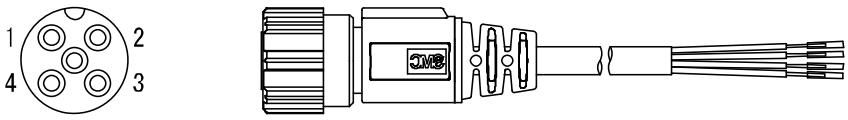
•Align the lead wire connector with the connector key groove, and insert it straight in. Turn the knurled part clockwise. Connection is complete when the knurled part is fully tightened. Check that the connection is not loose.

•To remove the connector, loosen the knurled part and pull the connector straight out.





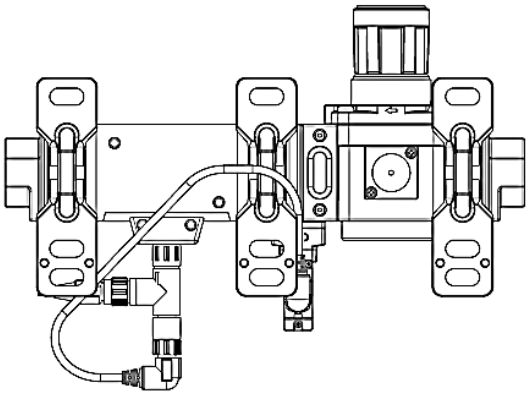
Connector pin numbers and function (lead wire)



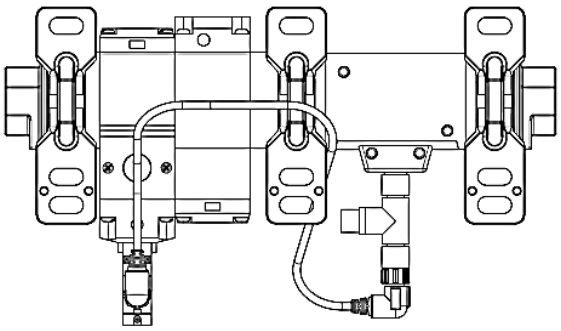
Pin number	Wire colour	Description	Function
1	Brown	DC(+)	24 VDC
2	White	OUT2	Switch output
3	Blue	DC(–)	0 V
4	Black	C/Q	Communication data (IO-Link)/Switch output (SIO)

(3) Connection to each device

Refer to the following instructions when device maintenance/replacement is required.
AMS components and the digital flow switch are connected via branch connector.
All connections are M12 A-coded. The following table shows the functions of each port.



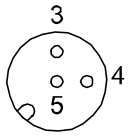
AMS##X-X2044 Series



AMS##X-X2045 Series

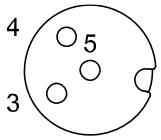
•Connection to Residual Pressure Relief Valve (VP)

VP side: M12 3-pin A-coded (Plug)

Connector	Pin No.	Signal	Details
	3	0 V	0 V
	4	+	Input
	5	FE	Ground

•Connection to Standby regulator

Standby regulator (ARS) side M12 3-pin A-coded (Plug)

Connector	Pin No.	Signal	Details
	3	0 V	0 V
	4	C/Q	Input
	5	NC	Not connected

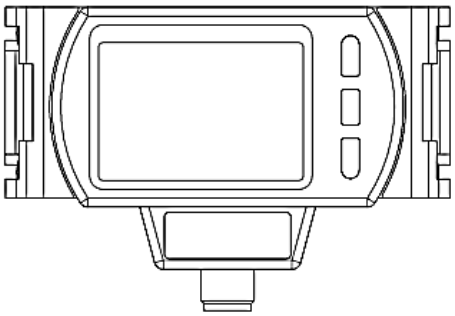
System overview

The AMS##X-X2044/X2045 is a system comprising the following two devices.
・Standby regulator: Manual adjustment of standby pressure. Standby pressure is activated by electrical signal from the digital flow switch.
・Digital Flow Switch：Measures flow rate, pressure and temperature, IO-Link communication and controls the composed devices.
・Residual Pressure Relief Valve: Exhaust the downstream pressure and is connected to the Digital Flow Switch.

The AMS components are compatible with SMC's modular AC-D F.R.L. system and can be combined with existing installations.

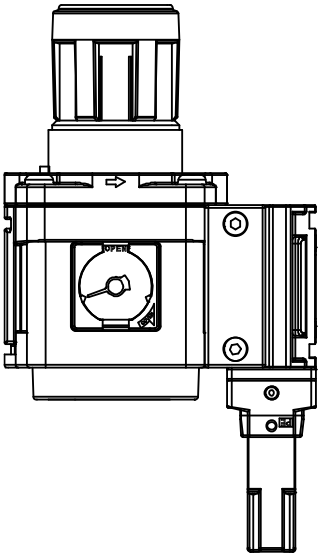
1. Digital Flow Switch (PF3A8-X105)

The standby flow rate is set and the standby regulator or the residual pressure relief valve is controlled by a standby input signal from the IO-Link master.



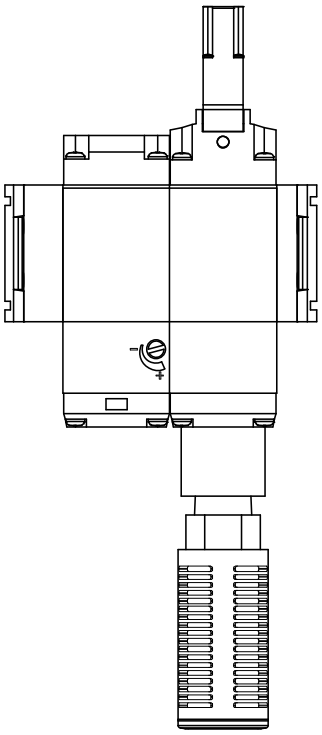
***2.* Standby regulator:*(*ARS)**

The manual pressure setting type uses an ARS module to set the standby pressure.



3. Residual Pressure Relief Valve (VP)

A VP valve module can be used for isolation mode with an optional soft start function. The silencer is not included and therefore should be ordered separately.



○Working Principle

The AMS functions in two modes: operation mode and standby mode (AMS#X-X2044) or isolation mode (AMS#X-X2045).

For AMS#X-X2044

When the measured flow rate is below a set flow value "1. Standby flow rate (Threshold)" for longer than a set time "2. Standby ON delay" and "3. Standby input signal" is ON (Output process data: standby signal is ON), the AMS output pressure will be reduced from the operation pressure down to the user specified "4. Standby pressure". AMS is the non relief construction hence air consumption is required to drop pressure to the standby pressure.
While in Standby Mode, if the "3. Standby input signal" switches OFF (Output process data: standby signal is OFF.), the AMS output pressure will increase back to the operation pressure.
Once the measured flow rate exceeds the "6. Standby flow rate (Hysteresis)", the "5. Standby OFF delay" timer starts. If the "3. Standby input signal" is ON (Output process data: standby signal is ON)) again within the time, the AMS will immediately return to Standby Mode without waiting "2. Standby ON delay".

For AMS#X-X2045

When the measured flow rate is below a set flow value "1. Standby flow rate (Threshold)" for longer than a set time "2. Standby ON delay" and "3. Standby input signal" is ON (Output process data: standby signal is ON), the AMS output pressure will be exhausted from the pressure in operation mode by the closing of the Residual Pressure Relief Valve.
While in Isolation Mode, if the "3. Standby input signal" switches OFF (Output process data: standby signal is OFF.), the AMS output pressure will increase back to the operation pressure.
Once the measured flow rate exceeds the "6. Standby flow rate (Hysteresis)", the "5. Standby OFF delay" timer starts. If the "3. Standby input signal" is ON (Output process data: standby signal is ON)) again within the time, the AMS will immediately return to Isolation Mode without waiting "2. Standby ON delay".
AMS##X-X2045 series have a "7. Soft start function" when it back from isolation mode to operation mode.

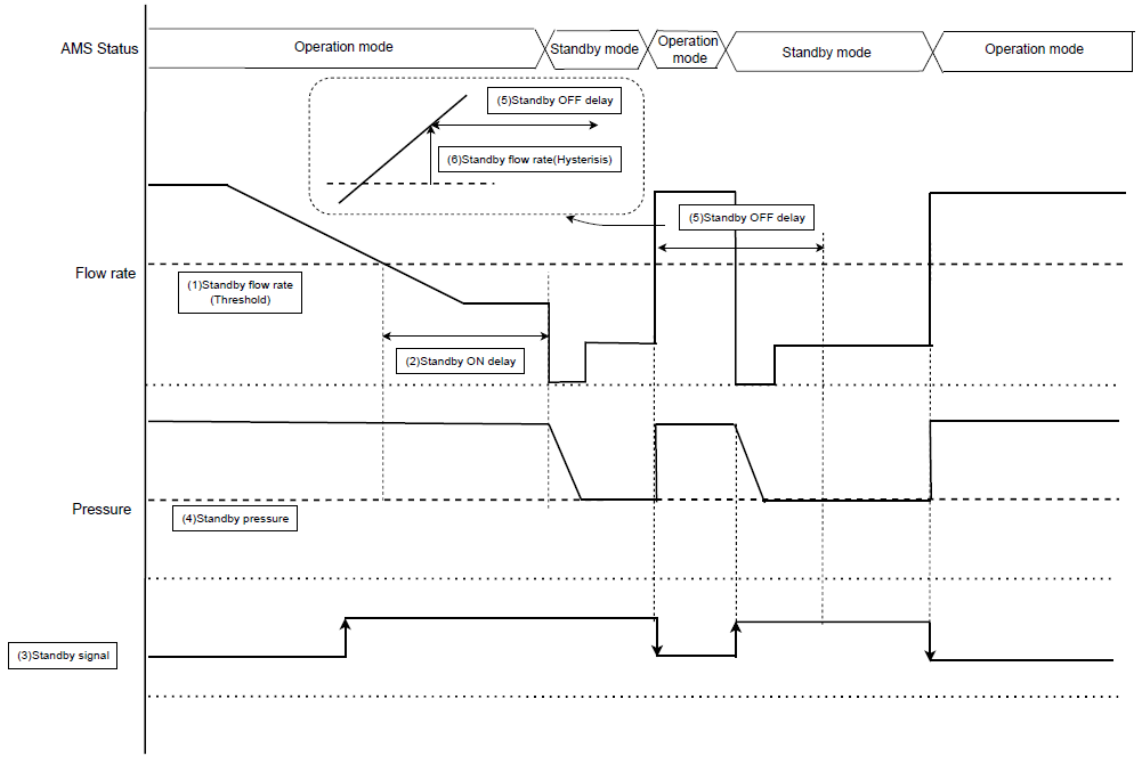
The table below summarizes the AMS inputs and parameters.

Item	Name	Type
1	Standby flow rate (Threshold)	Configurable parameter. (Refer to page 104)
2	Standby ON delay	Configurable parameter. (Refer to page 104)
3	Standby input signal	Process Data
4	Standby pressure	AMS#X-X2044: Hand adjustable.
5	Standby OFF delay	Configurable parameter. (Refer to page 104)
6	Standby flow rate (Hysteresis)	Configurable parameter. (Refer to page 104)
7	Soft start function	Mechanical, configurable by an adjusting screw on the product.

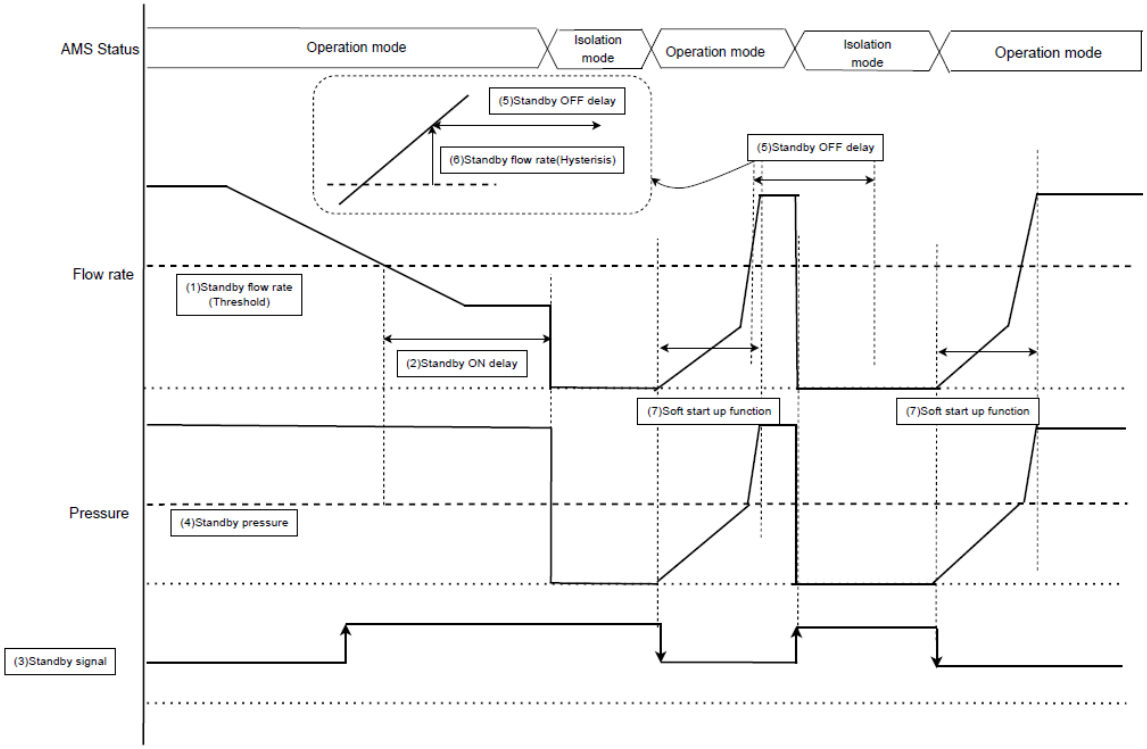
○Timing Chart

This timing chart is for reference only, the actual be haviour depends on the machine volume connected to the AMS outlet side.

・AMS##X-X2044：Standby regulator type



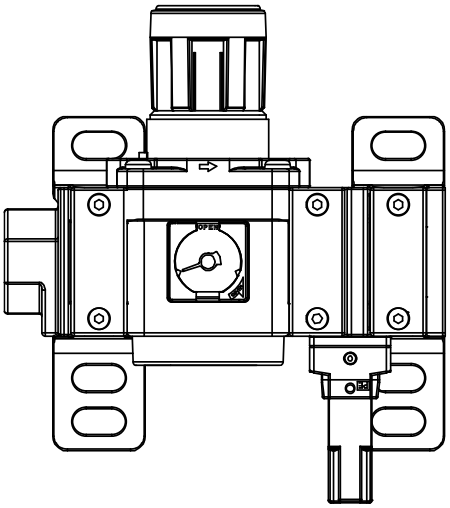
・AMS##X-X2045：Residual Pressure Relief Valve type



AMS Operation Setting

○Standby regulator pressure setting

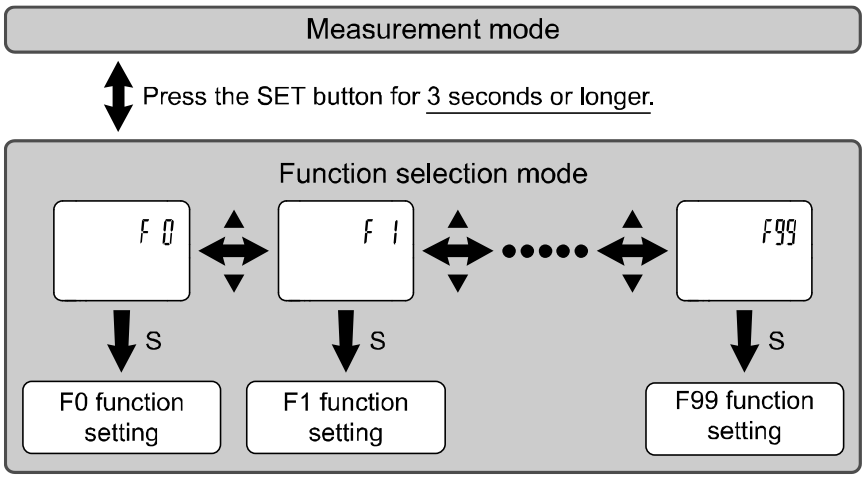
For the ARS type AMS, the operation pressure is the same as the AMS supply pressure. To set the standby pressure, the AMS must first be forced into standby mode. When in standby mode, set the standby pressure by turning the handle on the regulator module. Or, change to the standby mode via ARS manual operation, and then set the pressure in the standby mode.



Function Setting on Display

■Function selection mode

In this mode, each function setting can be changed separately.
In measurement mode, press the SET button for 3 seconds or longer to display [F 0].
Press the UP or DOWN button to select the function to be changed.



Press the SET button for 2 seconds or longer to return to measurement mode.

■Default setting

Function			Default Settings Sub display (Right)	Applicable Page
Main display (Right)	Main display (Left)	Sub display (Left)		
[F 0]	FLoW	[rEF] Select display units	[Std] Standard condition	Page 35
	FLoW	[Unit] Units selection function ∗1	[L] L/min	
	tEMP		[C] °C	
	PrES		[MPA] MPa	
	–	[NorP] Select NPN/PNP	[PNP] PNP output	
[F 1]	–	[SW1] Select the target for setting	[FLoW] Flow rate	Page 38
	FLoW	[ModE] Select switch mode	[HYS] Hysteresis mode	
	FLoW	[1ot] Select switch operation	[1_P] Normal output	
	FLoW	[P_1] Input the set value	[250] 250 L/min (AMS20)	
			[500] 500 L/min (AMS30)	
			[1000] 1000 L/min (AMS40)	
			[2000] 2000 L/min (AMS60)	
	FLoW	[H_1] Input of hysteresis	[25] 25 L/min (AMS20)	
			[50] 50 L/min (AMS30)	
			[100] 100 L/min (AMS40)	
			[200] 200 L/min (AMS60)	
	FLoW	[dtH1] ON delay time setting	[0.00] 0 second	
	FLoW	[dtL1] OFF delay time setting	[0.00] 0 second	
[F 2]	–	[SW2] Select the target for setting	[FLoW] Flow rate	Page 44
	FLoW	[ModE] Select switch mode	[HYS] Hysteresis mode	
	FLoW	[2ot] Select switch operation	[2_P] Normal output	
	FLoW	[P_2] Input the set value	[250] 250 L/min (AMS20)	
			[500] 500 L/min (AMS30)	
			[1000] 1000 L/min (AMS40)	
			[2000] 2000 L/min (AMS60)	
	FLoW	[H_2] Input of hysteresis	[25] 25 L/min (AMS20)	
			[50] 50 L/min (AMS30)	
			[100] 100 L/min (AMS40)	
			[200] 200 L/min (AMS60)	
	FLoW	[dtH2] ON delay time setting	[0.00] 0 second	
	FLoW	[dtL2] OFF delay time setting	[0.00] 0 second	
[F 3]	FLoW	[FiL] Select digital filter	[1.0] 1 second	Page 45
	PrES		[0.10] 0.1 second	
[F 6]	PrES	[FSC] Display value fine adjustment	[0.0] 0%	Page 46
[F13]	–	[rEv] Select reverse display	[oFF] Reverse display OFF	Page 47
[F14]	FLoW	[CUt] Select Zero cut-off setting	[1.0] 1%F.S. cut	Page 48
	PrES		[0.0] 0%	
[F16]	PrES	[MES] Measurement display setting	[diSP] Display	Page 51
	tEMP		[diSP] Display	
	AC		[diSP] Display	
[F30]	AC	[SAvE] Accumulated value hold	[oFF] Not stored	Page 52
[F33]	–	[PoE] Communication failure	[Hold] Hold	Page 53

Function			Default Settings Sub display (Right)	Applicable Page
Main display (Right)	Main display (Left)	Sub display (Left)		
[F40]	–	[FrtE] standby flow rate (Threshold)	[25] 25 L/min (AMS20) [50] 50 L/min (AMS30) [100] 100 L/min (AMS40) [200] 200 L/min (AMS60)	Page 54
	–	[FHyS] standby flow rate (Hysteresis)	[50] 50 L/min (AMS20) [100] 100 L/min (AMS30) [200] 200 L/min (AMS40) [400] 400 L/min (AMS60)	
	–	[t_on] standby ON delay	[600] 600 sec	
	–	[t_oFF] standby OFF delay	[0] 0 sec	
	–	[iSoL] auto isolation	[OFF] auto isolation OFF	
	–	[t_iSo] auto isolation delay	[3600] 3600 sec	
[F41]	–	[SEt] Force AMS mode	[AMS] No forced AMS mode	Page 57
[F80]	–	[diSP] Display OFF mode	[on] Display ON	Page 58
[F81]		[Pin]Security code	[oFF] Not used	Page 59
[F90]		[ALL] Setting of all functions	[oFF] Not used	Page 61
[F96]		[CYCL] Check of cycle time	[– – –. –] No input signal	Page 63
[F98]		[tESt] Setting of output check	[n] Normal output	Page 64
[F99]		[ini] Reset to the default settings	[oFF] Not used	Page 73

∗1: Setting is only possible for models with the units selection function.

■[F 0] Reference condition/Units selection function/Switch output function

Reference condition

Standard condition or normal condition can be selected.

Standard condition and normal condition are defined as follows:

- •Standard condition: Displayed flow rate which is converted to volume at 20 °C, 101.3 kPa (absolute pressure).
- •Normal condition: Displayed flow rate which is converted to volume at 0 °C, 101.3 kPa (absolute pressure).

Units selection function

This setting is only available for models with the units selection function.

*: kPa/MPa can be selected if the product does not have the unit selection function.

Switch output function

The switch output function can be selected (NPN or PNP output).

*: AMS20X/30X/40X/60X-X2044/X2045 must be used with PNP output.
The factory default setting is PNP output.

<Operation>

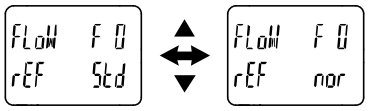
Display [F 0] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the reference condition.

Reference condition

Press the UP or DOWN button to select the reference condition.



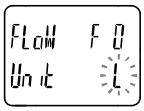


Standard condition　　Normal condition

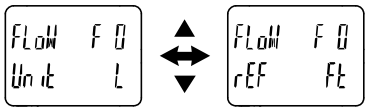
Press the SET button to set. ⬇ Move on to the units selection function. (For units selection type)

Units selection function

Press the UP or DOWN button to select the display units.



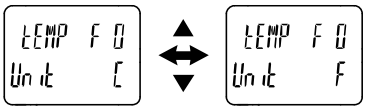
1) Flow rate



L/min　　cfm (ft^3/min)

Press the SET button to set. ⬇

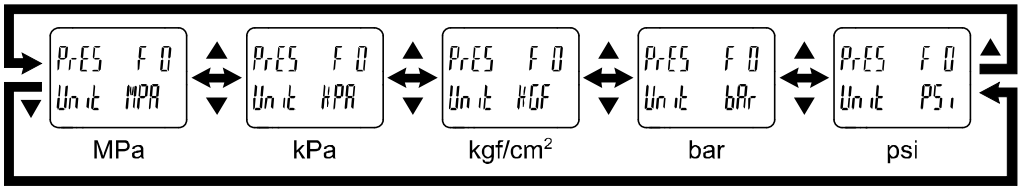
2) Temperature



°C　　°F

Press the SET button to set. ⬇

3) Pressure



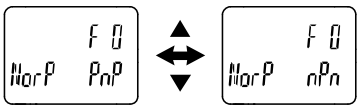
MPa　　kPa　　kgf/cm^2　　bar　　psi

Press the SET button to set. ⬇ Move on to switch output function.

