No.PF※※-OMW0004-C

Operation Manual

PRODUCT NAME

Digital Flow Switch
(Manifold type)

MODEL / Series / Product Number

PF3WB
PF3WC
PF3WS
PF3WR

SMC Corporation

Table of Contents

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

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, fuel 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
We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries. **Use in non-manufacturing industries is not covered.** Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act. 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.

■Precautions

⚠Warning
■Do not disassemble, modify (including changing the printed circuit board) or repair. An injury or failure can result.
■Do not operate the product outside of the specifications. Do not use for flammable or harmful fluids. Fire, malfunction, or damage to the product can result. Verify the specifications before use.
■Do not operate in an atmosphere containing flammable or explosive gases. Fire or an explosion can result. This product is not designed to be explosion proof.
■Do not use with flammable or highly permeable fluids. Fire, explosion, damage or corrosion can result.
■Do not use the product in a place where static electricity is a problem. Otherwise it can cause failure or malfunction of the system.
■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 •Ensure the flow is shut off before performing maintenance Otherwise an injury can result.

⚠Caution

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

■Do not touch the piping or its connected parts when the fluid is at high temperature.
It may lead to burnt.
Ensure the piping cools sufficiently before touching.

■After maintenance is complete, perform appropriate functional inspections and leak tests.
Stop operation if the equipment does not function properly or there is a leakage of fluid.
When leakage occurs from parts other than the piping, the product might be faulty.
Disconnect the power supply and stop fluid supply.
Do not apply fluid under leaking conditions.
Safety cannot be assured in the case of unexpected malfunction.

■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

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

∗Product specifications

- Use 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.
  Verify the operating voltage of the load before use.
- Do not exceed the specified maximum allowable load.
  Otherwise it can cause damage or shorten the life of the product.
- Input data to the product is not deleted, even if the power supply is cut off.
  (Number of times of rewriting: 1000000 times)
- Confirm the pressure loss at the flow rate according to the flow rate characteristics (Pressure loss) graph before designing piping.
  Confirm pressure loss from the flow characteristics chart.
- The applicable fluids are water (0 to 90 °C) and ethylene glycol solution with a viscosity of 3 mPa·s (3 cP) or less.
  Fluids other than those mentioned above will not be guaranteed.
  Do not use fluids containing chemicals, synthetic oils, organic solvents, salt or corrosive gases.
  Using such fluids can result in malfunction and damage to the product.
  Check the details of the specifications before use.
- Do not touch the piping or its connected parts when the fluid is at high temperature.
  It may lead to burnt.
- The rated pressure range and proof pressure vary depending on the fluid temperature.
  Verify the specifications before use.
- Consider measures to prevent over pressure due to water hammer.
  <Measures to reduce water hammer>
  1. Install a water hammer relieving valve.
  2. Use a flexible material for piping (such as a rubber hose) and an accumulator that can absorb impact pressure.
  3. Keep piping as short as possible.
- Use the product within the specified operating pressure and temperature range.
- Reserve a space for maintenance.
  Allow sufficient space for maintenance when designing the system.