Switch output function

Press the UP or DOWN button to select the switch output function.





PNP output NPN output

Press the SET button to set. Return to function selection mode.

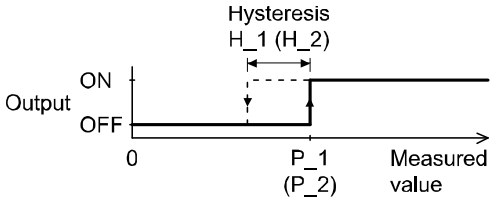
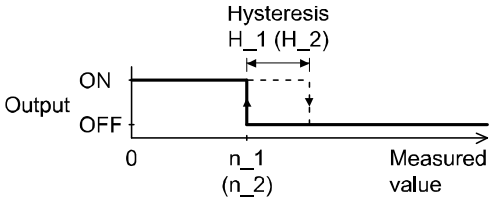
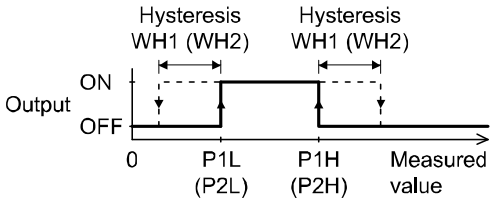
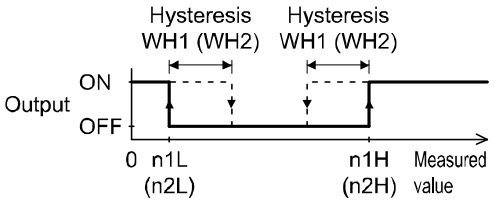
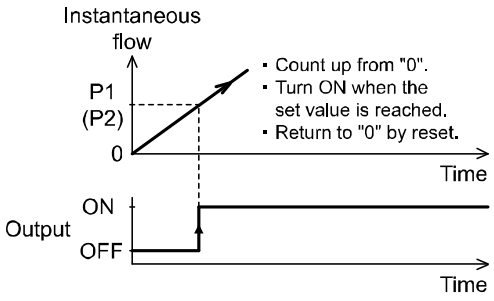
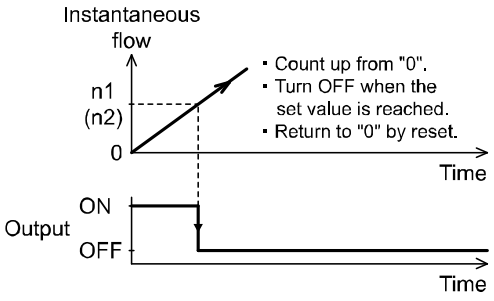
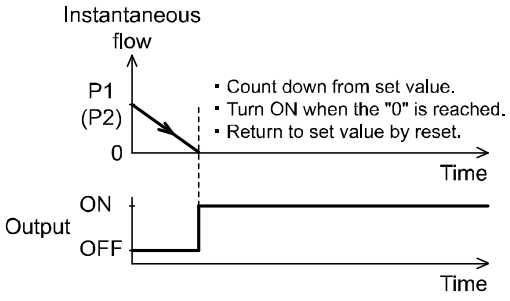
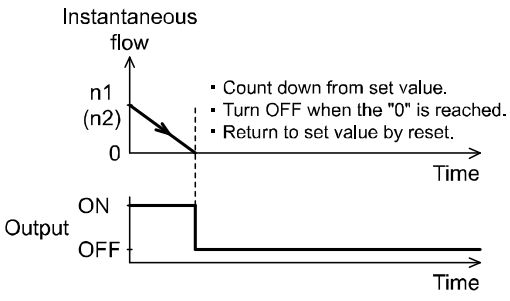
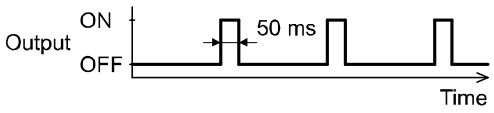
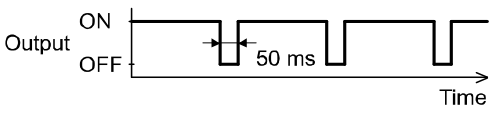
[F 0] Reference condition/Units selection function/ Switch output function is completed

■[F 1] Setting of SW1

Set the output mode of SW1.

●Switch output modes

Select the output mode required from the table below.

	Normal output	Reversed output
Hysteresis mode		
Window comparator mode		
Accumulated output mode (Increment)		
Accumulated output mode (Decrement)		
Accumulated pulse output mode		

∗: The operation may become unstable if hysteresis mode or window comparator mode are used during fluctuating flow conditions. In this case, maintain an interval between the set values and start using after confirming stable operation.

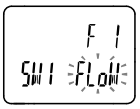
<Operation>

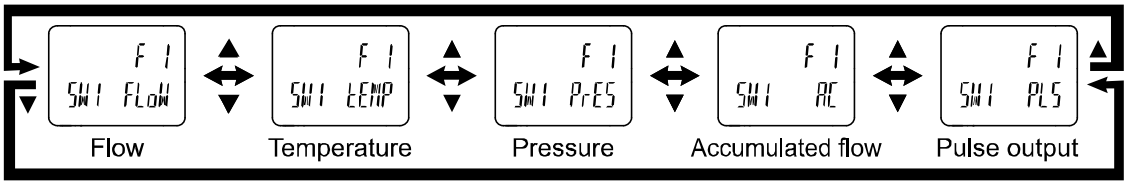
Display [F 1] by pressing UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to select the target for setting.

Select the target for setting

Press the UP or DOWN button to select the target for setting.





Press the SET button to set. ⬇ Move on to settings.

a. Flow rate/temperature/pressure is selected: Refer to page 40.
b. Accumulated flow is selected: Refer to page 42.
c. Accumulated pulse output is selected: Refer to page 43.

Press the SET button to set. ⬇ Return to function selection mode.

[F 1] Setting of SW1 completed

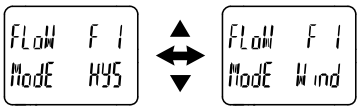
∗: Selected item becomes valid after pressing SET button.
∗: After enabling the setting by pressing SET button, it is possible to return to the measurement mode by keeping pressing SET button for 2 second or longer.

a. Flow rate/temperature/pressure is selected

Select output mode

Press the UP or DOWN button to select the output mode.





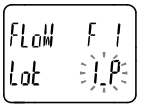
Hysteresis mode

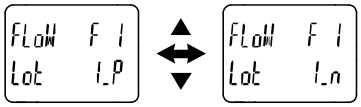
Window comparator mode

Press the SET button to set. ⬇ Move on to the reversed output.

Reversed output setting

Press the UP or DOWN button to select reversed output.





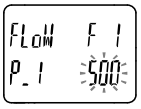
Normal output

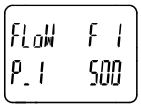
Reversed output

Press the SET button to set. ⬇ Move on to setting of set value.

Setting of set value

Set the value based on the setting method on page 56.





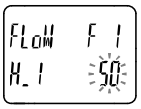
Set value

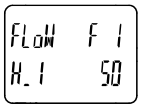
Hysteresis mode: [P_1]
Window comparator mode: [P1L] [P1H]
"P" is changed to "n" as [P_1] → [n_1] when reversed output is selected
The snap shot function can still be used.

Press the SET button to set. ⬇ Move on to setting of hysteresis.

Setting of hysteresis

Set the value based on the setting method on page 56.





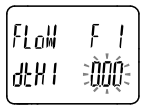
Hysteresis

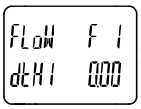
Hysteresis mode: [H_1]
Window comparator mode: [WH1]
The snap shot function can still be used.

Press the SET button to set. ⬇ Move on to the ON delay time input.

ON delay time input

Press the UP or DOWN button to set the ON delay time.
ON delay time set range: 0.00 to 60.00 [s]



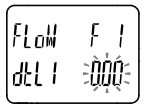


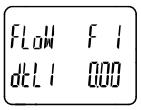
ON delay time

Press the SET button to set. ⬇ Move on to the OFF delay time input.

OFF delay time input

Press the UP or DOWN button to set the OFF delay time.
OFF delay time set range: 0.00 to 60.00 [s]





OFF delay time

Press the SET button to set. ⬇ Return to function selection mode.

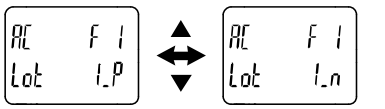
[F 1] Setting of SW1 completed

b. Accumulated flow is selected

Reversed output setting

Press the UP or DOWN button to select reversed output.





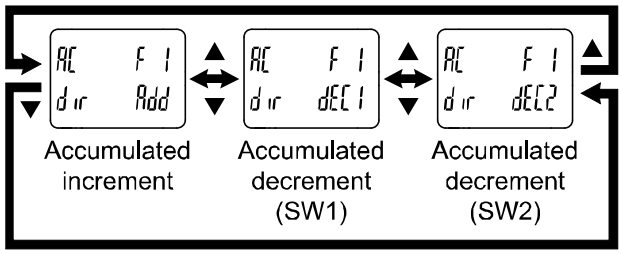
Normal output Reversed output

Press the SET button to set. ⬇ Move on to the accumulated increment (addition)/decrement (subtraction).

Select accumulated increment (addition) or decrement (subtraction)

Press the UP or DOWN button to select the accumulated increment (addition)/decrement (subtraction).





Accumulated increment | Accumulated decrement (SW1) | Accumulated decrement (SW2)

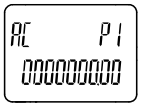
∗: For Accumulated decrement, SW1 or SW2 is displayed.
The switch output can be set individually.

Press the SET button to set. ⬇ Move on to setting of set value.

Setting of set value

Press the UP or DOWN button to change the value.
Press the SET button to move to the digit to the right.
Press the SET button for 1 second or longer to flash all digits.
Press the SET button while all the digits are flashing to move to the next step.





Set value

The accumulated output setting range is displayed by the set value of the 9 digits and the units (x10^3 L).

Press the SET button to set. ⬇ Return to function selection mode.

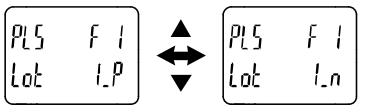
[F 1] Setting of SW1 completed

c. Accumulated pulse output is selected

Reversed output setting

Press the UP or DOWN button to select reversed output.





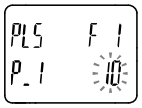
Normal output Reversed output

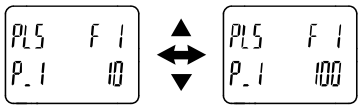
Press the SET button to set. Move on to setting of accumulated pulse output value.

Select accumulated pulse output

Press the UP or DOWN button to select accumulated pulse output value.

For PF3A8R5H: select from 1 L/pulse∗, 10 L/pulse
For PF3A801H,802H: select from 10 L/pulse∗, 100 L/pulse
For PF3A804H: select from 100 L/pulse∗, 1000 L/pulse
[∗ is factory setting]





10 L/pulse 100 L/pulse

Press the SET button to set. Return to function selection mode.

[F 1] Setting of SW1 completed

■[F 2] Setting of SW2

Set the output mode of SW2.

<Operation>

Display [F 2] by pressing UP or DOWN button in function selection mode.

Press the SET button. ⬇

[F 1] Set the output based on the setting of SW1.

∗: The part displayed as "1" in the SW1 setting is displayed as "2" in the SW2 setting.
*: SW2 does not have Accumulated pulse output mode.

■[F 3] Select digital filter

The digital filter can be selected to filter the flow rate and pressure measurement.
Output chattering or display flicker in measurement mode can be reduced by setting the digital filter.

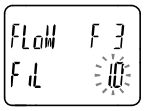
<Operation>

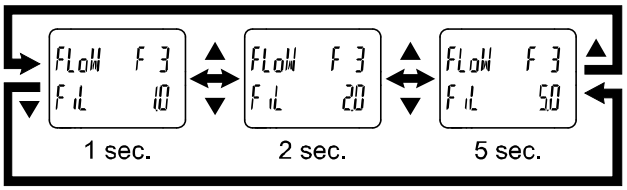
Display [F 3] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select digital filter (flow rate).

Select digital filter (flow rate)

Press the UP or DOWN button to select the flow rate digital filter.

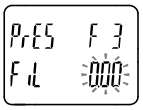


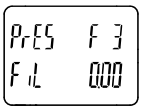


Press the SET button to set. ⬇ Move on to the select digital filter (pressure).

Select digital filter (pressure)

Press the UP or DOWN button to select the pressure digital filter.
Digital filter set range: 0.00 to 30.00 [s]





0 to 30 sec.

Press the SET button to set. ⬇ Return to function selection mode.

[F 3] Digital filter setting is completed

*: Each set value is a guideline for 90% response time.

*: Both the switch output and flow display are affected.

■[F 6] Fine adjustment of display value

This function is used to manually perform a fine adjustment of the displayed pressure value.
Pressure can be adjusted in the following range of ±5%R.D.

<Operation>

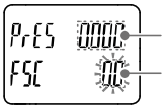
Display [F 6] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the fine adjustment of display value.

Fine adjustment of display value

Press the UP or DOWN button to change adjustment rate.

When the adjustment rate is changed, the pressure value after the adjustment will be displayed on the main screen.



Press the SET button to set. ⬇ Return to function selection mode.

[F 6] Fine adjustment of display value is completed

■[F13] Setting for reversed display mode

This function is used to rotate the display upside down.
It is used to correct the display when it is upside down due to installation of the product.
When the reversed display function is ON, the function of the UP/DOWN buttons are reversed.

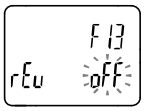
<Operation>

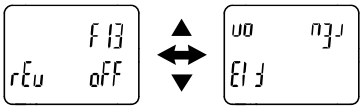
Display [F13] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select reversed display.

Select reversed display

Press the UP or DOWN button to select reversed display.





Reversed display OFF　　Reversed display ON

Press the SET button to set. ⬇ Return to function selection mode.

[F13] Setting for reversed display mode is completed

*: When the reversed display function is ON, the characters of the sub display appear upside down.

■[F14] Zero cut-off setting

When the flow rate and pressure is close to zero, this function forces the display to zero.
The zero cut-off range is 0.0 to 10.0%F.S., and can be set in 1.0%F.S. increments.

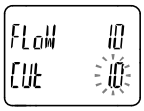
<Operation>

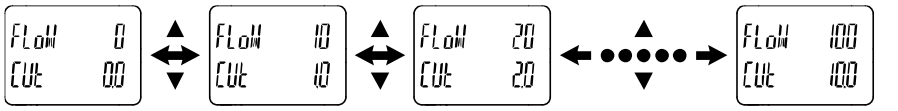
Display [F14] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select zero cut-off setting (flow rate).

Select zero cut-off setting (flow rate)

Press the UP or DOWN button to select the value of zero cut-off.



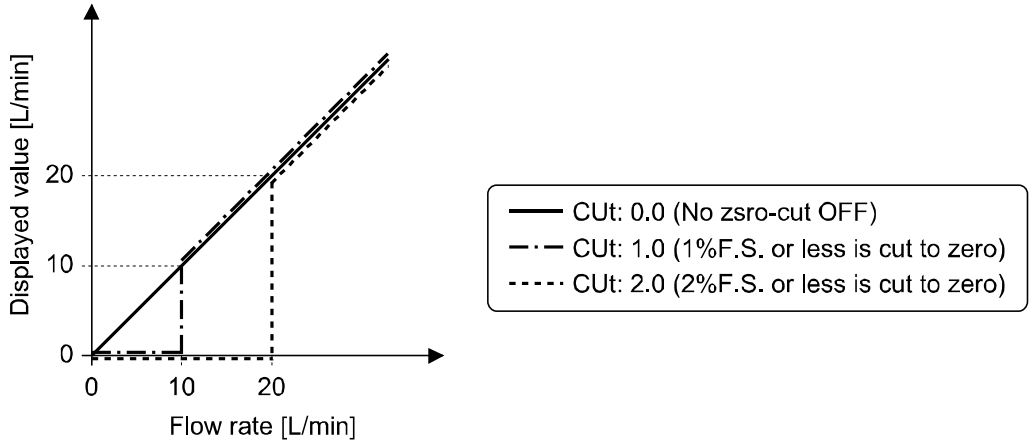


No zero-cut OFF | 1%F.S. or less is cut to zero | 2%F.S. or less is cut to zero | 10%F.S. or less is cut to zero

*: The display above is an example of when [L] is selected for the AMS30 (1000 L/min type) with the unit switching function.

*: If the flow rate does not reach the above value, the display will be zero.

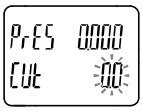
Example: AMS30 (1000 L/min type)

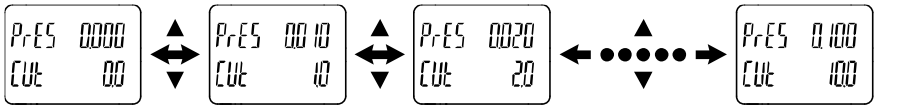


Press the SET button to set. ⬇ Move on to the select the zero cut-off Setting (pressure).

Select zero cut-off setting (pressure)

Press the UP or DOWN button to select the value of Zero cut-off.





No zero-cut OFF | 1%F.S. or less is cut to zero | 2%F.S. or less is cut to zero | 10%F.S. or less is cut to zero

Press the SET button to set. ⬇ Return to function selection mode.

[F14] Zero cut-off setting is completed

●Displayable flow rate range

Zero cut-off set	Zero cut-off range	Displayable flow range			
		AMS20	AMS30	AMS40	AMS60
0.0 *	0%F.S.	0 to 525 L/min	0 to 1050 L/min	0 to 2100 L/min	0 to 4200 L/min
1.0	0 to 1%F.S.	5 to 525 L/min (Displays 0 when the value is below 5 L/min)	10 to 1050 L/min (Displays 0 when the value is below 10 L/min)	20 to 2100 L/min (Displays 0 when the value is below 20 L/min)	40 to 4200 L/min (Displays 0 when the value is below 40 L/min)
2.0	0 to 2%F.S.	10 to 525 L/min (Displays 0 when the value is below 10 L/min)	20 to 1050 L/min (Displays 0 when the value is below 20 L/min)	40 to 2100 L/min (Displays 0 when the value is below 40 L/min)	80 to 4200 L/min (Displays 0 when the value is below 80 L/min)
3.0	0 to 3%F.S.	15 to 525 L/min (Displays 0 when the value is below 15 L/min)	30 to 1050 L/min (Displays 0 when the value is below 30 L/min)	60 to 2100 L/min (Displays 0 when the value is below 60 L/min)	120 to 4200 L/min (Displays 0 when the value is below 120 L/min)
4.0	0 to 4%F.S.	20 to 525 L/min (Displays 0 when the value is below 20 L/min)	40 to 1050 L/min (Displays 0 when the value is below 40 L/min)	80 to 2100 L/min (Displays 0 when the value is below 80 L/min)	160 to 4200 L/min (Displays 0 when the value is below 160 L/min)
5.0	0 to 5%F.S.	25 to 525 L/min (Displays 0 when the value is below 25 L/min)	50 to 1050 L/min (Displays 0 when the value is below 50 L/min)	100 to 2100 L/min (Displays 0 when the value is below 100 L/min)	200 to 4200 L/min (Displays 0 when the value is below 200 L/min)
6.0	0 to 6%F.S.	30 to 525 L/min (Displays 0 when the value is below 30 L/min)	60 to 1050 L/min (Displays 0 when the value is below 60 L/min)	120 to 2100 L/min (Displays 0 when the value is below 120 L/min)	240 to 4200 L/min (Displays 0 when the value is below 240 L/min)
7.0	0 to 7%F.S.	35 to 525 L/min (Displays 0 when the value is below 35 L/min)	70 to 1050 L/min (Displays 0 when the value is below 70 L/min)	140 to 2100 L/min (Displays 0 when the value is below 140 L/min)	280 to 4200 L/min (Displays 0 when the value is below 280 L/min)
8.0	0 to 8%F.S.	40 to 525 L/min (Displays 0 when the value is below 40 L/min)	80 to 1050 L/min (Displays 0 when the value is below 80 L/min)	160 to 2100 L/min (Displays 0 when the value is below 160 L/min)	320 to 4200 L/min (Displays 0 when the value is below 320 L/min)
9.0	0 to 9%F.S.	45 to 525 L/min (Displays 0 when the value is below 45 L/min)	90 to 1050 L/min (Displays 0 when the value is below 90 L/min)	180 to 2100 L/min (Displays 0 when the value is below 180 L/min)	360 to 4200 L/min (Displays 0 when the value is below 360 L/min)
10.0	0 to 10%F.S.	50 to 525 L/min (Displays 0 when the value is below 50 L/min)	100 to 1050 L/min (Displays 0 when the value is below 100 L/min)	200 to 2100 L/min (Displays 0 when the value is below 200 L/min)	400 to 4200 L/min (Displays 0 when the value is below 400 L/min)

*: The zero-cut-off range of the accumulated value should be 1%F.S. or more. However, please note that if the zero-cut-off set value is 0.0, any value below 1%F.S. will be cut.

●Displayable pressure range

Zero cut-off set value	Zero cut-off range	Displayable pressure range
0.0	0%F.S.	-0.050 to 1.050 MPa
1.0	0 to 1%F.S.	-0.050 to -0.010 MPa 0.010 to 1.050 MPa (Displays 0 when the value is -0.009 to 0.009 MPa)
2.0	0 to 2%F.S.	-0.050 to -0.020 MPa 0.020 to 1.050 MPa (Displays 0 when the value is -0.019 to 0.019 MPa)
3.0	0 to 3%F.S.	-0.050 to -0.030 MPa 0.030 to 1.050 MPa (Displays 0 when the value is -0.029 to 0.029 MPa)
4.0	0 to 4%F.S.	-0.050 to -0.040 MPa 0.040 to 1.050 MPa (Displays 0 when the value is -0.039 to 0.039 MPa)
5.0	0 to 5%F.S.	-0.050 MPa 0.050 to 1.050 MPa (Displays 0 when the value is -0.049 to 0.049 MPa)
6.0	0 to 6%F.S.	0.060 to 1.050 MPa (Displays 0 when the value is below 0.060 MPa)
7.0	0 to 7%F.S.	0.070 to 1.050 MPa (Displays 0 when the value is below 0.070 MPa)
8.0	0 to 8%F.S.	0.080 to 1.050 MPa (Displays 0 when the value is below 0.080 MPa)
9.0	0 to 9%F.S.	0.090 to 1.050 MPa (Displays 0 when the value is below 0.090 MPa)
10.0	0 to 10%F.S.	0.100 to 1.050 MPa (Displays 0 when the value is below 0.100 MPa)

■[F16] Measurement display setting

Display/hide the measured accumulated flow rate, pressure, and temperature can be set.

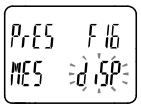
<Operation>

Display [F16] by pressing the UP or DOWN button in function selection mode.

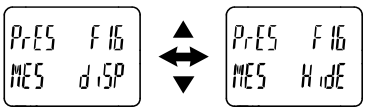
Press the SET button. ⬇ Move on to the measurement display setting.

Measurement display setting

Press the UP or DOWN button to select the measurement display setting.



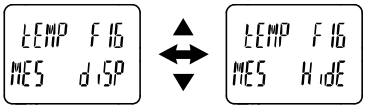
1) Pressure



Display Hide

Press the SET button to set. ⬇

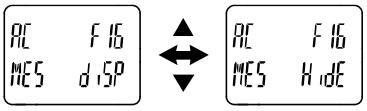
2) Temperature



Display Hide

Press the SET button to set. ⬇

3) Accumulated flow



Display Hide

Press the SET button to set. ⬇ Return to function selection mode.

[F16] Setting of measurement display is completed

*: When the temperature is set to "hide" and the integrated flow rate is set to "display", the maximum number of display digits for the accumulated flow rate is 9 digits.

■[F30] Setting of accumulated value hold

In the default setting, the accumulated flow value is not held when the power supply is turned off.
This function enables the accumulated flow value to be stored in permanent memory every 2 or 5 minutes.

*: When using the accumulated value hold function, calculate the product life from the operating conditions, and use the product within its life. Maximum updating time of the accumulated value is 1.5 million times.
If the product is operated 24 hours per day, the product life will be as follows.
•Data memorized every 5 minutes: 5 minutes x 1.5 million times = 7.5 million minutes = 14.3 years
•Data memorized every 2 minutes: 2 minutes x 1.5 million times = 3 million minutes = 5.7 years
If the accumulated flow external reset is repeatedly used, the product life will be shorter than calculated life.

<Operation>

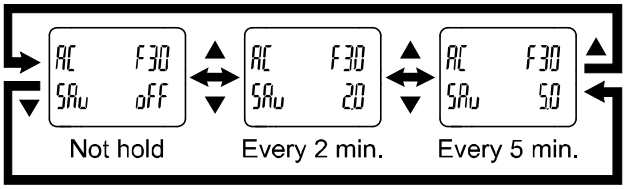
Display [F30] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select accumulated value hold.

Select accumulated value hold

Press the UP or DOWN button to select the accumulate value hold.



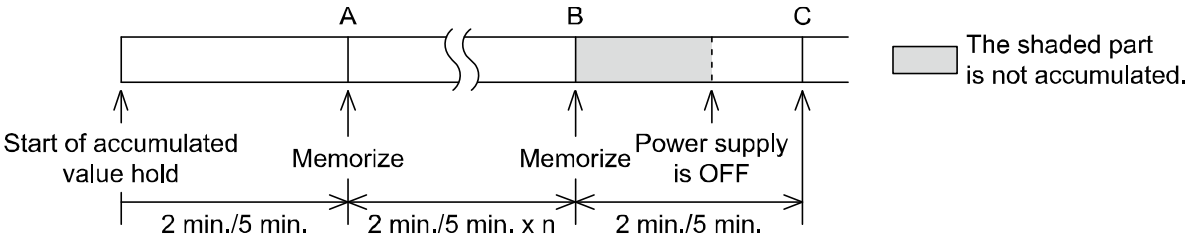


Press the SET button to set. ⬇ Return to function selection mode.

[F30] Setting of accumulated value hold is completed

*: The value is stored in memory every 2 or 5 minutes. If the power supply is turned off, the accumulated flow since the last time it was stored will be lost.

*: When the power supply is turned on again, the accumulated flow count will start from the last value recorded at B.



■[F33] Setting for Communication failure

This function sets the output action when IO-Link communication is disconnected.

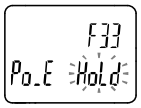
<Operation>

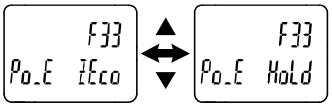
Display [F33] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the communication failure

Select output in communication failure

Press the UP or DOWN to select output in communication failure.





Output PD 0 Output PD hold

Press the SET button to set. ⬇ Return to function selection mode.

[F33] Setting for Communication failure is completed

■[F40] Setting for standby/auto isolation function

This is the function to set the parameters for standby mode.

<Operation>

Display [F40] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the standby flow rate (Threshold)

Setting of standby flow rate (Threshold)

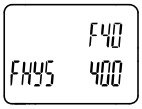
Set the value based on the setting method on page 56
For the parameter setting range, refer to page 104



Press the SET button. ⬇ Move on to the standby flow rate (Hysteresis)

Setting of standby flow rate (Hysteresis)

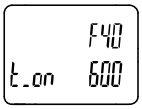
Set the value based on the setting method on page 56
For the parameter setting range, refer to page 104



Press the SET button. ⬇ Move on to the standby ON delay

Setting of standby ON delay

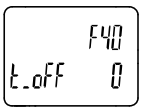
Set the value based on the setting method on page 56
For the parameter setting range, refer to page 104



Press the SET button. ⬇ Move on to the standby OFF delay

Setting of standby OFF delay

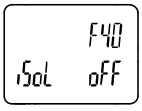
Set the value based on the setting method on page 56
For the parameter setting range, refer to page 104

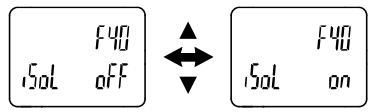


Press the SET button. ⬇ Move on to the auto isolation

Setting of auto isolation

Select auto isolation OFF or ON with UP or DOWN button.
*Bit 3 (isolation SW) of the input PD is switched.
*Isolation SW does not exhaust air at the product.





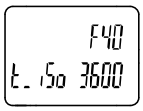
Auto isolation OFF　　Auto isolation ON

Auto isolation OFF
Press the SET button to set.
Return to function selection mode.

Auto isolation ON
Press the SET button to set.
Move on to the auto isolation delay.

Setting of auto isolation delay

Set the value based on the setting method on page 56.
For the parameter setting range, refer to page 104

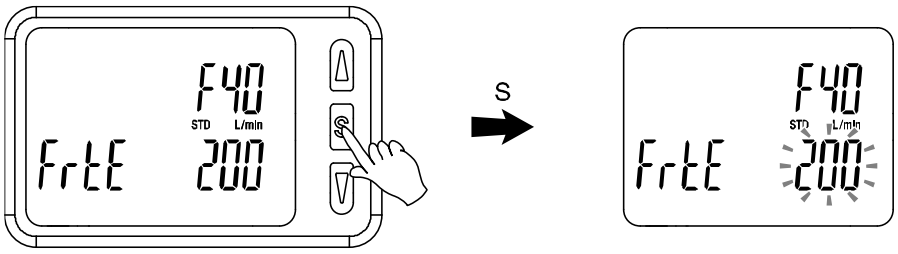


Press the SET button to set. Return to function selection mode.

[F40] Setting for standby/auto isolation function is completed

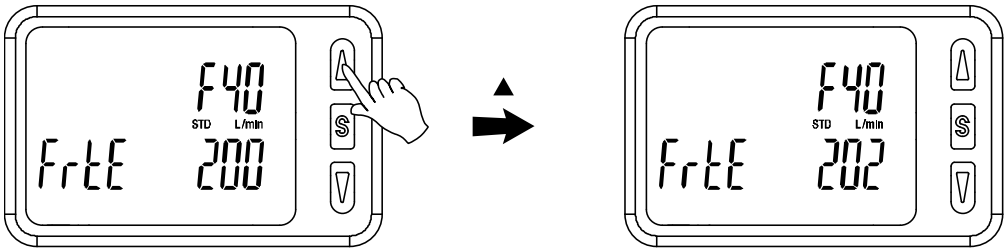
•How to set the value with buttons.

(1) Press the SET button once when the item to be changed is displayed on the display.
The set value on the sub display (right) will start flashing.

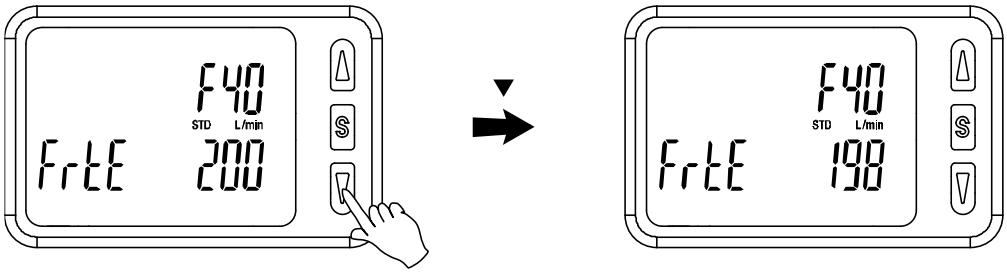


(2) Press the UP or DOWN button to change the set value.
The UP button is to increase and the DOWN button is to decrease the set value.

•Press the UP button once to increase the value by one digit, press and hold to continuously increase.



•Press the DOWN button once to reduce the value by one digit, press and hold to continuously reduce.



(3) Press the SET button to complete the setting.

■[F41] Setting of Force AMS mode

Regardless of the conditions and parameters, this function will force the AMS into the selected mode.

<Operation>

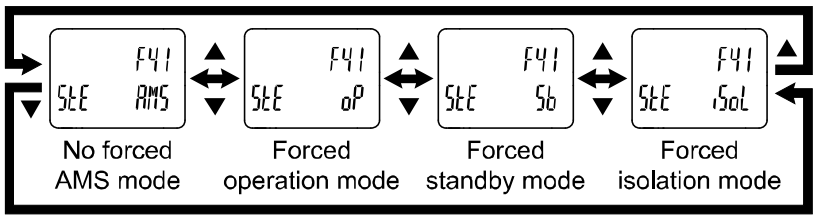
Display [F41] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the setting of Force AMS mode.

Setting of Force AMS mode

Select the mode using the UP or DOWN button.





No forced AMS mode | Forced operation mode | Forced standby mode | Forced isolation mode

Press the SET button to set. ⬇ Return to function selection mode.

[F41] Setting of Force AMS mode is completed

■[F80] Setting of display OFF mode

This function will turn the display OFF if no buttons are pressed for 30 seconds.

<Operation>

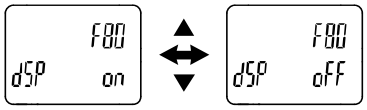
Display [F80] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select display OFF mode.

Select display OFF mode

Press the UP or DOWN button to select display OFF function.





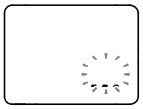
Display ON　　Display OFF

Press the SET button to set. ⬇ Return to function selection mode.

[F80] Setting of display OFF mode is completed

*: In display OFF mode, the under bar of the sub display flashes.

*: When any button is activated, the display will turn on. If no button operation is performed within 30 seconds, the display will turn off again.



■[F81] Security code

The security code can be turned on and off and the security code can be changed when unlocked.

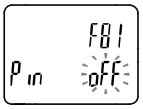
<Operation>

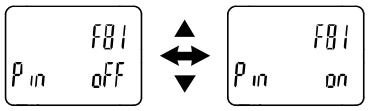
Display [F81] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the select security code.

Select security code

Press the UP or DOWN button to select security code.





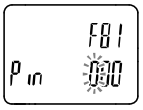
Not used　　Used

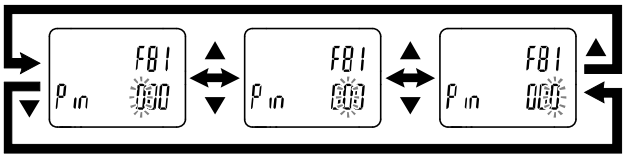
[oFF] is selected.
Press the SET button to return to function selection mode.

[on] is selected.
Press the SET button to set. ⬇ Move on to the check the setting of security code.

Check of the setting of security code

Press the UP or DOWN button to change the value.
Press the SET button to move to the digit to the right.
(The default setting is [000])





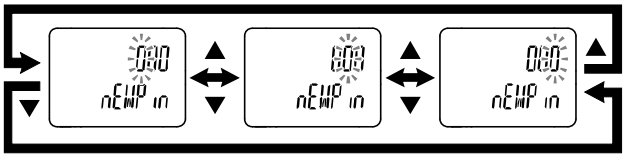
Press the SET button for 1 second or longer.
•When the security code is correct, move on to the security code setting.
•If the security code entered is incorrect, [FAL] will be displayed, and the security code must be entered again.
If the wrong security code is entered 3 times, [nG] is displayed on the main display and the device returns to function selection mode.

⬇ Move on to the changing of security code.

Changing of security code.

New security code is displayed on the main display.
Press the UP or DOWN button to change the value.
Press the SET button to move on to input the next digit.





After entry, the changed security code will flash by pressing the SET button for 1 second or longer.
(At this point, the changing of the security code is not completed)
Press the UP or DOWN button to return to setting step.



Press the SET button to set. ⬇ Return to function selection mode.

[F81] Setting of security code is completed

If the security code function is enabled, it is necessary to input a security code to release the key lock.

*: If a key is not pressed for 30 seconds while entering the security code, function selection mode will return.

■[F90] Setting of all functions

Each time the SET button is pressed, the function steps in the order shown in the following table.

<Operation>

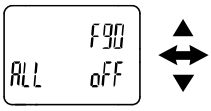
Display [F90] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the set all functions.

Set all functions

Press the UP or DOWN button to select all function settings.





Not used Used

[oFF] (not use) is selected
Press the SET button to set.
Return to function selection mode.

[on] (use) is selected

Setting of functions *

Press the SET button for 2 seconds or longer.

[F90] Setting of all functions is completed

Measurement mode

*: Setting of each function

Every time the SET button is pressed, the display moves to the next function in "Order of function settings".

Set by pressing UP and DOWN button.

For details of how to set each function, refer to the relevant setting of function section in this manual.

●Order of function settings

Order	Function	Applicable model
F0	Reference condition	All models
	Unit selection function	Model with units selection function
	Switch output function	All models
[F 1]	SW1 output mode	All models (when flow rate, temperature and pressure settings are selected)
	Select the reversed output of SW1	All models
	Selection of accumulated increment or decrement of SW1	All models (when accumulated flow rate is selected)
	SW1 set value	All models
	SW1 hysteresis	All models (when flow rate, temperature and pressure settings are selected)
	SW1 delay time	All models (when flow rate, temperature and pressure settings are selected)
[F 2]	SW2 output mode	All models (when flow rate, temperature and pressure settings are selected)
	Select the reversed output of SW2	All models
	Selection of accumulated increment or decrement of SW2	All models (when accumulated flow rate is selected)
	SW2 set value	All models
	SW2 hysteresis	All models (when flow rate, temperature and pressure settings are selected)
	SW2 delay time	All models (when flow rate, temperature and pressure settings are selected)
F3	Selection of digital filter	All models
F6	Fine adjustment of display value	All models
F13	Setting for reverse display mode	All models
F14	Zero cut-off setting	All models
F16	Measurement display setting	All models
F30	Setting of accumulated value hold	All models
F33	Communication failure	All models
F40	Setting of standby function	All models
F41	Setting of Force AMS mode	All models
F80	Set display OFF mode	All models
F81	Security code	All models

■[F96] Check cycle time

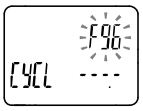
The average cycle time of the internal bus of the Digital Flow Switch can be checked.

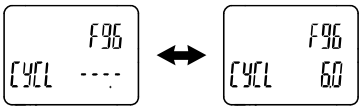
<Operation>

Display [F96] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to the check cycle time.

Check cycle time





No input signal

Average of truecycle time (ms)

Press the SET button to set. ⬇ Return to function selection mode.

[F96] Setting of check cycle time is completed

■[F98] Setting of output check

By forcibly switching the output ON / OFF operation by the button operation, the operation of the system can be checked regardless of the measured value.

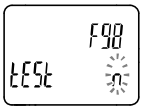
<Operation>

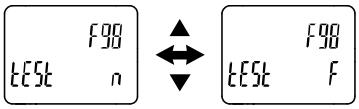
Display [F98] by pressing UP or DOWN button in function selection mode.

Press the SET button. ⬇ Move on to select of output check.

Select of output check

Press the UP or DOWN button to select the output check.





Normal output (Output not checked)

Forced output (Output is checked)

[n] (Normal output) is selected.

Press the SET button to set.

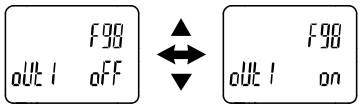
Return to function selection mode.

[F] (Forced output) is selected.
Press the SET button to set. ⬇ Move on to output check of OUT1.

Output check of OUT1

Press the UP or DOWN button to select output check of OUT1.





Forced output OFF

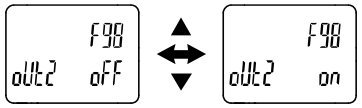
Forced output ON

Press the SET button to set. ⬇ Move on to output check of OUT2.

Output check of OUT2

Press the UP or DOWN button to select output check of OUT2.





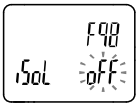
Forced output OFF

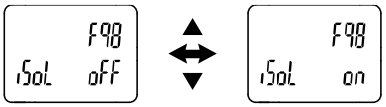
Forced output ON

Press the SET button to set. ⬇ Move on to PD Isolation SW bit check.

PD Isolation SW bit check

Select the Isolation SW bit check by pressing the UP or DOWN button.



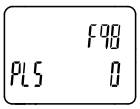


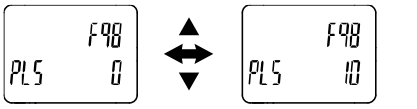
Isolation SW bit 0 | Isolation SW bit 1

Press the SET button to set. Move on to PD accumulated pulse output check.

PD accumulated pulse output check

Accumulated pulse is output for 10 times by pressing the UP button.
Accumulated pulse conversion value is cleared and stopped by pressing the DOWN button.





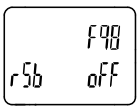
Initial state | Pulse converted value × 10 times output

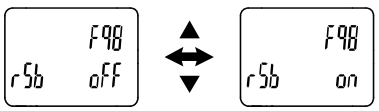
∗: When the converted pulse value is 10 L/pulse, the value is changed between 0 and 100 by pressing the UP button once (total of 10 times of output). If the UP button is pressed again, the value is changed to 100 to 200.

Press the SET button to set. Move on to PD Standby signal reception bit check.

PD Standby signal reception bit check

Select the Standby signal reception bit check by pressing the UP or DOWN button.



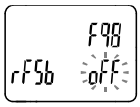


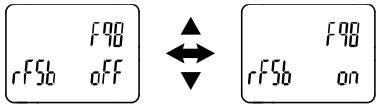
Standby signal reception bit 0 | Standby signal reception bit1

Press the SET button to set. Move on to PD Forced Standby signal reception bit check.

PD Forced Standby signal reception bit check

Select the Forced Standby signal reception bit check by pressing the UP or DOWN button.





Forced Standby signal reception bit 0

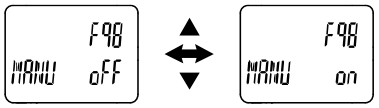
Forced Standby signal reception bit 1

Press the SET button to set. Move on to PD Forced mode bit check.

PD Forced mode bit check

Select the Forced mode bit check by pressing the UP or DOWN button.





Forced mode bit 0

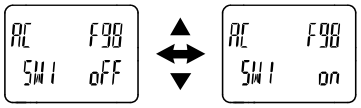
Forced mode bit 1

Press the SET button to set. Move on to PD Accumulated SW1 bit check.

PD Accumulated SW1 bit check

Select the accumulated SW1 bit check by pressing the UP or DOWN button.





Accumulated SW1 bit 0

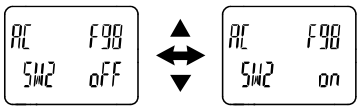
Accumulated SW1 bit 1

Press the SET button to set. Move on to PD Accumulated SW2 bit check.

PD Accumulated SW2 bit check

Select the accumulated SW2 bit check by pressing the UP or DOWN button.





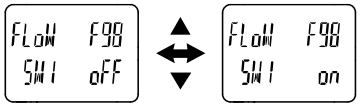
Accumulated SW2 bit 0 | Accumulated SW2 bit 1

Press the SET button to set. Move on to PD Flow rate SW1 bit check.

PD Flow rate SW1 bit check

Select the flow rate SW1 bit check by pressing the UP or DOWN button.





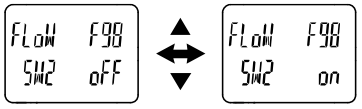
Flow rate SW1 bit 0 | Flow rate SW1 bit 1

Press the SET button to set. Move on to PD Flow rate SW2 bit check.

PD Flow rate SW2 bit check

Select the flow rate SW2 bit check by pressing the UP or DOWN button.





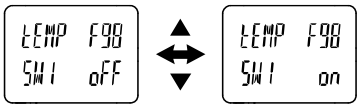
Flow rate SW2 bit 0 | Flow rate SW2 bit 1

Press the SET button to set. Move on to PD Temperature SW1 bit check.

PD Temperature SW1 bit check

Select the temperature SW1 bit check by pressing the UP or DOWN button.





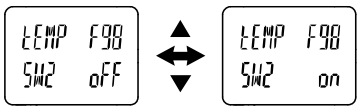
Temperature SW1 bit 0 | Temperature SW1 bit 1

Press the SET button to set. Move on to PD Temperature SW2 bit check.

PD Temperature SW2 bit check

Select the SW2 bit check by pressing the UP or DOWN button.





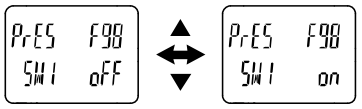
Temperature SW2 bit 0 | Temperature SW2 bit 1

Press the SET button to set. Move on to PD Pressure SW1 bit check.

PD Pressure SW1 bit check

Select pressure SW1 bit check by pressing the UP or DOWN button.





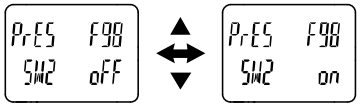
Pressure SW1 bit 0 | Pressure SW1 bit 1

Press the SET button to set. Move on to PD Pressure SW2 bit check.

PD Pressure SW2 bit check

Select pressure SW2 bit check by pressing the UP or DOWN button.



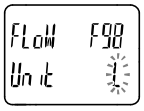


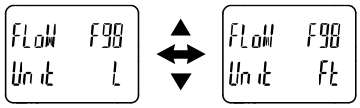
Pressure SW2 bit 0 | Pressure SW2 bit 1

Press the SET button to set. Move on to PD Flow rate unit bit check.

PD Flow rate unit bit check

Select the flow rate unit bit check by pressing the UP or DOWN button.



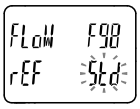


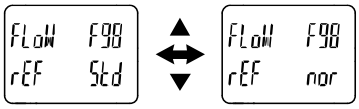
Flow rate unit bit 0 | Flow rate unit bit 1

Press the SET button to set. Move on to PD Flow rate criteria bit check.

PD Flow rate criteria bit check

Select the flow rate criteria bit check by pressing the UP or DOWN button.





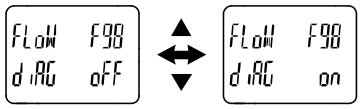
Flow rate criteria bit 0 | Flow rate criteria bit 1

Press the SET button to set. Move on to PD Flow rate diagnosis bit check.

PD Flow rate diagnosis bit check

Select the flow rate diagnosis bit check by pressing the UP or DOWN button.





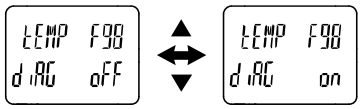
Flow diagnosis bit 0 | Flow diagnosis bit 1

Press the SET button to set. Move on to PD Temperature diagnosis bit check.

PD Temperature diagnosis bit check

Select the temperature diagnostic bit check by pressing the UP or DOWN button.



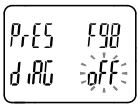


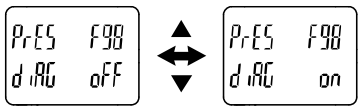
Temperature diagnosis bit 0 | Temperature diagnosis bit 1

Press the SET button to set. Move on to PD Pressure diagnosis bit check.

PD Pressure diagnosis bit check

Select the Pressure diagnosis bit check by pressing the UP or DOWN button.





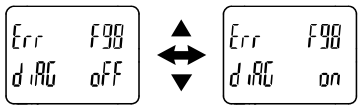
Pressure diagnosis bit 0 | Pressure diagnosis bit 1

Press the SET button to set. Move on to PD Error diagnosis bit check.

PD Error diagnosis bit check

Select the Error diagnosis bit check by pressing the UP or DOWN button.





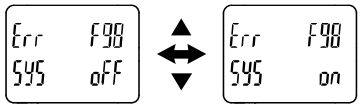
Error diagnosis bit 0 | Error diagnosis bit 1

Press the SET button to set. Move on to PD System error diagnosis bit check.

PD System error diagnosis bit check

Select the System error diagnosis bit check by pressing the UP or DOWN button.



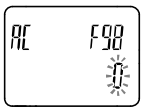


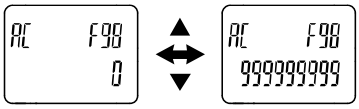
System error diagnosis bit 0 | System error diagnosis bit 1

Press the SET button to set. Move on to PD Accumulated value check.

PD Accumulated value check

Press the UP or DOWN button to select the accumulate value check.



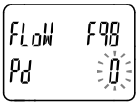


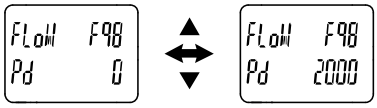
PD Accumulated value lower limit | PD Accumulated value upper limit

Press the SET button to set. Move on to PD Flow rate check.

PD Flow rate check

Press the UP or DOWN button to select the flow rate check.





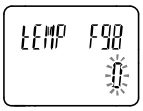
Lower limit of flow measurement value

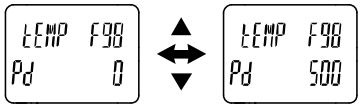
Upper limit of flow measurement value

Press the SET button to set. Move on to PD Temperature check.

PD Temperature check

Press the UP or DOWN button to select the temperature check.





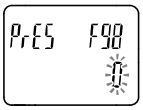
PD Temperature lower limit

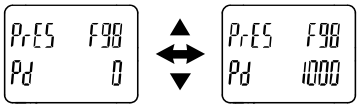
PD Temperature upper limit

Press the SET button to set. Move on to PD Pressure check.

PD Pressure check

Press the UP or DOWN button to select the pressure check.





PD Pressure lower limit

PD Pressure upper limit

Press the SET button to set. Return to function selection mode.

[F98] Setting of output check completed

∗: Measurement mode can return from any setting item by pressing the SET button for 2 seconds or longer.

∗: An increase or decrease in flow rate, temperature or pressure will have no effect on the output while the output operation is being performed.

*: ITEM [PD] is available with IO-Link communication.

■[F99] Reset to the default settings

If the flow switch settings are uncertain, the default values can be restored.

*: Only the settings for settable buttons can be reverted to the state at the time of shipment.

*: If the setting is only reverted to the state at the time of shipment, turning on the power supply again returns the setting to that as of before change.

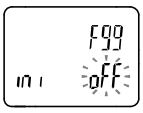
<Operation>

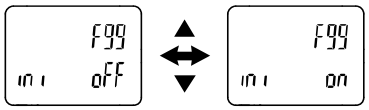
Display [F99] by pressing the UP or DOWN button in function selection mode.

Press the SET button. ↓ Move on to the reset to factory default settings.

Rest to factory default settings.

Press the UP or DOWN button to display [ON], then press the SET and DOWN buttons simultaneously for 5 seconds or longer.





Not used　　Used

[oFF] (not use) is selected
Press the SET button to set.
Return to function selection mode.

All settings are returned to the default values.
Return to function selection mode.

[F99] Reset to the default settings is completed

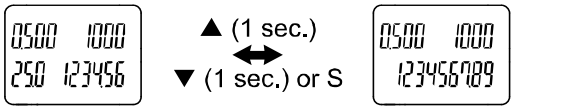
Other Settings

○Reset operation

The accumulated flow, peak value, and bottom value can be reset.
To reset the accumulated value, press the DOWN and SET buttons simultaneously for 1 second or longer.
Resetting the accumulated flow is possible only when the accumulated flow is displayed.
Resetting the peak value and bottom value is effective for the measurement target displayed in the peak display or bottom display.

○Display select function

The number of accumulated flow rate display digits can be temporarily switched when the temperature and accumulated flow rate are set in the measurement display settings.
The normal accumulated display consists of the mantissa part (maximum 6 digits) and [Power value display] indicated by the index part displayed by $x10^6$ or $x10^3$.
If the DOWN button is pressed for 1 second, the mantissa part will be displayed in 9 digits and the power value will be displayed as $x10^3$.



Power value is displayed (6 digits)　　Power value is displayed (9 digits)

*: If there is no button operation for 30 seconds while the 9-digit power is displayed, the number of displayed powers will return to 6 digits.

*: When the temperature is set to "hide", the displayed power value is fixed at 9 digits.

○Zero-clear function

When the pressure is displayed in the measurement display setting, the displayed value can be adjusted to zero within the range of ±7%F.S. from the factory default value.
(The zero clear range varies by ±1% F.S. due to variation between individual products.
When the UP and DOWN buttons are pressed simultaneously for 1 second or longer in measurement mode, the image below is displayed and the displayed value is reset to zero.
The display returns to measurement mode automatically.



Zero-clear

○Key-lock function

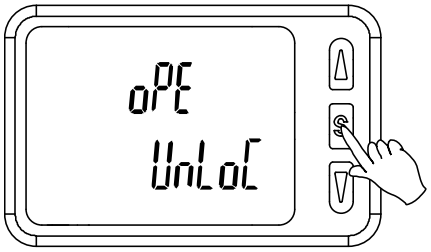
The key lock function is used to prevent errors occurring due to unintentional changes of the set values. If the SET button is pressed while the keys are locked, [LoC] is displayed on the sub display (left) for approximately 1 second.

(Each setting and peak/ bottom values are displayed using the UP and DOWN buttons.)

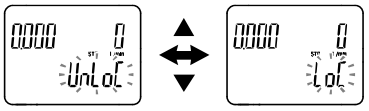
<Operation – Without security code input>

(1) Press the SET button for 5 seconds or longer in measurement mode. When [oPE] is displayed on the main display, release the button. The current setting [LoC] or [UnLoC] will be displayed on the sub display.

(To release the key-lock repeat the above operation)



(2) Select the key locking/un-locking using the UP or DOWN button and press the SET button to set.

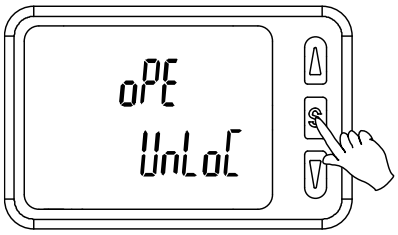


Unlock Lock

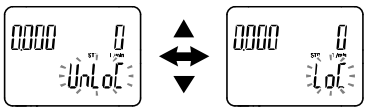
<Operation – Without security code input>

•Locking

(1) Press the SET button for 5 seconds or longer in measurement mode. When [oPE] is displayed on the main display, release the button. The current setting [LoC] or [UnLoC] will be displayed on the sub display.



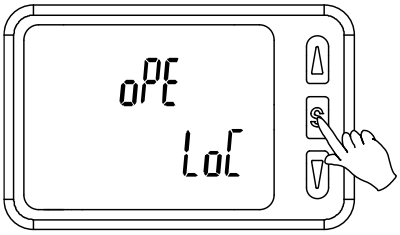
(2) Select the key locking/ un-locking using the UP or DOWN button and press the SET button to set.



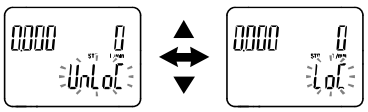
Unlock Lock

•Unlocking

(1) Press the SET button for 5 seconds or longer in measurement mode. When [oPE] is displayed on the main display, release the button. The current setting [LoC] or [UnLoC] will be displayed on the sub display.

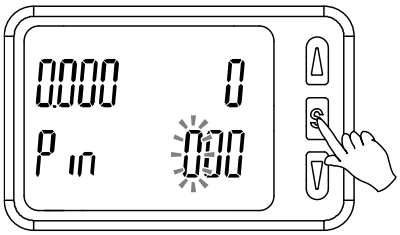


(2) Select the un-locking [UnL] using the UP or DOWN button. Setting is recognized by pressing the SET button, then the security code is required. When the security code is set, select the un-lock [UnLoC] using the UP or DOWN button. Setting is recognized by pressing the SET button, then the security code is required. If the security code is not set, select the un-lock [UnLoC]. Locking is released by pressing the SET button.



Unlock Lock

(3) For the input method, refer to [F81] Security code (checking of the setting of security code) (page 59).



(4) If the security code entered is correct, the indication of the main display changes to [UnLoC], and pressing one of the UP, SET or DOWN buttons releases the key lock and the measurement mode returns.
If the security code entered is incorrect, [FAL] will be displayed on the main screen, and the security code must be entered again. If an incorrect security code is entered 3 times, [LoC] will be displayed on the main screen and the device will return to measurement mode.

Maintenance

How to reset the product after a power loss or when the power has been unexpectedly removed
The settings for the product are retained in memory prior to the power loss or de-energizing of the product. The output condition is also recoverable to that prior to the power loss or de-energizing. However, this may change depending on the operating environment. Therefore, check the safety of the whole installation before operating the product.
If the installation is using accurate control, wait until the product has warmed up (approximately 10 to 15 minutes) before operation.

Forgotten the Security Code

If you have forgotten your security code, please contact SMC directly.

IO-Link Specifications

■Outline of IO-Link functions

○Communication function

This product can check the Switch to standby/isolation mode, measured value, diagnostic information and switch output status using cyclic data communication via the IO-Link system.

○Product status monitoring function

This function monitors the product status via the IO-Link.

•Several errors (e.g. internal hardware errors) can be monitored.

•Detects multiple warning conditions (flow rate error, Internal failure, etc.).

○Data storage function

The Data storage function stores the IO-Link device parameter settings to the IO-Link master.

With the IO-Link data storage function, the IO-Link device can be replaced easily without re-setting the equipment construction or setting parameters

When the device parameter is set and downloaded to the device using the IO-Link setting tool, the parameter will be uploaded to the data storage in the master by the system command after download (backup instruction by the communication command).

When the device is replaced with the same type of IO-Link device due to failure, the parameter settings stored in the master are downloaded automatically, device can be operated with the parameter settings of the previous device.

Device parameter setting is applicable to 3 types of back-up levels of the master setting ("Inactive", "back-up/Restore", "Restore").

"Back-up" implies the activation of upload and "restore" implies download.

■Communication specifications

IO-Link type	Device
IO-Link version	V1.1
Communication speed	COM2 (38.4 kbps)
Min. cycle time	7.2 ms
Process data length	Input Data: 14 byte, Output Data: 2 byte
On request data communication	Available
Data storage function	Available
Event function	Available

■Process data

Process data is the data which is exchanged periodically between the master and device.
This product process data consists of switch output status, error diagnostics, fixed output and measured value.
(Refer to the table below.)

Input process data

Bit offset	Item	Notes
0	Standby SW(OUT1)	0: OFF 1: ON
1	Control output（OUT2）	0: OFF 1: ON
2	Isolation SW	0: OFF 1: ON
3	Accumulated pulse	0: OFF 1: ON
8	Standby signal reception	0: OFF 1: ON
9	Forced Standby signal reception	0: OFF 1: ON
15	Forced mode	0: OFF 1: ON
16	Accumulated flow SW1	0: OFF 1: ON
17	Accumulated flow SW2	0: OFF 1: ON
18	Flow rate SW1	0: OFF 1: ON
19	Flow rate SW2	0: OFF 1: ON
20	Temperature SW1	0: OFF 1: ON
21	Temperature SW2	0: OFF 1: ON
22	Pressure SW1	0: OFF 1: ON
23	Pressure SW2	0: OFF 1: ON
24	Flow rate unit	0: L 1: ft3
25	Flow rate criteria	0: STD 1: nor
26	Flow diagnosis	0: Normal 1: HHH
27	Temperature diagnosis	0: Normal 1: HHH/LLL
28	Pressure diagnosis	0: Normal 1: HHH/LLL
29	Fixed output	0: Normal output 1: Fixed output
30	Error	0: Normal 1: Abnormal
31	System error	0: Normal 1: Abnormal
32～47	Pressure measured value	With sign: 16 bit
48～63	Temperature measured value	With sign: 16 bit
64～79	Flow measured value	With sign: 16 bit
80～95	Accumulated flow rate lower limit	Without sign: 32 bit
96～111	Accumulated flow rate upper limit	Without sign: 32 bit

Bit offset	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
Item	Accumulated flow rate upper limit (PD)															

Bit offset	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
Item	Accumulated flow rate lower limit (PD)															

Bit offset	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
Item	Flow measured value (PD)															

Bit offset	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
Item	Temperature measured value (PD)															

Bit offset	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Item	Pressure measured value (PD)															

Bit offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Item	System error	Error	Fixed output	Pressure diagnosis	Temp. diagnosis	Flow diagnosis	Flow rate Criteria	Flow rate Unit	Pressure SW2	Pressure SW1	Temp. SW2	Temp. SW1	Flow rate SW2	Flow rate SW1	Accumulated flow SW2	Accumulated flow SW1

Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Forced mode	Reservation					Forced Standby reception	Standby reception	Reservation				Accumulated pulse	Isolation SW	Control SW	Standby SW

Output process data

Bit offset	Item	Notes
0	Standby signal	0:OFF 1:ON
1	Forced standby signal	0:OFF 1:ON

Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Reservation														Forced standby signal	Standby signal

•The process data of this product is Big-Endian type.
When the transmission method of the upper communication is Little-Endian, the byte order will be changed.
Refer to the table below for the Endian type of the major upper communication.

Endian type	Upper communication protocol
Big-Endian type	Such as PROFIBUS and PROFINET
Little-Endian type	Such as EtherNET/IP, EtherCAT and CC-Link IE Field.

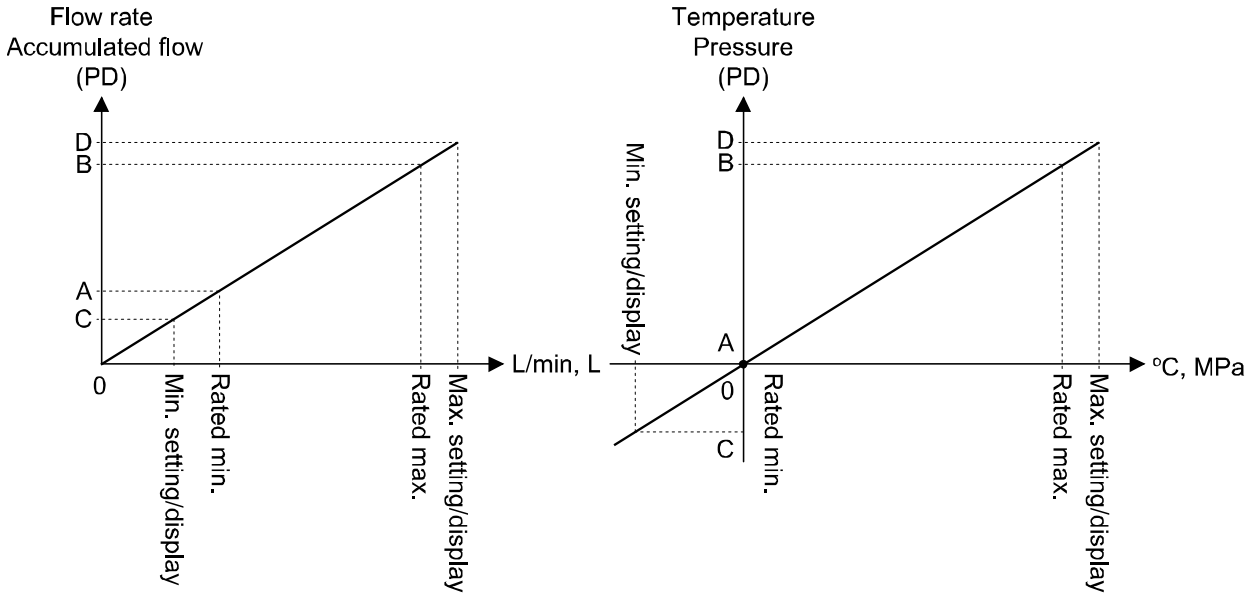
○Measurement/setting range

Measured object	Range	Rated range			Display/settable range		
		Min.	to	Max.	Min.	to	Max.
Flow rate	500 L/min	5	to	500	5	to	525
	1,000 L/min	10	to	1000	10	to	1050
	2,000 L/min	20	to	2000	20	to	2100
	4,000 L/min	40	to	4000	40	to	4200
Temperature	50 °C	0	to	50.0	-10.0	to	60.0
Pressure	1 MPa	0	to	1.000	-0.050	to	1.050
Accumulated flow	9,999,999,990 L	0	to	9,999,999,990	0	to	9,999,999,990

Measured object	Range	PD value					
		Rated range			Display/settable range		
		A	to	B	C	to	D
Flow rate	500 L/min	5	to	500	5	to	525
	1,000 L/min	10	to	1000	10	to	1050
	2,000 L/min	20	to	2000	20	to	2100
	4,000 L/min	40	to	4000	40	to	4200
Temperature	50 °C	0	to	500	-100	to	600
Pressure	1 MPa	0	to	1000	-50	to	1050
Accumulated flow	9,999,999,990 L	0	to	999999999	0	to	999999999

∗: The flow ranges and relationship between the fluid and PD are shown in the figures below.

●Relationship between measured value and PD



○Conversion formula of the process data and flow/temperature measured value

(1) Conversion formula from the process data to the flow measured value:

Pr = a × (PD) + b

(2) Conversion formula from the flow gauge measured value to the process data:

(PD) = (Pr – b) / a

Pr: Flow measured value and pressure set value
PD: Flow measured value (process data)
a: Inclination
b: Intercept

[Inclination and intercept to the unit specification]

Measured object	Range	Unit	Inclination a	Intercept b
Flow rate	500 L/min	L/min	1	0
		cfm	0.03532	0
	1,000 L/min	L/min	1	0
		cfm	0.03531	0
	2,000 L/min	L/min	1	0
		cfm	0.035315	0
	4,000 L/min	L/min	1	0
		cfm	0.035325	0
Temperature	50 °C	°C	0.1	0
		°F	0.18	32
Pressure	1 MPa	MPa	0.001	0
		kPa	1	0
		Kgf/cm^2	0.010197	0
		Bar	0.01	0
		Psi	0.14504	0
Accumulated flow	9,999,999,990 L	L	10	0
		Ft^3	1	0

[Calculation example]

(1) Conversion from the process data to the flow measured value
(For PF3A801H series, unit L/min, flow range 1000 L and PD = 280)

Pr = a × (PD) + b
= 1 × 280 + 0
= 280 [L/min]

(2) Conversion from the flow measured value to the process data
(For PF3A802H series, unit L/min, flow range 2000 L and Pr = 1750 [L/min])

(PD) = (Pr - b) / a
= [1750 - 0] / 1
= 1750

■IO-Link parameter setting

○IODD file

IODD (I/O Device Description) is a definition file which provides all properties and parameters required for establishing functions and communication of the device.
IODD includes the main IODD file and a set of image files such as vendor logo, device picture and device icon.
The IODD file is shown below.

Product No.	IODD file *
PF3A8*H-L2*-***-X105	SMC-PF3A8∗H-L2∗-∗∗∗-X105-yyyymmdd-IODD1.1

∗: "∗" indicates the product No., and the product No. applicable to each IODD file input.

∗: "yyyymmdd" indicates the file preparation date. yyyy is the year, mm is the month and dd is the date.

The IODD file can be downloaded from the SMC Web site (https://www.smcworld.com).

○Service data

The tables below indicates the parameters which can be read or written by simple access parameter (direct parameters page) and ISDU parameters which are applicable to various parameters and commands.

●Direct parameters page 1

DPP1 address	Access	Parameter name	Initial value (dec)	Content
0x07	R	Vendor ID	0x0083(131)	"SMC Corporation"
0x08				
0x09	R	Device ID	0X02EE(750) 0X02EF(751) 0X02F0(752) 0X02F1(753)	PF3A8R5H-L2x-xxx-X105 PF3A801H-L2x-xxx-X105 PF3A802H-L2x-xxx-X105 PF3A804H-L2x-xxx-X105
0x0A				
0x0B				

●ISDU parameters

Index (dec)	Sub index	Access *1	Parameters	Initial value	Remarks
0x0002 (2)	0	W	System command	-	Refer to "System command" on page 85.
0x000C (12)	0	R/W	Device access lock	0x0000	Refer to "Device access lock parameter" on page 85.
0x0010 (16)	0	R	Vendor name	SMC Corporation	
0x0011 (17)	0	R	Vendor text	www.smcworld.com	
0x0012 (18)	0	R	Product name	Example: PF3A802H-L2x-xxx-X105	
0x0013 (19)	0	R	Product ID	Example: PF3A802H-L2x-xxx-X105	
0x0014 (20)	0	R	Product text	Standby Controller	
0x0015 (21)	0	R	Serial number	Example: "12345678"	•Initial value is indicated as 8-digit. •16 octets fixed character string
0x0016 (22)	0	R	Hardware version	HW-Vx.y	x: Large revision number y: Small revision number
0x0017 (23)	0	R	Software version	FW-Vx.y	x: Large revision number y: Small revision number
0x0024 (36)	0	R	Device status parameter	-	Refer to "Device state parameters" on page 85.
0x0025 (37)	0	R	Device detailed state parameter	-	Refer to "Device detailed state parameter" on page 86.
0x0028 (40)	0	R	Process data input	-	The latest value of process data can be read.

*1: R: Read, W: Write

●System command (index 2)
In the ISDU index 0x0002 SystemCommand (system command), the command shown in the table below will be issued.
The button of each system command is displayed on the IO-Link setting tool (excluding "ParamDownloadStore").
Click the button to send the system command to the product.
Writable commands are shown below.
Data type: 8 bit UInteger

Value	Function definition	Description
128	Device Reset	Restarts the device
129	Application Reset	Reset of the peak/bottom value (All flow rate/temperature/pressure) Reset of the accumulated value
130	Restore Factory Reset	Initialize the set value to the default value
160	Pressure Zero Clear	Pressure zero-clear
170	All Peak/Bottom Clear	Clear all peak/bottom value
171	FLOW Peak/Bottom Clear	Clear the flow rate peak/bottom value
172	TEMP Peak/Bottom Clear	Clear the temperature peak/bottom value
173	PRES Peak/Bottom Clear	Clear the pressure peak/bottom value
190	Accumulated Reset	Reset of the accumulated value

●Device access lock parameter (index 12)
The contents are as follows.
Data type: 16 bit Record

Value	Contents
0	Key lock release, DS unlock (Initial value)
2	Key lock release, DS lock
8	Key lock, DS unlock
10	Key lock, DS lock

[Key lock]
This function prevents the user from physically changing the setting of the flow switch (button operation is not accepted).
Even when key lock function is activated, settings can be changed by IO-Link communication.
Restoration by data storage (overwriting parameter data) can be performed.

[Lock data storage (DS lock)]
Locking "Data storage" will invalidate the data storage function of the flow switch.
In this case, access will be denied for backup and restoration of data storage.

●Device state parameters (index 36)
Readable device states are as follows.
Data type: 8 bit UInteger

Value	State definition	Description
0	Normal operation	-
1	Maintenance inspection required	Not available
2	Outside specification range	Outside the measured range
3	Function check	Not available
4	Failure	Internal failure of digital flow switch

●Device detail status parameters (index 37)

Detailed event contents of readable device status are as follows.

Array	Event content	Event classification		Event code
		Definition	Value	
1	Internal failure of digital flow switch	Error	0xF4	0x8D02
2	Internal failure of digital flow switch	Error	0xF4	0x8D03
3	Internal failure of digital flow switch	Error	0xF4	0x8D04
4	Internal failure of digital flow switch	Error	0xF4	0x8D05
5	Internal failure of digital flow switch	Error	0xF4	0x8D01
6	Internal failure of digital flow switch	Error	0xF4	0x8D06
7	Internal failure of digital flow switch	Error	0xF4	0x8D08
8	Internal failure of digital flow switch	Error	0xF4	0x8CD0
9	Internal failure of digital flow switch	Error	0xF4	0x8CD1
10	OUT2 over current error	Error	0xF4	0x8CC0
11	Outside the accumulated flow value measurement	warning	0xE4	0x8D80
12	Outside the flow rate range	warning	0xE4	0x8D60
13	Outside the temperature range	warning	0xE4	0x8D61
14	Outside the pressure range	warning	0xE4	0x8D62
15	Below the temperature range	warning	0xE4	0x8D71
16	Below the pressure range	warning	0xE4	0x8D72
17	Test event A	warning	0xE4	0x8CA0
18	Test event B	warning	0xE4	0x8CA1
19	Data storage upload request	notification	0x54	0xFF91

●Product individual parameters

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1000	0x03E8	0	R/W	Flow Unit (Selection of display unit)		U8	0	Y	0: L/min (L) 1: cfm (ft^3)	When the unit selection function is not included, a read/write to an un-selectable item is rejected.
1020	0x03FC	0	R/W	N or P (Switch NPN/PNP)		U8	1	Y	0: nPn 1: PnP	Setting the switch output *: AMS20X/30X/40X/60X-X2044/X2045 must be used with PNP output.
1070	0x042E	0	R/W	Reference condition		U8	0	Y	0: std (Standard condition) 1: nor (Normal condition)	
1080	0x0438	0	R/W	Temperature Unit (Selection of temperature display unit)		U8	0	Y	0: C 1: F	When the unit selection function is not included, a read/write to an un-selectable item is rejected.
1090	0x0442	0	R/W	Pressure Unit (Selection of pressure display unit)		U8	0	Y	0: MPa 1: kPa 2: kgf/cm^2 3: bar 4: psi	When the unit selection function is not included, a read/write to an un-selectable item is rejected.
1210	0x04BA	1	R/W	SW1 setting (FloW)	ModE1 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		1ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW1 output normal and reserved output
1220	0x04C4	1	R/W		P_1 (n_1) (Selection of output set value)	S16	500L range 250 1000L range 500 2000L range 1000 4000L range 2000	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x1068 (40 to 4200)	Setting of SW1 output set value (Hysteresis)
		2	R/W		H_1 (Setting of SW1 hysteresis)	U16	500L range 25 1000L range 50 2000L range 100 4000L range 200	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0000 to 0x1040 (0 to 4160)	Setting of SW1 hysteresis (Hysteresis)

●Product individual parameters

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1220	0x04C4	3	R/W	SW1 setting (FloW)	P1L (n1L) (Lower limit of window comparator)	S16	500L range 150 1000L range 300 2000L range 600 4000L range 1200	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x1068 (40 to 4200)	Setting of SW1 output set value (Lower limit of window comparator)
		4	R/W		P1H (n1H) (Upper limit of window comparator)	S16	500L range 300 1000L range 600 2000L range 1200 4000L range 2400	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x1068 (40～4200)	Setting of SW1 output set value (Upper limit of window comparator)
		5	R/W		WH1 (Window comparator hysteresis)	U16	500L range 50 1000L range 100 2000L range 200 4000L range 400	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0000 to 0x1040 (0 to 4160)	Setting of SW1 hysteresis (Window comparator)
		6	R/W		dtH1 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW1 delay time ON 10 ms increments
		7	R/W		dtL1 (Delay time OFF)	U16	0	Y		Setting of SW1 delay time OFF 10 ms increments

●Product individual parameters (continued)

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1230	0x04CE	1	R/W	SW1 setting (tEMP)	ModE1 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		1ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW1 output normal and reserved output
1240	0x04D8	1	R/W		P_1 (n_1) (Selection of output set value)	S16	250	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 1 output set value (Hysteresis)
		2	R/W		H_1 (Setting of SW1 hysteresis)	U16	25	Y	Setting range 0x0000 to 0x02BC (0 to 700)	Setting of SW 1 hysteresis (Hysteresis)
		3	R/W		P1L (n1L) (Lower limit of window comparator)	S16	150	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 1 output set value (Lower limit of window comparator)
		4	R/W		P1H (n1H) (Upper limit of window comparator)	S16	300	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 1 output set value (Upper limit of window comparator)
		5	R/W		WH1 (Window comparator hysteresis)	U16	50	Y	Setting range 0x0000 to 0x015E (0 to 350)	Setting of SW 1 hysteresis (Window comparator)
		6	R/W		dtH1 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW 1 delay time ON 10 ms increments
		7	R/W		dtL1 (Delay time OFF)	U16	0	Y		Setting of SW 1 delay time OFF 10 ms increments
1250	0x04E2	1	R/W	SW 1 setting (PrES)	ModE1 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		1ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW 1 output normal and reserved output
1260	0x04EC	1	R/W		P_1 (n_1) (Selection of output set value)	S16	500	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 1 output set value (Hysteresis)
		2	R/W		H_1 (Setting of SW1 hysteresis)	U16	50	Y	Setting range 0x0000 to 0x044C (0 to 1100)	Setting of SW 1 hysteresis (Hysteresis)
		3	R/W		P1L (n1L) (Lower limit of window comparator)	S16	300	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 1 output set value (Lower limit of window comparator)
		4	R/W		P1H (n1H) (Upper limit of window comparator)	S16	600	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 1 output set value (Upper limit of window comparator)
		5	R/W		WH1 (Window comparator hysteresis)	U16	100	Y	Setting range 0x0000 to 0x0226 (0 to 550)	Setting of SW 1 hysteresis (Window comparator)
		6	R/W		dtH1 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW 1 delay time ON 10 ms increments
		7	R/W		dtL1 (Delay time OFF)	U16	0	Y		Setting of SW 1 delay time OFF 10 ms increments

●Product individual parameters (continued)

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1290	0x050A	0	R/W	SW1 setting (AC)	AC_1ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	
1300	0x0514	0	R/W		P1(n1)_L (Selection of output set value)	U32	0	Y	0 to 999,999,999	Common for all ranges, units, and criterion
1310	0x051E	0	R/W		P1(n1)_ft3 (Selection of output set value)	U32	0	Y	0 to 999,999,999	Common for all ranges, units, and criterion
1320	0x0528	0	R/W	SW 1 setting (PLS)	PLS1_L	U8	0	Y	500 L range 0: 1 (L/pulse) 1: 10 (L/pulse) 1000 L/2000 L range 0: 10 (L/pulse) 1: 100 (L/pulse) 4000 L range 0: 100 (L/pulse) 1: 1000 (L/pulse)	SW 1 accumulated pulse converted value setting
1330	0x0532	0	R/W		PLS1_Ft^3	U8	0	Y	500 L/1000 L range 0: 0.1 (L/pulse) 1: 1(L/pulse) 2000 L/4000 L range 0: 1 (Ft^3/pulse) 1: 10 (Ft^3/pulse)	
1340	0x053C	0	R/W	SW 1 setting (PLS/Err)	1ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW 1 output normal and reserved output.
1410	0x0582	1	R/W	SW 2 setting (FloW)	ModE2 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		2ot(Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW2 output normal and reserved output
1420	0x058C	1	R/W		P_2 (n_2) (Selection of output set value)	S16	500L range 250 1000L range 500 2000L range 1000 4000L range 2000	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x01068 (40 to 4200)	Setting of SW 2 output set value (Hysteresis)
		2	R/W		H_2 (Setting of SW 1 hysteresis)	U16	500L range 25 1000L range 50 2000L range 100 4000L range 200	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0000 to 0x1040 (0 to 4160)	Setting of SW 2 hysteresis (Hysteresis)

●Product individual parameters (continued)

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1420	0x058C	3	R/W	SW 2 setting (FloW)	P2L (n2L) (Lower limit of window comparator)	S16	500L range 150 1000L range 300 2000L range 600 4000L range 1200	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x01068 (40～4200)	Setting of SW 2 output set value (Lower limit of window comparator)
		4	R/W		P2H (n2H) (Upper limit of window comparator)	S16	500L range 300 1000L range 600 2000L range 1200 4000L range 2400	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 4000L range Setting range 0x0028 to 0x01068 (40 to 4200)	Setting of SW 2 output set value (Upper limit of window comparator)
		5	R/W		WH2 (Window comparator hysteresis)	U16	500L range 50 1000L range 100 2000L range 200 4000L range 400	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0028 to 0x1040 (0 to 4160)	Setting of SW 2 hysteresis (Window comparator)
		6	R/W		dtH2 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW 2 delay time ON 10 ms increments
		7	R/W		dtL2 (Delay time OFF)	U16	0	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0028 to 0x1040 (0 to 4160)	Setting of SW 2 delay time OFF 10 ms increments

●Product individual parameters (continued)

Index		Sub index	Access *1		Parameter	Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1430	0x0596	1	R/W	SW 2 setting (tEMP)	ModE2 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		2ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW 2 output normal and reserved output
1440	0x05A0	1	R/W		P_2 (n_2) (Selection of output set value)	S16	250	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 2 output set value (Hysteresis)
		2	R/W		H_2 (Setting of SW2 hysteresis)	U16	25	Y	Setting range 0x0000 to 0x02BC (0 to 700)	Setting of SW 2 hysteresis (Hysteresis)
		3	R/W		P2L (n2L) (Lower limit of window comparator)	S16	150	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 2 output set value (Lower limit of window comparator)
		4	R/W		P2H (n2H) (Upper limit of window comparator)	S16	300	Y	Setting range 0xFF9C to 0x0258 (-100 to 600)	Setting of SW 2 output set value (Upper limit of window comparator)
		5	R/W		WH2 (Window comparator hysteresis)	U16	50	Y	Setting range 0x000 to 0x015E (0 to 350)	Setting of SW 2 hysteresis (Window comparator)
		6	R/W		dtH2 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW 2 delay time ON 10 ms increments
		7	R/W		dtL2 (Delay time OFF)	U16	0	Y		Setting of SW 2 delay time OFF 10 ms increments
1450	0x05AA	1	R/W	SW 2 setting (PrSE)	ModE2 (Selection of output mode)	U8	0	Y	0: HYS (Hysteresis) 1: Wind (Window comparator)	
		2	R/W		2ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	Setting of SW 2 output normal and reserved output
1460	0x05B4	1	R/W		P_2 (n_2) (Selection of output set value)	S16	500	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 2 output set value (Hysteresis)
		2	R/W		H_2 (Setting of SW 1 hysteresis)	U16	50	Y	Setting range 0x0000 to 0x044C (0 to 1100)	Setting of SW 2 hysteresis (Hysteresis)
		3	R/W		P2L (n2L) (Lower limit of window comparator)	S16	300	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 2 output set value (Lower limit of window comparator)
		4	R/W		P2H (n2H) (Upper limit of window comparator)	S16	600	Y	Setting range 0xFFCE to 0x041A (-50 to 1050)	Setting of SW 2 output set value (Upper limit of window comparator)
		5	R/W		WH2 (Window comparator hysteresis)	U16	100	Y	Setting range 0x0000 to 0x0226 (0 to 550)	Setting of SW 2 hysteresis (Window comparator)
		6	R/W		dtH2 (Delay time ON)	U16	0	Y	Setting range 0x0000 to 0x1770 (0 to 6000)	Setting of SW 2 delay time ON 10 ms increments
		7	R/W		dtL2 (Delay time OFF)	U16	0	Y		Setting of SW 2 delay time OFF 10 ms increments

●Product individual parameters (continued)

Index		Sub index	Access *1	Parameter		Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
1490	0x05D2	0	R/W	SW 2 setting (AC)	AC_2ot (Selection of output type)	U8	0	Y	0: 1_P (Normal output) 1: 1_n (Reverse output)	
1500	0x05DC	0	R/W	SW 2 setting (AC)	P2(n2)_L (Selection of output set value)	U32	0	Y	0 to 999,999,999	Common for all ranges, units, and criterion
1510	0x05E6	0	R/W	SW 2 setting (AC)	P2(n2)_ft3 (Selection of output set value)	U32	0	Y	0 to 99,999,999	Common for all ranges, units, and criterion
1600	0x0640	0	R/W	Dir (Setting of the accumulated flow direction)		U8	0	Y	0: Add 1: dEC1 2: dEC2	Addition/Subtraction
1800	0x0708	1	R/W	FiL_FLoW (Digital filter_flow rate)		U8	0	Y	0: 1.0 sec 1: 2.0 sec 2: 5.0 sec	Set digital filter
		2	R/W	FiL_PrES (Digital filter_pressure)		U16	10	Y	0 to 3000 ms	10 ms increments (0 to 30 sec.)
1810	0x0712	0	R/W	FSC_PrES (Fine adjustment of the pressure span)		S16	0	N	-50 to 50	0.1% increments (-5 to 5%)
2000	0x07D0	0	R/W	Sub (Sub screen display)		U8	0	Y	Refer to the Fig. Data for the sub screen display (Page 97)	
2020	0x07E4	0	R/W	rEv (Reserved display)		U8	0	Y	0: Normal display 1: Reversed display	
2030	0x07EE	1	R/W	Zero Cut(Flow)		U8	1	Y	0 to 10	Zero cut-off setting 1.0% increments
		2	R/W	Zero Cut (PrES)		U8	0	Y		
2050	0x0802	1	R/W	Mes disp/hide_PrES (Measurement display/ hide_pressure)		U8	0	Y	0: diSP (displayed) 1: HidE (hidden)	Measurement display/hide setting
		2	R/W	Mes disp/hide_tEMP (Measurement display/ hide_temperature)		U8	0	Y	0: diSP (displayed) 1: HidE (hidden)	
		3	R/W	Mes disp/hide_AC (Measurement display/ hide_accumulated flow rate)		U8	0	Y	0: diSP (displayed) 1: HidE (hidden)	
2200	0x0898	0	R/W	SAvE (Accumulated flow value hold setting)		U8	0	Y	0: oFF (Not held) 1: 2.0 min 2: 5.0 min	
2310	0x0906	0	R/W	PoE （Communication failure）		U8	1	Y	0:Zero 1:Hold	
2400	0x0960	0	R/W	Display OFF (Display OFF setting)		U8	0	Y	0: on 1: oFF	
2410	0x096A	1	R/W	Security code	Pin (Security code Used/Not used)	U8	0	Y	0: unused 1: use	
		2	R/W	Security code	PinCode (Security code setting)	U16	0	Y	Setting range 0x0000 to 0x03E7 (0 to 999)	

●Product individual parameters (continued)

Index		Sub index	Access *1	Parameter	Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex								
6110	0x17DE	1	R/W	FrtE standby flow rate (Threshold)	S16	500L range 25 1000L range 50 2000L range 100 4000L range 200	Y	500L range Setting range 0x0005 to 0x020D (5 to 525) 1000L range Setting range 0x000A to 0x041A (10 to 1050) 2000L range Setting range 0x0014 to 0x0834 (20 to 2100) 2000L range Setting range 0x0028 to 0x1068 (40 to 4200)	Setting of standby flow rate (Threshold)
		2	R/W	FHYS standby flow rate (Hysteresis)	U16	500L range 50 1000L range 100 2000L range 200 4000L range 400	Y	500L range Setting range 0x0000 to 0x0208 (0 to 520) 1000L range Setting range 0x0000 to 0x0410 (0 to 1040) 2000L range Setting range 0x0000 to 0x0820 (0 to 2080) 4000L range Setting range 0x0000 to 0x1040 (0 to 4160)	Setting of standby flow rate (Hysteresis)
		3	R/W	t_on (standby ON delay)	U16	600	Y	Setting range 0x0000 to 0x270F (0 to 9999)	Setting of standby ON delay time 1 s increments
		4	R/W	t_off (standby OFF delay)	U16	0	Y	Setting range 0x0000 to 0x270F (0 to 9999)	Setting of standby OFF delay 1 s increments
6120	0x17E8	1	R/W	iSoL (auto isolation)	U8	0	Y	0:off 1:on	Auto isolation enable/disable setting
		2	R/W	t_iso (auto isolation delay)	U16	3600	Y	Setting range 0x0000 to 0x270F (0 to 9999)	Setting of auto isolation delay time 1 s increments
6130	0x17F2	0	R/W	StE (Force AMS mode)	U8	0	Y	0:AMS 1:operation 2:standby 3:isolation	
7000	0x1B58	0	W	Communication OUT test: Communication OUT output test	U8	0	N	0: Normal output 1: Fixed output	The PD becomes 1 when a fixed output has been received
7010	0x1B62	0	W	Communication OUT test: Toggle output command	U8	-	N	Refer to table "Toggle output command". (Page 96)	

●Product individual parameters (continued)

Index		Sub index	Access *1		Parameter	Data type *2	Initial value	Data storage *3	Set value *4	Remarks
dec	hex									
8000	0x1F40	0	R	Measurement related	Flow rate PD conversion equation: a	F32	-	N	Refer to "Inclination and intercept to the unit specification". (Page 82)	
8010	0x1F4A	0	R		Flow rate PD conversion equation: b	F32	-	N		
8020	0x1F54	0	R		Flow peak value	S16	-	N	0x0000 to 0x1068 (0 to 4200)	
8030	0x1F5E	0	R		Flow bottom value	S16	-	N		
8060	0x1F7C	0	R		Accumulated PD conversion equation: a	F32	-	N	Refer to "Inclination and intercept to the unit specification". (Page 82)	
8070	0x1F86	0	R		Accumulated PD conversion equation: b	F32	-	N		
8200	0x2008	0	R		Temperature PD conversion equation: a	F32	-	N		
8210	0x2012	0	R		Temperature PD conversion equation: b	F32	-	N		
8220	0x201C	0	R		Flow peak value	S16	-	N	0xFF9C to 0x0258 (-100 to 600)	
8230	0x2026	0	R		Flow bottom value	S16	-	N		
8400	0x20D0	0	R		Pressure PD conversion equation: a	F32	-	N	Refer to "Inclination and intercept to the unit specification". (Page 82)	
8410	0x20DA	0	R		Pressure PD conversion equation: b	F32	-	N		
8420	0x20E4	0	R		Flow peak value	S16	-	N	0xFFCE to 0x041A (-50 to 1050)	
8430	0x20EE	0	R		Flow bottom value	S16	-	N		

∗1: "R" means Read and "W" means Write.
∗2: Refer to the table below for the symbol.

Symbol	Data type (IO-Link standard)	Data length Bit [byte]	Description
U8	UIntegerT	8[1]	Unsigned integer
U16		16[2]	
S16	IntegerT	16[2]	Signed integer
F32	Float32T	32[4]	Floating point number

∗3: "Y" indicates that the parameter setting data is saved to the master, and "N" indicates that the parameter is not saved.
∗4: Read/write to un-selectable items will be rejected depending on the product No.

[Toggle output command]

Item		Value	Notes
Measured value	Accumulated	0	Odd number : Rated minimum value Even number : Rated maximum value
	Flow rate	1	
	Temperature	2	
	Pressure	3	
OUT output bit	OUT1	16	Reverse only the bits of the process data.
	OUT2	17	Linked to hardware outputs
SW output bit	Accumulated 1	32	Reverse only the bits of the process data.
	Accumulated 2	33	
	Flow rate 1	34	
	Flow rate 2	35	
	Temperature 1	36	
	Temperature 2	37	
	Pressure 1	38	
	Pressure 2	39	
Isolation SW bit		128	
Accumulate pulse bit		129	Output a fixed periodic pulse.
Standby signal reception bit		134	
Forced standby signal reception bit		135	
Forced mode bit		143	
Display unit bit		208	Reverse only the bits of the process data.
Unit reference bit		209	Reverse only the bits of the process data.
Flow diagnosis bit		224	
Temperature diagnosis bit		225	
Pressure diagnosis bit		226	
Error bit		254	
System error bit		255	

[Data for sub screen]

Value	Setting content		Supplemental information
0	Measurement display		Initial value
1	SW1 set value display	Flow rate HYS mode set value	Values that do not match the SW∗ output mode settings can also be written. In this case, there is a contradiction in the display of the sub screen.
2		Flow rate HYS mode hysteresis	
3		Flow rate Wind mode lower side set value	
4		Flow rate Wind mode upper side set value	
5		Flow rate Window comparator mode hysteresis	
6		Temperature HYS mode set value	
7		Temperature HYS mode hysteresis	
8		Temperature Wind mode lower side set value	
9		Temperature Wind mode upper side set value	
10		Temperature Wind mode hysteresis	
11		Pressure HYS mode set value	
12		Pressure HYS mode hysteresis	
13		Pressure Wind mode lower side set value	
14		Pressure Wind mode upper side set value	
15		Pressure Wind mode hysteresis	
16		AC mode set value	
20	SW2 set value display	Flow rate HYS mode set value	
21		Flow rate HYS mode hysteresis	
22		Flow rate Wind mode lower side set value	
23		Flow rate Wind mode upper side set value	
24		Flow rate Wind mode hysteresis	
25		Temperature HYS mode set value	
26		Temperature HYS mode hysteresis	
27		Temperature Wind mode lower side set value	
28		Temperature Wind mode upper side set value	
29		Temperature Wind mode hysteresis	
30		Pressure HYS mode set value	
31		Pressure HYS mode hysteresis	
32		Pressure Wind mode lower side set value	
33		Pressure Wind mode upper side set value	
34		Pressure Wind mode hysteresis	
35		AC mode set value	
39	Flow bottom value		
40	Flow peak value		
41	Temperature bottom value		
42	Temperature peak value		
43	Pressure bottom value		
44	Pressure peak value		
45	IO-Link mode display		Upper line: SIO mode/SDCI mode Lower line: Device ID

Troubleshooting

If an operation failure of the product occurs, please confirm the cause of the problem using the following table.
If the cause applicable to the problem cannot be identified and normal operation can be recovered by replacement with a new product, this indicates that the product itself was faulty. Problems with the product may be due to the operating environment (network configuration etc). Please consult SMC.

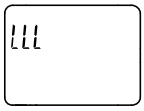
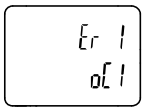
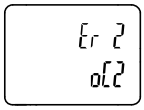
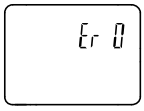
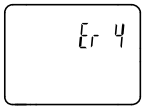
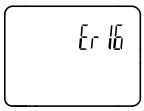
●Troubleshooting list

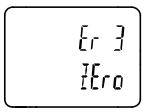
•Troubleshooting with Digtal Flow Switch display

Error indication	Problem Possible causes	Investigation method	Countermeasure
•System error (Er0, 4 to 16, 40) is displayed •"HHH", "LLL" is displayed •Hardware error (Er1, 2) is displayed	Incorrect internal data processing of the product (Er0, 4 to 16, 40)	(1) Check if there is noise interference (such as static electricity). Check if there is a noise source nearby. (2) Check if the power supply voltage is in the range 24 VDC ±10%.	(1) Remove the noise and the noise source (or take measures to prevent noise interference) and reset the product (or turn off and then turn back on the power supply. (2) Check that the Power supply voltage is within 24 VDC ±10%.
	The measured value exceeds the upper limit (HHH) or lower limit (LLL)	(1) Check if the value exceeds the upper or lower limit of the set range. (2) Check if foreign matter has entered the piping.	(1) Return the value to within the set range. (2) Take measures to prevent foreign matter from entering the piping.
	Product failure (Er1, 2)		Replace the product
The display is unstable.	Incorrect power supply	Check if the power supply voltage is in the range 24 VDC ±10%.	Power supply voltage shall be within 24 VDC ±10%.
	Incorrect wiring	Check the power supply wiring Check if the brown and blue wires are connected to DC(+) and DC(-) respectively, and if the wiring is secure	Check and correct the wiring.
	Factory line pressure is not stable	Check if the factory line pressure is changing.	Setting of the response time may improve the condition.
•The display turns off. •Part of the display is missing.	Incorrect power supply	Check if the power supply voltage is within 24 VDC ±10%.	Power supply voltage shall be within 24 VDC ±10%.
	Incorrect wiring	Check the power supply wiring Check if the brown and blue wires are connected to DC(+) and DC(-) respectively, and if the wiring is secure	Check and correct the wiring.
	Display off mode	Check if display off mode is selected.	Select the required display off mode again.
	Product failure		Replace the product

Error indication	Problem Possible causes	Investigation method	Countermeasure
Display flashes	Incorrect wiring	(1) Check the power supply wiring. (2) Check if there is bending stress applied to any part of the lead wire.	(1) Check and correct the wiring. (2) Correct the wiring (bend radius and stress).
The display accuracy does not meet the specifications.	Foreign matter entered	Confirmed foreign matter entry or sticking to the piping port.	Use a filter to prevent foreign matter from entering or sticking. Discharge the condensate of the filter periodically.
	Air leakage	Check if air is leaking from the piping.	Rework the piping. If the tightening torque is exceeded, the mounting screws, brackets and the flow switch may be damaged.
	Warming up time inadequate	Check if the product satisfies the specified accuracy 10 minutes after supplying power.	After energizing, the display and output can drift. Allow the product to warm up for 10 to 15 minutes.
	Product failure		Replace the product
Display measurement unit cannot be changed.	Model Selection (model selected does not have unit selection function)	Check if the product number printed on the product indicates with Unit selection function type.	Unit selection function is not available for products Fixed to SI units. *: The unit selection function is not for use in Japan due to a new measurement law. *: Unit fixed to SI: L/min
	Product failure		Check the key-lock function.
Buttons do not work	Key-lock mode is activated.	Check if the key-lock function is turned on.	Replace the product
	Product failure		Replace the product
There is noise.	Air leakage	Check if air is leaking from the piping.	Rework the piping. If the tightening torque is exceeded, the mounting screws and the switch may be damaged.
	Product failure		Replace the product.
The operation is unstable. (chattering)	The hysteresis is small and is affected by the fluctuations in the original pressure, etc.	Check the set value (hysteresis).	Check the settings
	Incorrect wiring/ broken lead wire	(1) Check the power supply wiring. (2) Check if there is bending stress applied to any part of the lead wire. (bending radius, tensile force to the lead wire)	(1) Check and correct the wiring. (2) Correct the wiring. (Reduce the tensile force or increase the bending radius.)
	Product failure		Replace the product

■Error display

Error name	Error display	Description	Measures
Instantaneous flow error		Flow rate exceeding the upper limit of the settable flow range is applied.	Reset the applied flow rate to a level within the settable flow range.
Pressure error		Pressure exceeding the upper limit of the set pressure range is applied.	Reset the applied pressure to a level within the set pressure range.
		Pressure below the lower limit of the set pressure range is applied.	
Temperature error		Temperature exceeding the upper limit of the set temperature range is applied.	Reset the applied temperature to a level within the settable temperature range.
		Temperature below the lower limit of the set temperature range is applied.	
Hardware error		Internal hardware error detected.	Power cycle. If the display still shows an error, contact SMC.
			
System error		An internal data error has occurred.	Turn the power off and on again. If the failure cannot be solved, contact SMC.
			
	≀		
			
			

Error name	Error display	Description	Measures
Accumulated flow error		The accumulated value has exceeded the accumulated flow range. (For accumulated increment)	Reset the accumulated flow. (Press the DOWN and SET buttons simultaneously for 1 second or longer)
Zero clear error		A pressure of 7%F.S. or more is applied during the zero clear operation. (Return to measurement mode in 1 second)	Adjust the pressure and try the zero clear operation again.

*: If the error cannot be reset after the above measures are taken, or errors other than above are displayed, please contact SMC.

•When air leak is found on piping

Trouble	Possible cause	Countermeasure
Air leakage (Air leaks from where the products are connected)	Seal is damaged.	Replace the seal with a new one.
	Screws for retainer are loose.	Tighten screws to the specified torque.

*: For individual product, refer to the operation manual of each product.

Specifications

Air Management System(AMS##X-X2044 Series)

Parts number		AMS20X-X2044	AMS30X-X2044	AMS40X-X2044	AMS60X-X2044
Components	Standby regulator	AR20S	AR30S	AR40S	AR50S
	Digital Flow switch	PF3A8R5H-X105	PF3A801H-X105	PF3A802H-X105	PF3A804H-X105
Piping ports		1/8、1/4	1/4、3/8	3/8、1/2	3/4、1
Applicable fluid *1		Air			
Rated flow range		5 to 500 L/min	10 to 1000 L/min	20 to 2000 L/min	40 to 4000 L/min
Operating fluid temperature		0 to 50 °C(No condensation & freezing)			
Proof pressure		1.0 MPa			
Rated maximum pressure		0.7 MPa			
Supply pressure range		0.3 to 0.7 MPa			
Setting pressure range		0.2 to 0.4 MPa			
Power supply voltage		24 VDC ±10%			
Current consumption		170 mA or less			
Input and Output		IO-Link、Output for standby regulator			
Type of actuation		N.O.(Normally open)			
Enclosure (IP rating)		IP65 (Only applicable for electrical part)			
Weight		1000g	1400g	2000g	3500g

*1: Air quality grade is ISO 8573-1:2010 [6:6:4].

Use an air filter with 5 μm or less filtration rating on the inlet side.

Air Management System(AMS##X-X2045 Series)

Parts number		AMS20X-X2045	AMS30X-X2045	AMS40X-X2045	AMS60X-X2045
Components	Digital Flow switch	PF3A8R5H-X105	PF3A801H-X105	PF3A802H-X105	PF3A804H-X105
	Residual Pressure Relief Valve	VP346E-X661	VP546E-X661	VP746E-X661	VP946E-X661
Piping ports		1/8、1/4	1/4、3/8	3/8、1/2	3/4、1
Applicable fluid *1		Air			
Rated flow range		5 to 500 L/min	10 to 1000 L/min	20 to 2000 L/min	40 to 4000 L/min
Operating fluid temperature		0 to 50 °C(No condensation & freezing)			
Proof pressure		1.0 MPa			
Rated maximum pressure		0.7 MPa			
Supply pressure range		0.2 to 0.7 MPa			
Power supply voltage		DC24 V±10%			
Current consumption		170 mA or less			
Input and Output		IO-Link、Output for Residual Pressure Relief Valve			
Type of actuation		N.O.(Normally open)			
Enclosure (IP rating)		IP65 (Only applicable for electrical part)			
Weight		1000g	1500g	2400g	4300g

*1: Air quality grade is ISO 8573-1:2010 [6:6:4].

Use an air filter with 5 μm or less filtration rating on the inlet side.

Digital Flow Switch

Models			PF3A8R5H-X105	PF3A801H-X105	PF3A802H-X105	PF3A804H-X105
Fluid	Applicable fluid [*1]		Air, N_2			
	Operating fluid temperature		0 to 50 ℃			
Flow specifications	Detection method		Heating type sensor (branch flow type)			
	Rated flow range		5 to 500 L/min	10 to 1000 L/min	20 to 2000 L/min	40 to 4000 L/min
	Set flow rate range [*2]	Instantaneous flow	5 to 525 L/min	10 to 1050 L/min	20 to 2100 L/min	40 to 4200 L/min
		Accumulated flow	0 to 9,999,999,990 L			
	Lowest configurable increment	Instantaneous flow	1 L/min		2 L/min	
		Accumulated flow	10 L			
	Accumulated volume per pulse (Pulse width = 50 msec.)		Select from 1 L/pulse, 10 L/pulse	Select from 10 L/pulse, 100 L/pulse		Select from 100 L/pulse, 1000 L/pulse
	Accumulated value hold [*3]		2 or 5 minutes can be selected..			
Pressure specifications	Rated pressure range		0.000 to 1.000 MPa			
	Set pressure range [*2]		-0.050 to1.050 MPa			
	Lowest configurable increment		0.001 MPa			
	Proof pressure		1.5 MPa			
Temp. specifications	Rated temperature range		0.0 to 50.0 ℃			
	Set temperature range		-10.0 to 60.0 ℃			
	Lowest configurable increment		0.1 ℃			
Electrical specifications	Power supply voltage		DC21.6 to 30 VDC			
	Current consumption		150 mA or less			
	Protection		Polarity protection			
Accuracy	Accuracy	Flow rate [*4]	±3.0%F.S.			
		Pressure	±3.0%F.S.			
		Temp. [*5]	±2.5 ℃			
	Repeatability (Flow rate/Pressure)		±1.0%F.S.			
	Temperature characteristics (Flow rate/Pressure)		±5.0%F.S.(Ambient temp. 0 to 50 ℃, 25 ℃ standard)			
	Pressure characteristics (Flow rate) [*6]		±5.0%F.S. (0 to 1.0 MPa, 0.5 MPa standard)			
	Impact when modular devices are connected (Flow rate) [*7]		±5.0%F.S.			

Models			PF3A8R5H-X105	PF3A801H-X105	PF3A802H-X105	PF3A804H-X105
Output for Air Management System (OUT1)(OUT2)	Output type		Select from PNP open collector or NPN open collector (2 outputs) *12			
	Output mode		Standby SW(OUT1): determined by standby flow rate and standby delay. Control output(OUT2): determined by standby SW and standby signal.			
	Standby flow range (Threshold)		5 to 525 L/min	10 to1050 L/min	20 to 2100 L/min	40 to 4200 L/min
	Standby flow range (Hysteresis)		0 to 520 L/min	0 to 1040 L/min	0 to 2080 L/min	0 to 4160 L/min
	Maximum load current		60 mA			
	Maximum applied voltage (Only NPN)		30 VDC			
	Internal voltage drop (Residual voltage)		1.5 V or less (at load current 60 mA)			
	Standby ON/OFF delay		0 to 9999 s			
	Isolation delay		0 to 9999 s			
	Protection		Over current protection			
Display	Reference condition *8		Select from Standard condition or Normal condition			
	Unit *9	Instantaneous flow	L/min、CFM(ft^3/min)			
		Accumulated flow	L、ft^3			
		Pressure	MPa、kPa、kgf/cm^2、bar、psi			
		Temp.	℃、℉			
	Display range	Instantaneous flow *10	0 to 525 L/min (Displays 0 when the value is below 5 L/min.)	0 to 1050 L/min (Displays 0 when the value is below 10 L/min.)	0 to 2100 L/min (Displays 0 when the value is below 20 L/min.)	0 to 4200 L/min (Displays 0 when the value is below 40 L/min.)
		Accumulated flow	0 to 9,999.99 x 10^6 L (6 digit display) 0 to 9,999,999.99 x 10^3 L (9 digit display)			
		Pressure *10	-0.050 to 1.050 MPa			
		Temp.	-10.0 to 60.0 ℃			
	Min. display unit	Instantaneous flow	1 L/min		2 L/min	
		Accumulated flow	10 L			
		Pressure	0.001 MPa			
		Temp.	0.1 ℃			
	Display		Display method: LCD Number of displays: 4 Display colour (upper line:): Red and green Display colour (lower line:): Orange Display (upper line/lower line): 10 digits (7 segment 5digits, 11 segment 5 digits)			
	Operation LED		OUT LED: Orange is ON when output is ON			

Models		PF3A8R5H-X105	PF3A801H-X105	PF3A802H-X105	PF3A804H-X105
Digital filter *11	Flow rate	1 s (2 s or 5 s can be selected)			
	Pressure	0.1 s (Variable at 0 to 30 s/0.01 s step)			
	Temp.	1 s			
Environmental resistance	Protection	IP65			
	Withstand voltage	1000 VAC for 1 minute between terminals and housing			
	Insulation resistance	50 MΩ between terminals and housing (with 500 VDC megger)			
	Operating temperature range	Operation: 0 to 50 °C, Storage: -10 to 60 °C (No condensation or freezing)			
	Operating humidity range	Operation, Storage: 35 to 85%RH (No condensation)			
Standards		CE/UKCA marked, UL (CSA)			
Piping	Piping specification	Modular (Body size: 20)	Modular (Body size: 30)	Modular (Body size: 40)	Modular (Body size: 50,60)
Material of fluid contact parts		SUS304, Aluminum alloy, PPS, HNBR (Sensor: Pt, Au, Ni, Fe, lead glass (not RoHS compliant), Al203)			
Length of lead wire with connector		3 m			
Weight	Body	350 g	350 g	400 g	720 g
	Lead wire with connector	+90 g			

∗1: The air quality class is according to JIS B 8392-1:2012 [6:6:4] and ISO8573-1:2010 [6:6:4].
Use an air filter with 5 μm or less filtration rating on the inlet side.

∗2: The set range changes based on the setting of the zero cut-off function.

∗3: When using the accumulated value hold function, calculate the product life from the operating conditions, and use the product within its life. The maximum update limit of the memory device is 1.5 million times.
If the product is energized for 24 hours per day, the product life will be as follows:
•Data memorized every 5 minutes --- 5 minutes x 1.5 million times = 7.5 million minutes = 14.3 years
•Data memorized every 2 minutes --- 2 minutes x 1.5 million times = 3 million minutes = 5.7 years
If the Accumulated Flow External Reset is repeatedly used, the product life will be shorter than calculated life.

∗4: When pipe bore sizes 1/4 (PF3A8R5H),3/8 (PF3A801H),1/2 (PF3A802H) and 1 (PF3A804H) are connected.

∗5: In the low flow rate range, the temperature value fluctuates (rises). Refer to the temperature accuracy chart. (Page 106)

∗6: Do not release the OUT side piping port of the product directly to the atmosphere without connecting piping. If the product is used with the piping port released to atmosphere, accuracy may vary.

∗7: These values are for modular products with a pipe bore size of 1/4 (PF3A8R5H),3/8 (PF3A801H),1/2 (PF3A802H), 1 (PF3A804H), and supply pressure of 0.5 MPa.

∗8: The flow rate given in the specification is the value at standard condition (STD).

∗9: This is only available for models with the units selection function.

∗10: Displayable range change based on the setting of zero cut-off function.

∗11: Set the time for digital filter to the sensor input. The response time indicates when the set value is 90% in relation to the step input.

∗12: AMS20X/30X/40X/60X-X2044/X2045 must be used with PNP output.The factory default setting is PNP output.

∗13: Any products with tiny scratches, smears, or display colour variation or brightness which does not affect the performance are verified as conforming products.

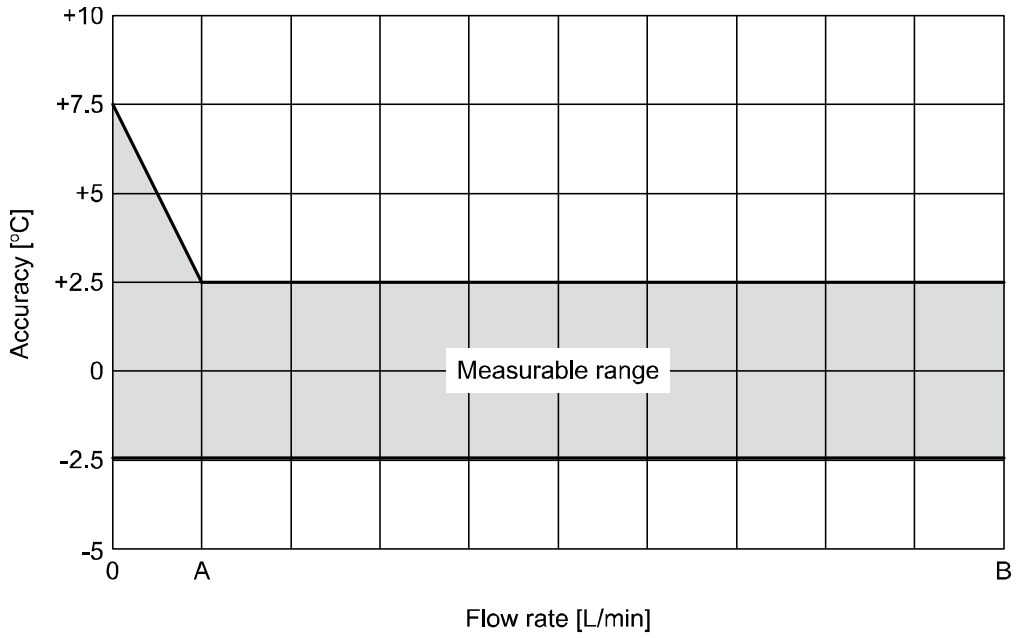
Communication specification (During IO-Link mode)

IO-Link type	Device
IO-Link version	V1.1
Communication speed	COM2(38.4 kbps)
Configuration file	IODD file ∗1
Min. cycle time	7.2 ms
Process data length	Input Data：14 byte、Output Data：2 byte
On request data communication	Available
Data storage function	Available
Event function	Available
Vendor ID	131(0x0083)
Device ID ∗2	PF3A8R5H-L2#-###-X105: 750 (0x02EE) PF3A801H-L2#-###-X105: 751 (0x02EF) PF3A802H-L2#-###-X105: 752 (0x02F0) PF3A804H-L2#-###-X105: 753 (0x02F1)

∗1: The configuration file can be downloaded from the SMC website. (URL https://www.smcworld.com)

∗2: The Device ID varies depending on the output specification of the product.

●Temperature accuracy (reference value)

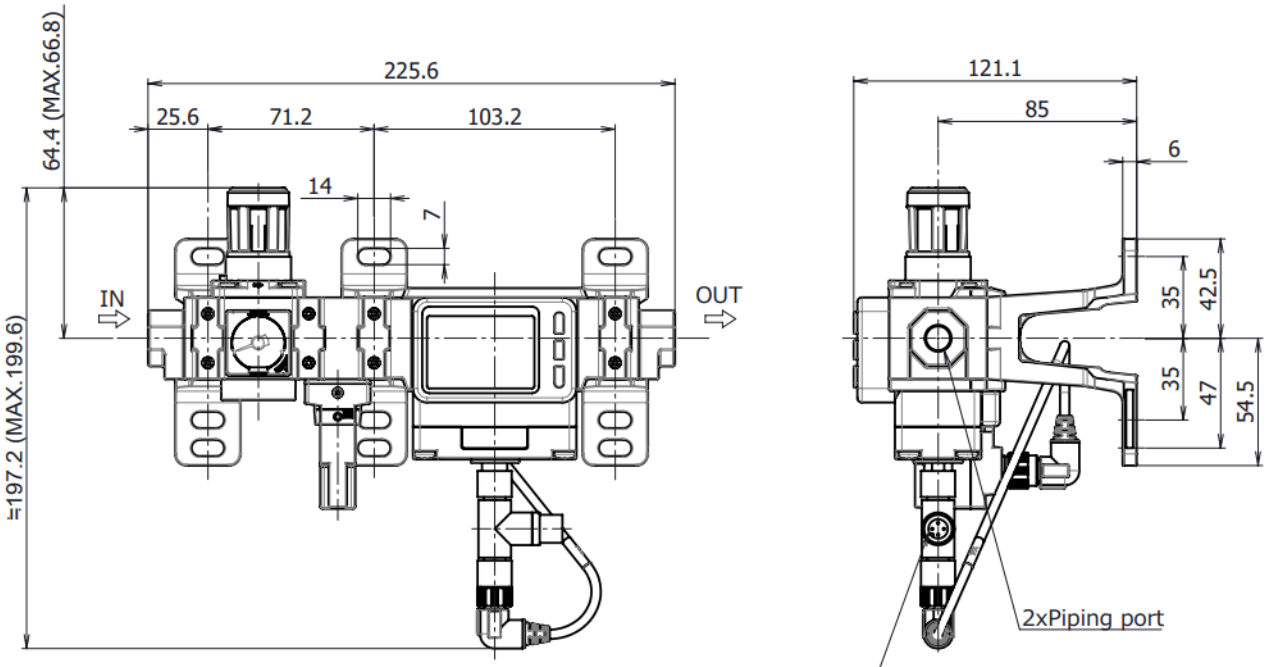


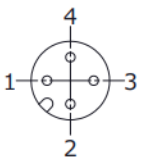
Models	A	B
AMS20	5 L/min	500 L/min
AMS30	10 L/min	1000 L/min
AMS40	20 L/min	2000 L/min
AMS60	40 L/min	4000 L/min

Dimensions

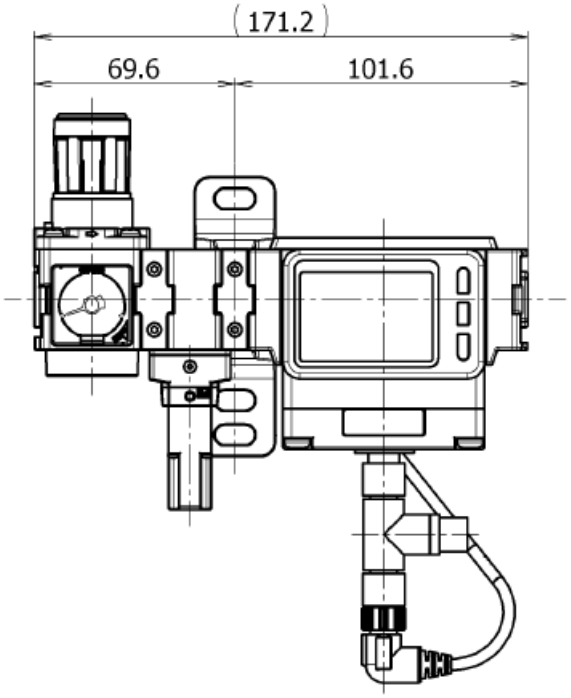
Standby regulator type

・AMS20X-R/N/F#-#L#-X2044

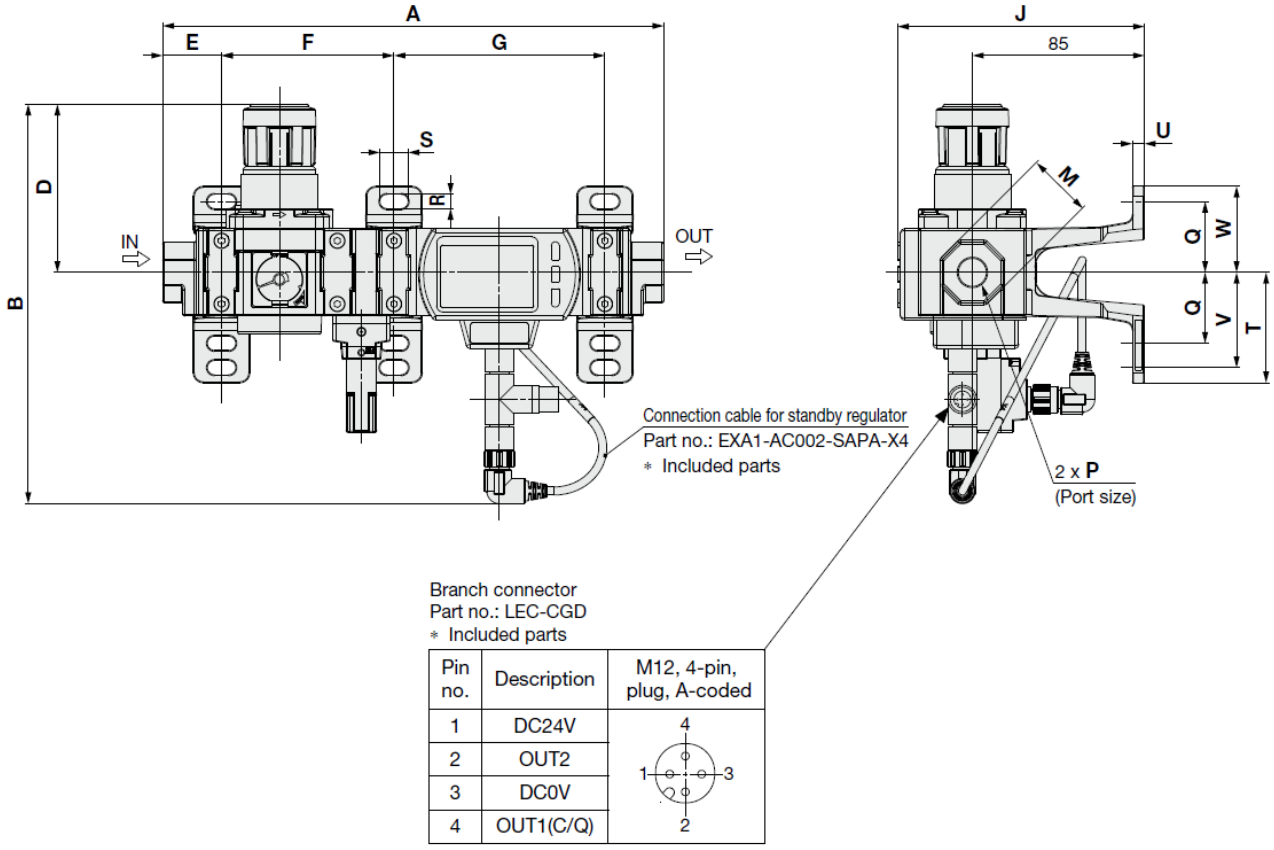


Pin No.	Discription	M12,4pins, Plug,A-code
1	DC24V	
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

・AMS20X-#00-#L#-X2044



・AMS30/40X-R/N/F#-#L#-X2044



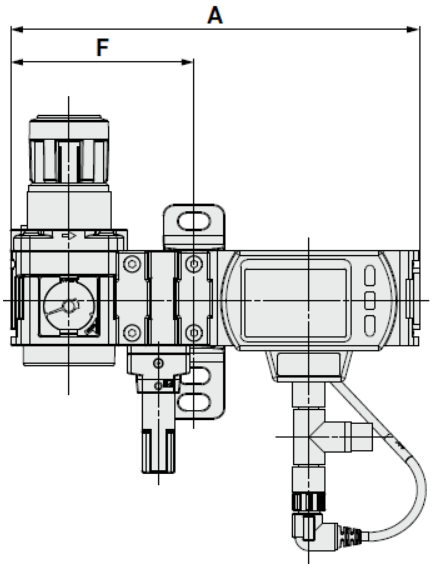
Pin no.	Description	M12, 4-pin, plug, A-coded
1	DC24V	4 / 1 / 3 / 2
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

Model	P	A	B ※	D ※	E	J	M
AMS30X-##-#L#-X2044	1/4 , 3/8	247.6	201.2	86.5	29.1	122	30
AMS40X-##-#L#-X2044	3/8 , 1/2	273.6	206.2	91.5	32.6	126.5	36

※ : The dimension of B and D is the length when the regulator knob is unlocked.

Model	Bracket dimensions								
	F	G	Q	R	S	T	U	V	W
AMS30X-##-#L#-X2044	85.2	104.2	35	7	14	54.5	6	47	42.5
AMS40X-##-#L#-X2044	103.2	105.2	40	9	18	65	7	55	50

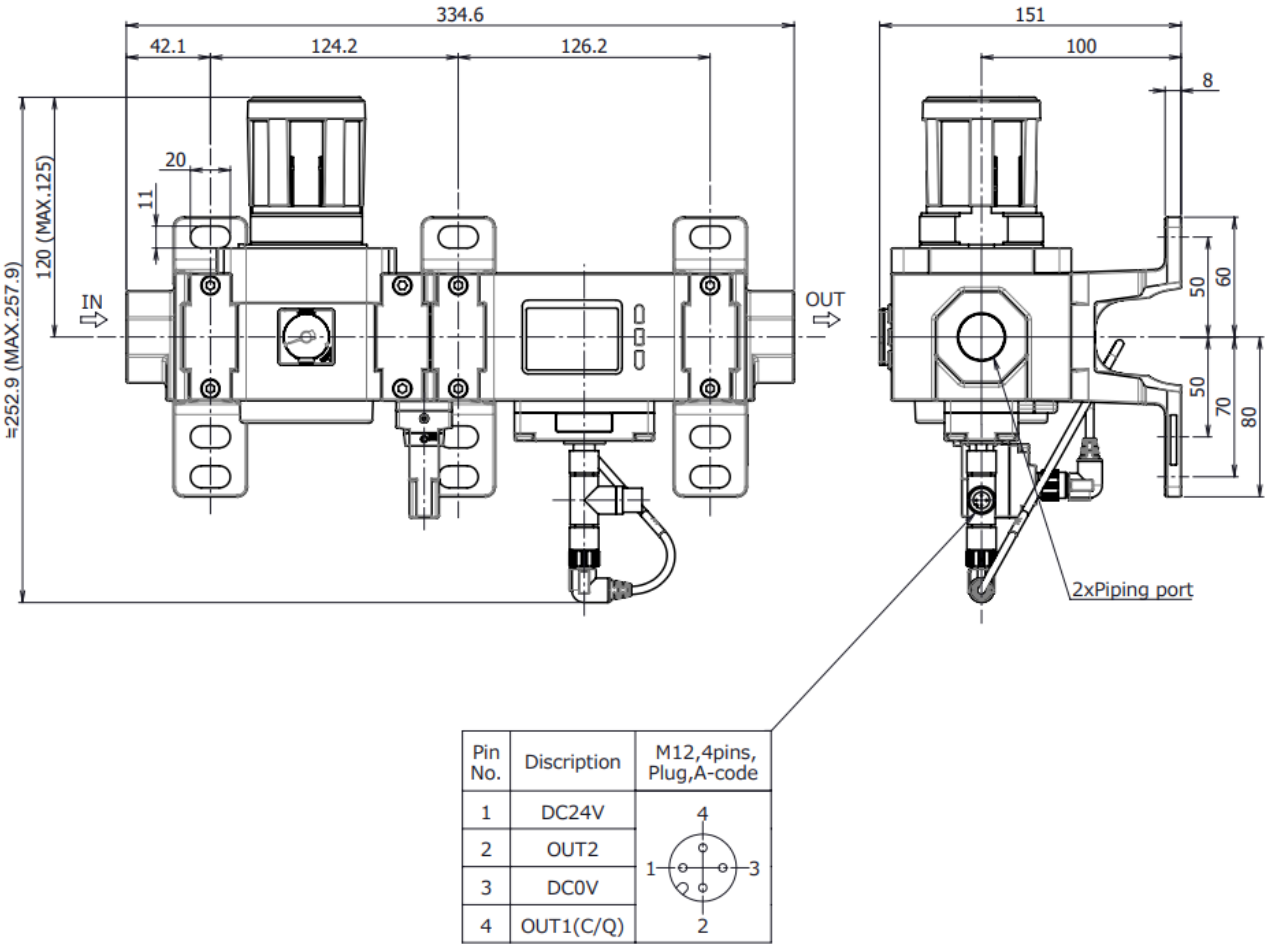
・AMS30/40X-#00-#L#-X2044



Model	P	A	F
AMS30X-#00-#L#-X2044	-	185.2	83.1
AMS40X-#00-#L#-X2044	-	203.2	100.6

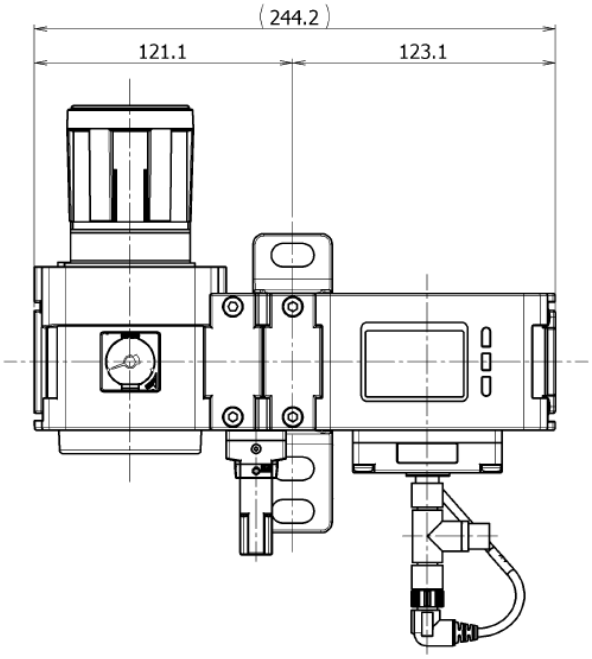
*: Refer to " AMS30/40X-R/N/F#-#L#-X2044" for dimensions other than "A" and "F". (page 109)

・AMS60X-R/N/F#-#L#-X2044



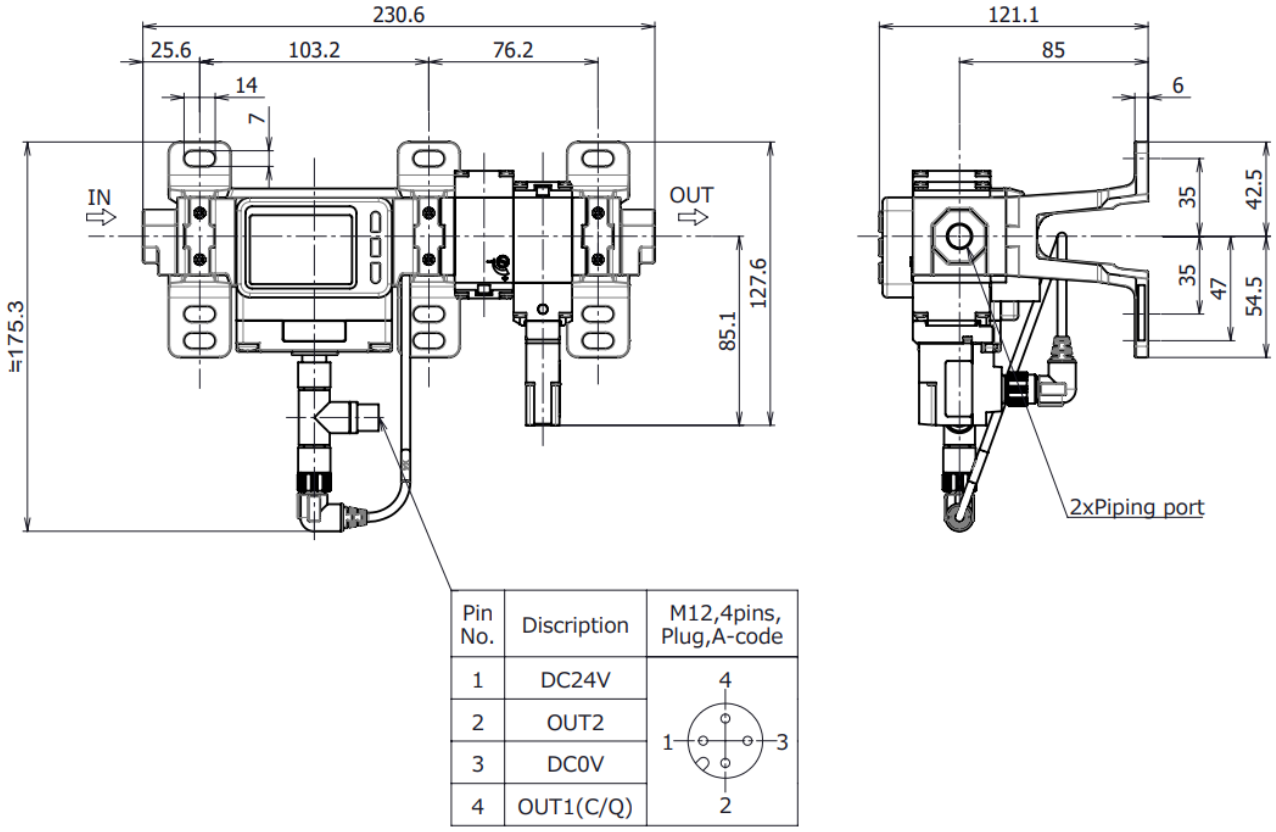
Pin No.	Discription	M12,4pins, Plug,A-code
1	DC24V	
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

・AMS60X-#00-#L#-X2044



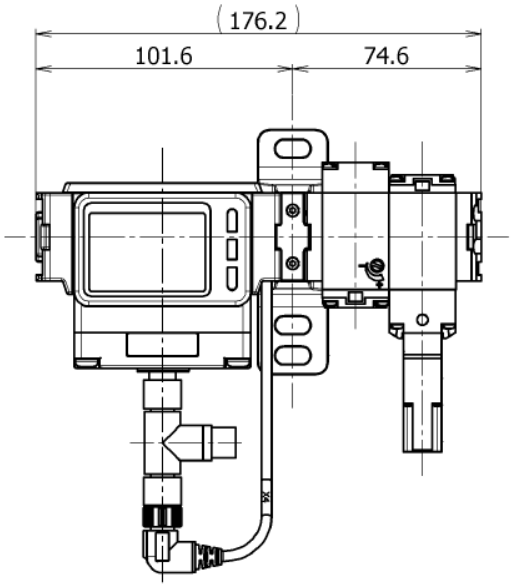
Residual Pressure Relief Valve type

・AMS20X-R/N/F#-#L#-X2045

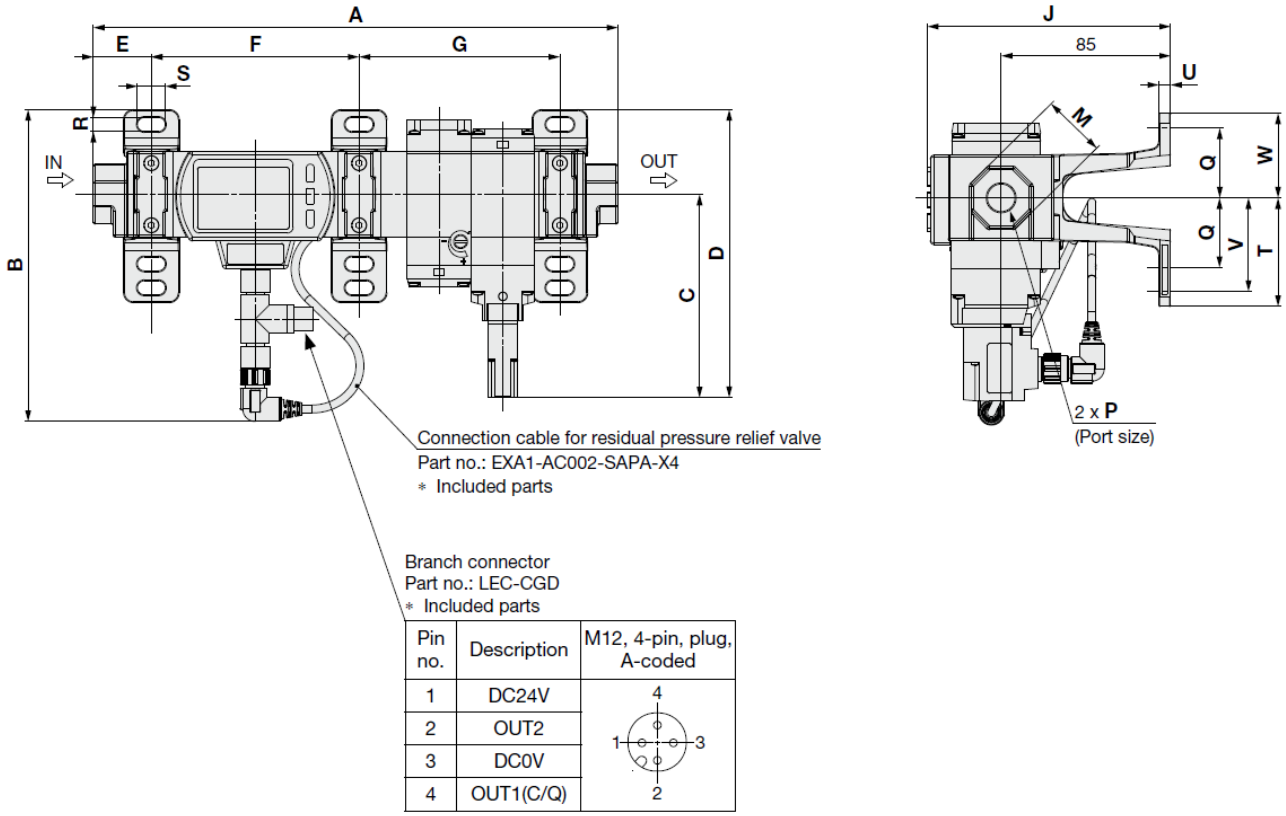


Pin No.	Discription	M12,4pins, Plug,A-code
1	DC24V	
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

・AMS20X-R00-#L#-X2045



・AMS30/40X-R/N/F#-#L#-X2045

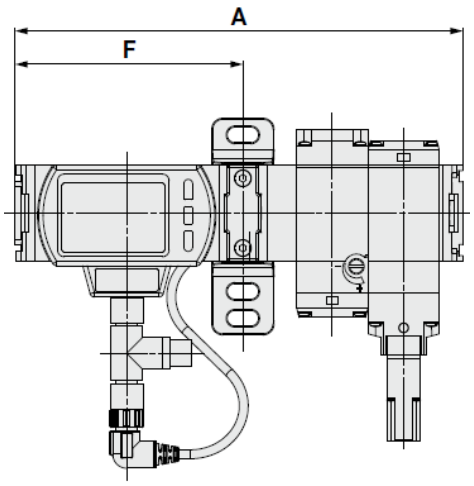


Pin no.	Description	M12, 4-pin, plug, A-coded
1	DC24V	4 / 1 / 3 / 2
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

Model	P	A	B	C	D	E	J	M
AMS30X-##-#L#-X2045	1/4 , 3/8	263.1	157.2	102.1	144.6	29.1	122	30
AMS40X-##-#L#-X2045	3/8 , 1/2	292.6	164.7	119.4	169.4	32.6	124	36

Model	Bracket dimensions								
	F	G	Q	R	S	T	U	V	W
AMS30X-##-#L#-X2045	104.2	100.7	35	7	14	54.5	6	47	42.5
AMS40X-##-#L#-X2045	105.2	122.2	40	9	18	65	7	55	50

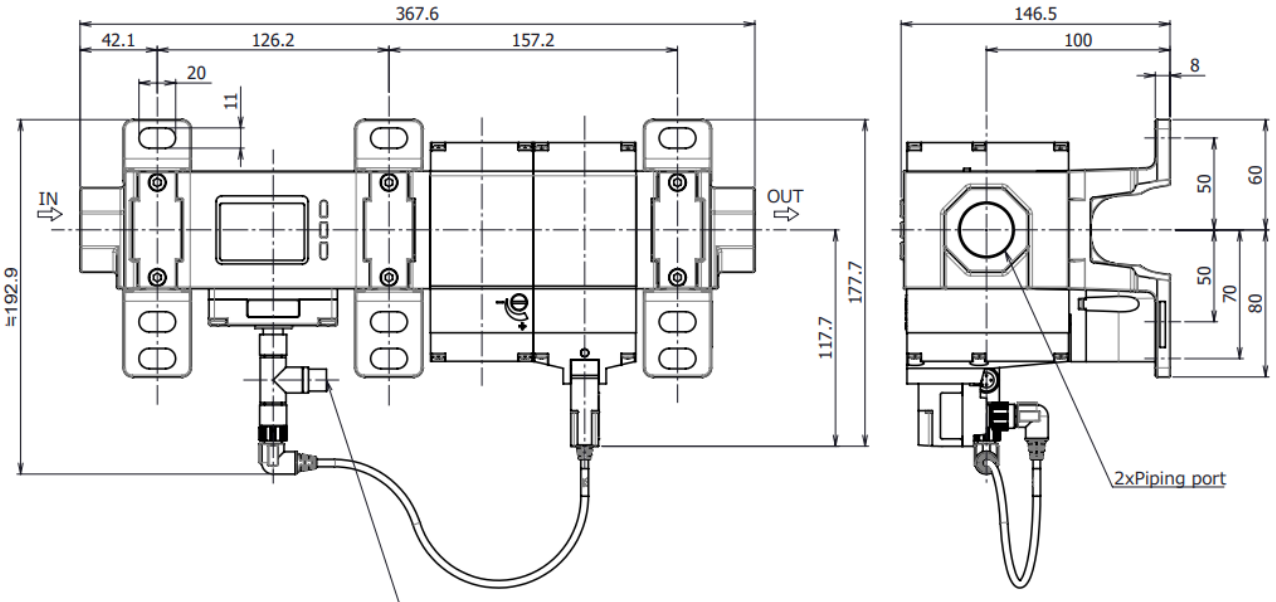
・AMS30/40X-R00-#L#-X2045

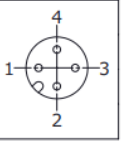


Model	P	A	F
AMS30X-R00-#L#-X2045	-	200.7	102.1
AMS40X-R00-#L#-X2045	-	222.2	102.6

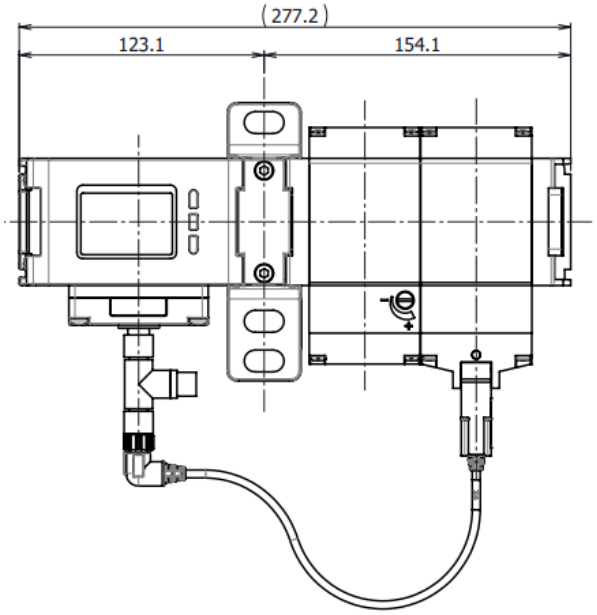
*: Refer to " AMS30/40X-R/N/F#-#L#-X2045" for dimensions other than "A" and "F". (page 115)

・AMS60X-R/N/F#-#L#-X2045



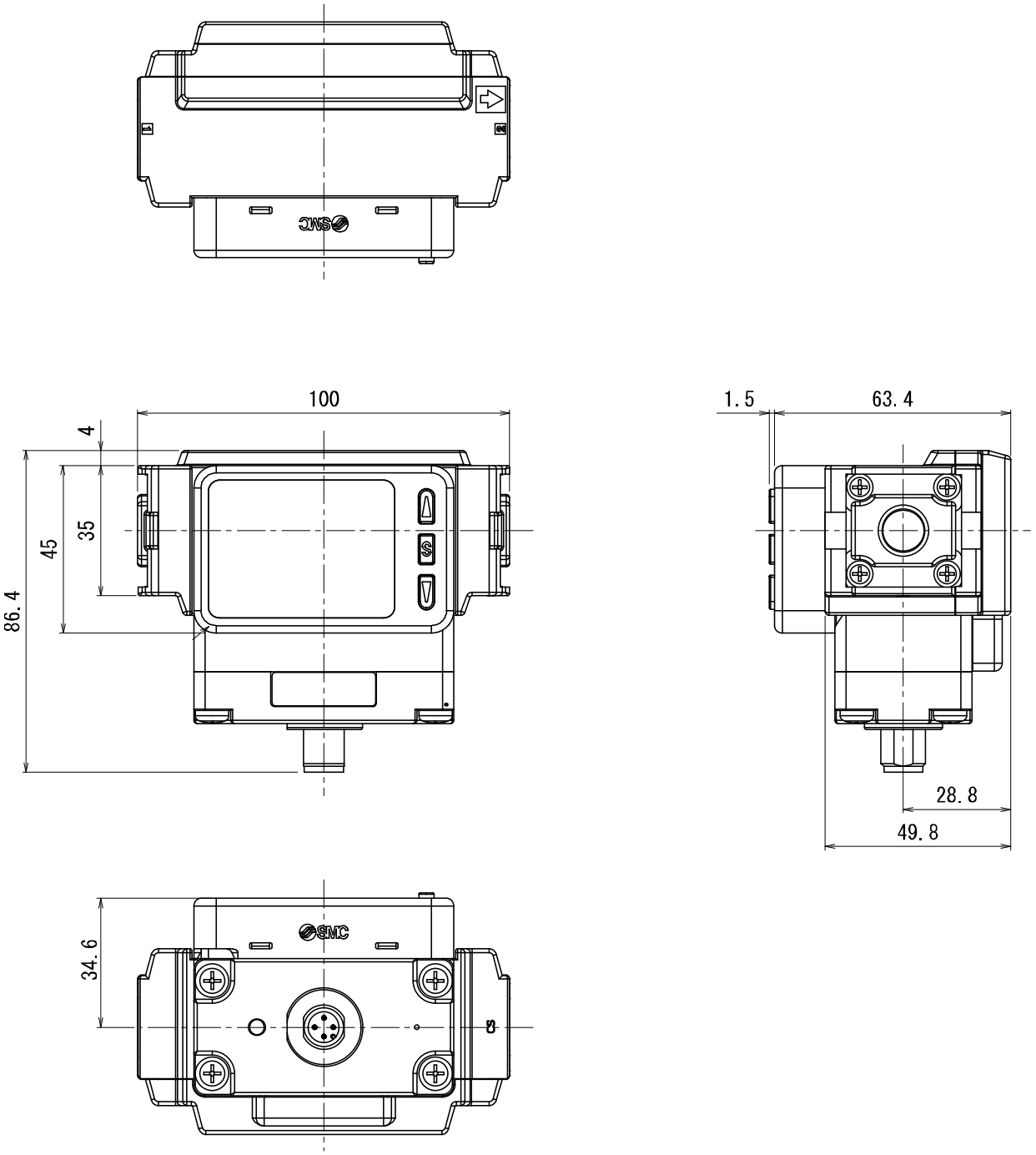
Pin No.	Discription	M12,4pins, Plug,A-code
1	DC24V	
2	OUT2	
3	DC0V	
4	OUT1(C/Q)	

・AMS60X-R00-#L#-X2045

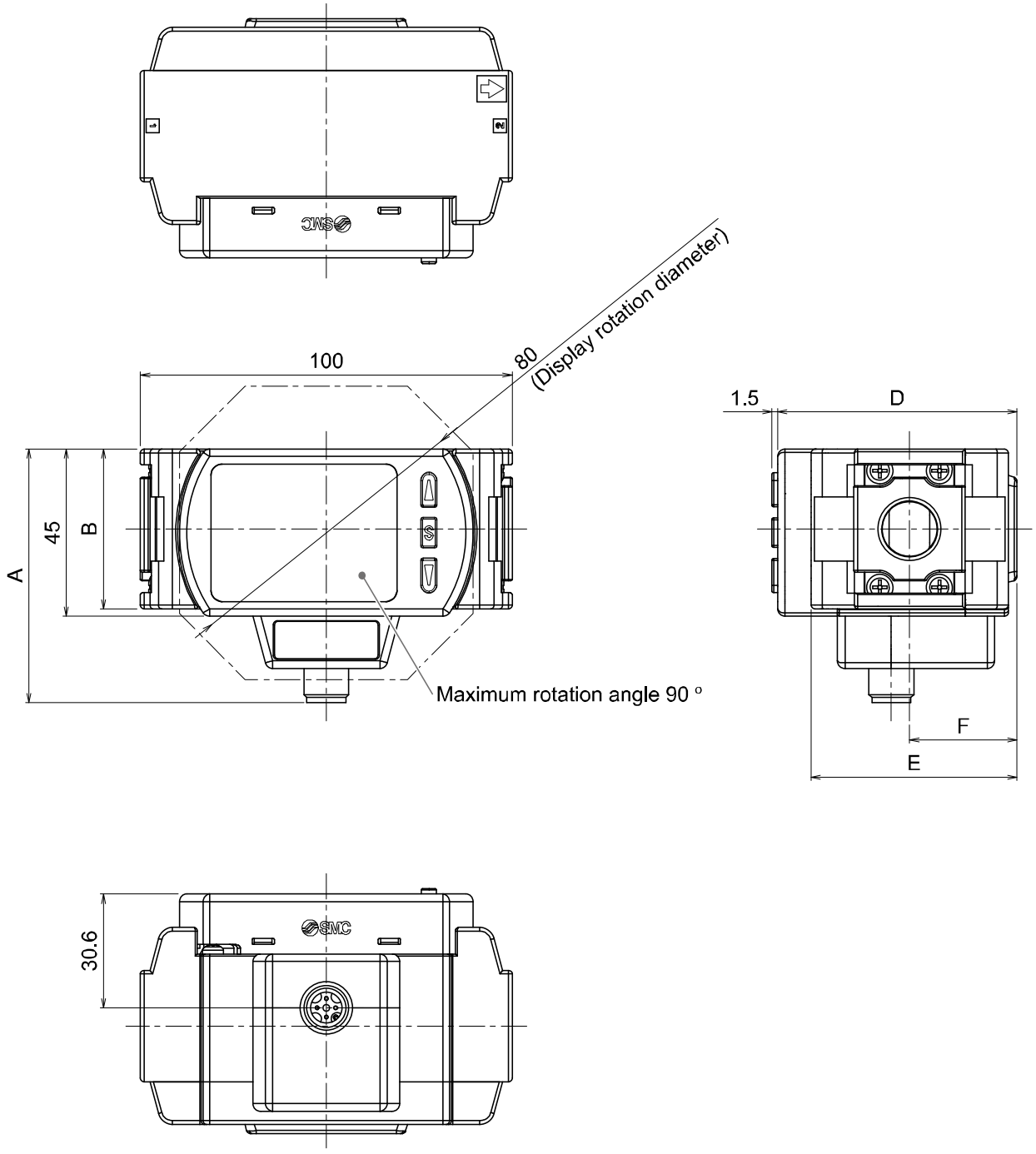


Digital Flow Switch

・PF3A8R5H-L2#-##-#-X105



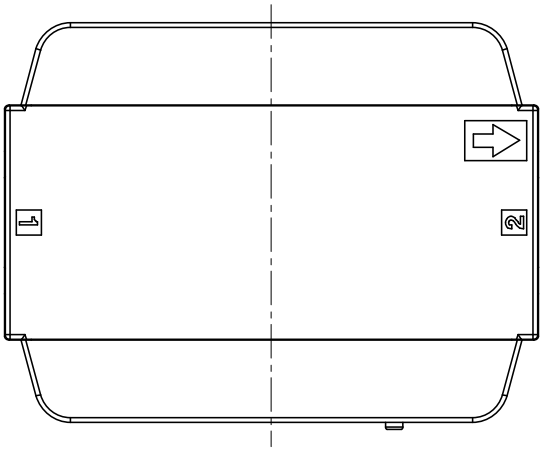
・PF3A801/802H-L2#-##-#-X105

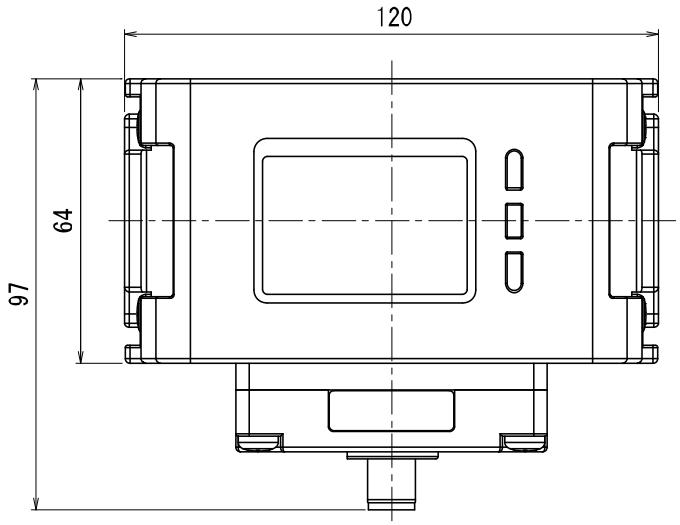


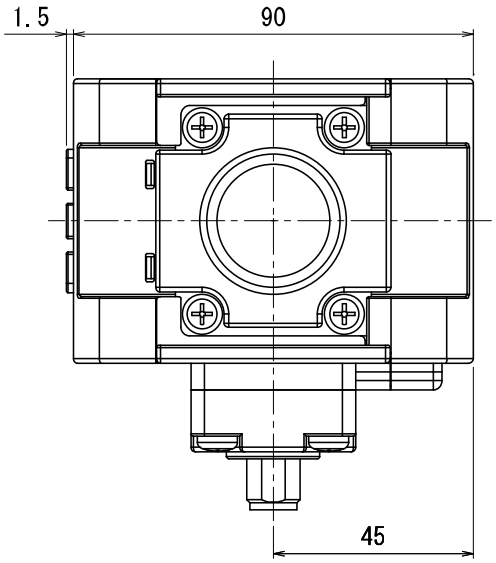
Symbol / Models	A	B	D	E	F
PF3A801H-X105	68.3	43	64.4	55.4	28.9
PF3A802H-X105	72.3	51	73	71	35.5

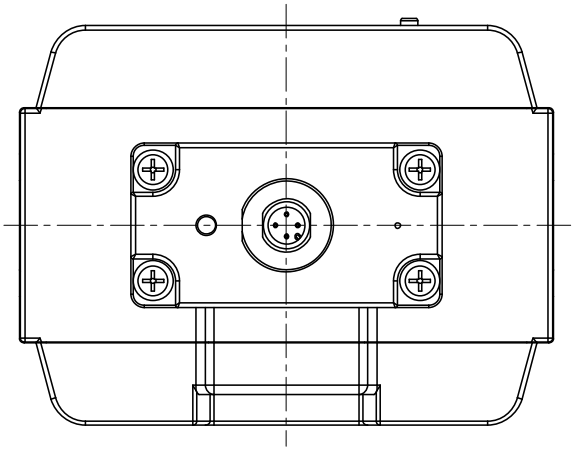
Refer to separate operation manuals for other AMS components.

・PF3A804H-L2#-##-#-X105









Accessories

Silencer

Connect a silencer to the exhaust port on the residual pressure relief valve. Recommended part numbers are shown below.

Part number	Silencer	Compact resin type		Metal body type	High noise reduction type
	Part number	AN20-02	AN30-03	AN500-06	AN500-06
	Piping size	1/4	3/8	3/4	3/4
AMS20X-R/N/F#-#L#-X2045	NO	○	-	-	-
AMS30X-R/N/F#-#L#-X2045	NO	-	○	-	-
AMS40X-R/N/F#-#L#-X2045	NO	-	○	-	-
AMS60X-R/N/F#-#L#-X2045	NO	-	-	○	○

Power Supply Cable (M12 connector, For PF3A)

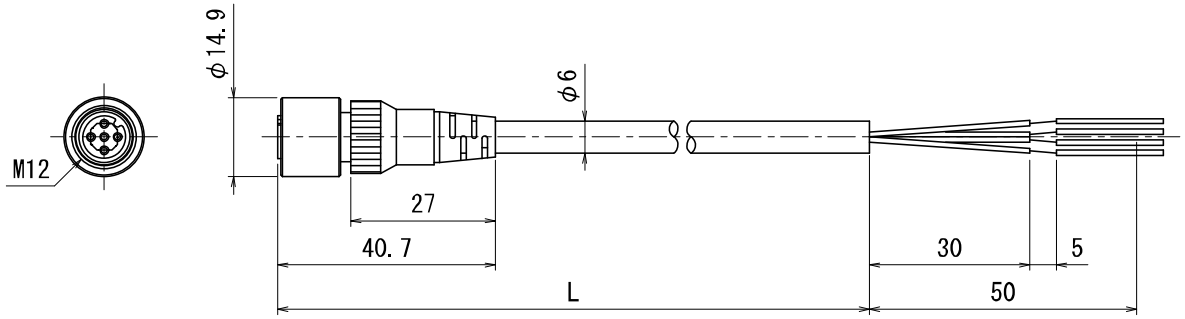
EX500-AP 050 - S

Cable length (L) • • Connector specification

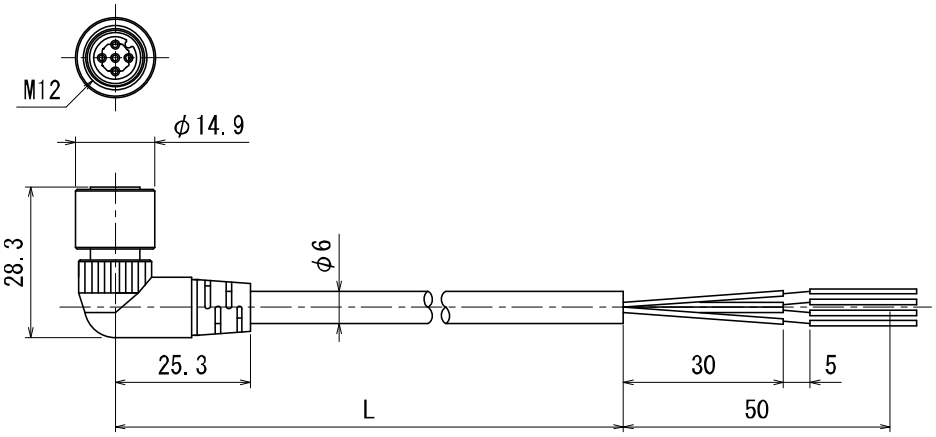
Symbol	Content
010	1000 mm
050	5000 mm

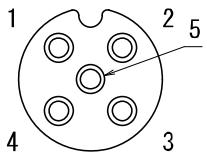
Symbol	Content
S	Straight
A	Right angle

Straight connector type

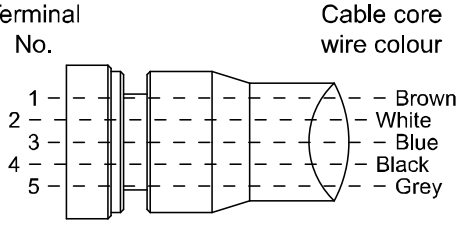


Angle connector type





Socket connector pin arrangement
A-coded
(Normal key)



Wiring

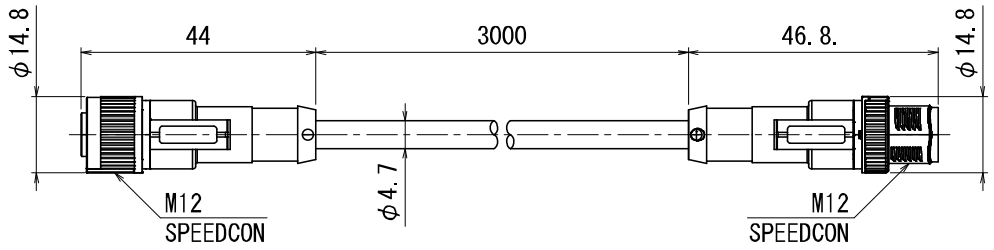
Item	Specifications
Cable O.D.	φ6 mm
Nominal cross section	0.3 mm²/AWG22
Wire diameter (Including insulator)	1.5 mm
Min. bending radius (Fixed)	40 mm

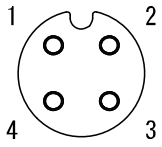
Power Supply Cable with M12 Connector (A-coded)

PCA-1557769

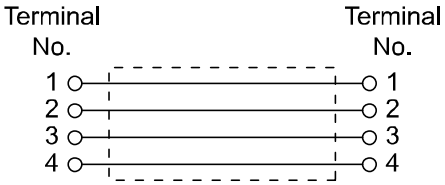
• Cable length (L)

Symbol	Content
1557769	3000 mm

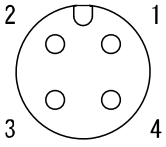




Socket connector pin arrangement A-coded (Normal key)

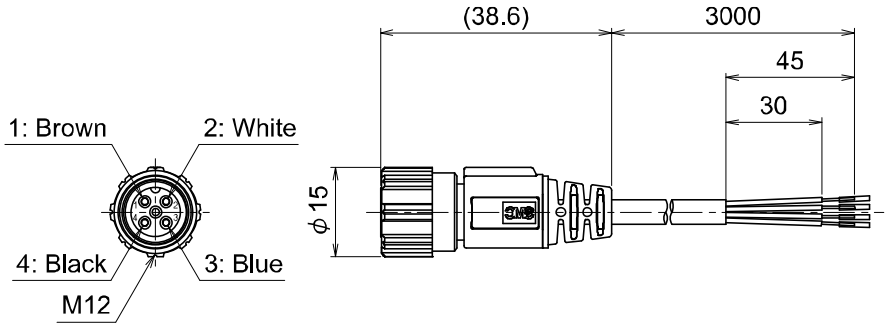


Wiring

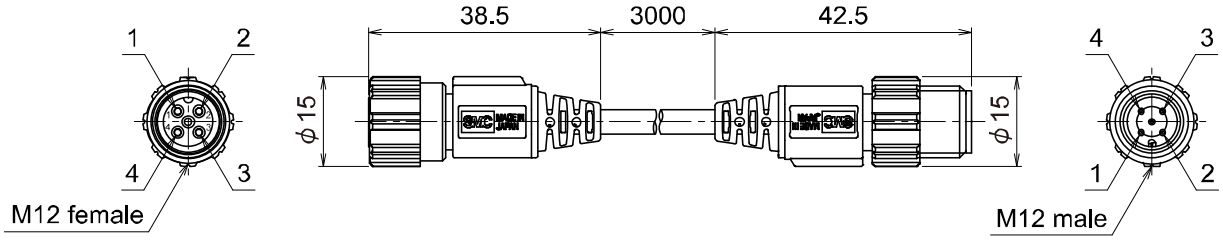


Plug connector pin arrangement A-coded (Normal key)

Lead wire with M12 connector (ZS-37-A)



Lead wire with M12 connector (ZS-49-A)

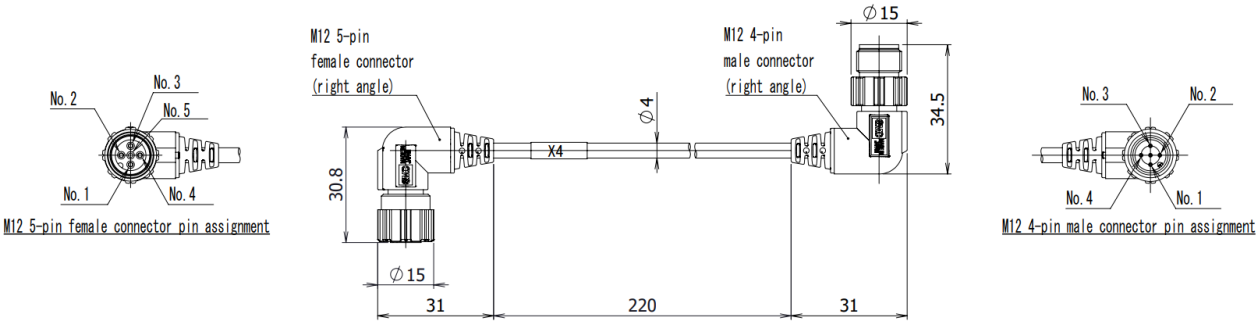


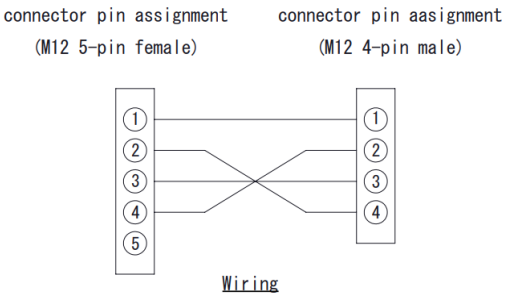
Cable specification for M12 connector and lead wire (ZS-37-A, ZS-49-A)

Item		Specifications
Conductor	Nominal cross section	AWG23
Insulator	O.D.	Approx. 1.1 mm
	Clours	Brown, Blue, Black, White
Sheath	Cable O.D.	φ4

Connector cable for AMS components

Lead wire with M12 connector (EXA1-AC002-SAPA-X4)





Cable specification for M12 connector and lead wire

Item		Specifications
Conductor	Nominal cross section	AWG23
Insulator	O.D.	Approx. 1.1 mm
Sheath	Cable O.D.	φ4

Revision history
-1: Contents revised in several places [April 2025] -2: Contents revised in several places [September 2025] -3: Contents revised in several places [October 2025]

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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