●Product handling

∗Installation

- •Tighten to the specified tightening torque.
  If the tightening torque is exceeded the mounting screws, brackets and the product can be broken. Insufficient torque can cause displacement of the product from its proper position and the looseness of the mounting screws.
  (Refer to "Mounting and Installation" on page 24.)
- •Be sure to ground terminal FG when using a commercially available switch-mode power supply.
- •Do not use in a place subject to heavy vibration and/or shock.
  Otherwise damage to the internal parts can result, causing malfunction.
- •Do not drop, hit or apply excessive shock to the product.
  Otherwise damage to the internal parts can result, causing malfunction.
- •Do not pull the lead wire forcefully, not lift the product by pulling the lead wire.
  (Tensile force 49 N or less)
  Hold the product (plate of the main piping) by the body when handling to prevent damage.
- •For piping of the product, hold the piping with a spanner on the metal part of the piping (Piping attachment).
  Applying the spanner to other parts may lead to damage to the product.
  In particular, do not let the spanner come into contact with the M8 connector.
  The connector can be easily damaged.
- •Eliminate any dust left in the piping by air blow before connecting the piping to the product.
  Otherwise it can cause damage or malfunction.
- •Refer to the flow direction of the fluid indicated on the model number plate or the body for installation and piping.
  Residual air can cause errors in measurement accuracy.
- •Avoid piping in which the piping size of the IN side of the switch changes suddenly.
  If the piping size is reduced sharply or there is a restrictor such as a valve on the IN side, fluid velocity distribution in the piping will be disturbed, leading to improper measurement.
  Therefore, the above-mentioned piping should be connected on the OUT side.
  If the OUT side is opened, or flow rate is excessive, cavitations may be generated, which may result in improper measurement.
  As a measure against this, it is possible to reduce the cavitations by increasing the fluid pressure.
  Take action such as mounting an orifice on the OUT side of the switch, and confirm that there is no malfunction before handling.
  If the orifice of the OUT side is fully closed to operate the pump, the switch may malfunction due to the effect of pulsation (pressure fluctuation). Ensure that there is no malfunction before usage.
- •Do not insert metal wires or other foreign objects into the flow path.
  Such actions can damage the sensor causing failure or malfunction.
- •Never mount the product in a location that will be used as a scaffold.
  The product may be damaged if excessive force is applied by stepping or climbing onto it.
- •If the fluid may contain foreign matter, install and connect a filter or mist separator to the inlet.
  The adherence of foreign matter to the vortex generator or detector can cause errors in measurement accuracy.
  A filter of approx. 40 mesh is recommended.
- •Design and install the application so that the fluid detection path is always full.
- •If the product is mounted vertically, let the liquid flow from bottom to top.
  Trapped air bubbles can cause errors in measurement accuracy.
  (If the fluid detection path is always filled with liquid, there will be no problem.)
  Please be aware that water droplets may cause early deterioration/damage, particularly if the product is installed vertically or upside-down.
- •Do not apply excessive rotation force to the flor switch monitor.
  Rotating the display with excessive force will damage the end stop.
- •The manifold body is made from resin. Do not apply load directly to the product during installation or piping.
  This may cause damage, breakage and/or water leakage of the product.

∗Wiring

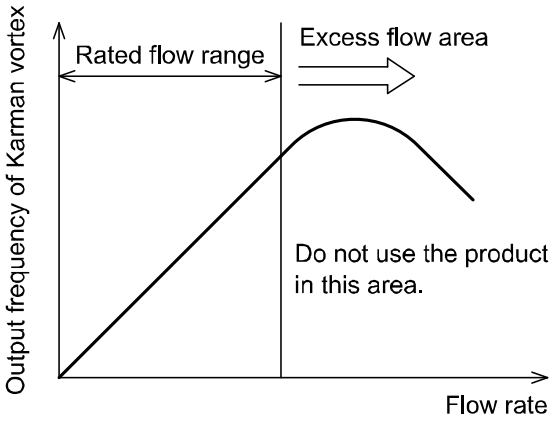
- Do not pull the lead wires. In particular, never lift a product equipped with fitting and piping by holding the lead wires.
  Otherwise damage to the internal parts can result, causing malfunction or disconnection from the connector.
- Avoid repeatedly bending, stretching or applying a heavy object or force to the lead wire.
  Repetitive bending or tensile stress can cause the sheath of the wire to peel off, or break the wire.
  If the lead wire can move, fix it near 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 can break the product.
- Do not perform wiring while the power is on.
  Otherwise damage to the internal parts can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
  Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line. Route the wires (piping) of the product separately from power or high voltage cables.
- Confirm proper insulation of wiring.
  Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied 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 30 m. (IO-Link compatible device: 20 m or less)
  Wire the DC(–) line (blue) as close as possible to the power supply.
- When the analogue output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

∗Environment

- Do not use the product in an environment that is constantly exposed to the splash of water.
  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 could be splashed.
  Otherwise damage to the product and malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.
  If the product is 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 a machine or equipment generating large surge near the product (magnetic type lifter, high frequency inductive furnace, motor, etc.), this can result in malfunction (display of incorrect value), deterioration and damage of internal elements. Take measures against the surge sources, and prevent the lines from coming into close contact.
- Do not use a load which generates surge voltage.
  When a surge-generating load such as a relay or solenoid is driven directly, use a load with a built-in surge suppressor.
- 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 failure or malfunction can result.
- Do not use the product in the presence of a magnetic field.
  Such use can result in malfunction of the product.
- Do not let foreign matter, such as wire debris, get inside the product.
  To prevent malfunction or failure take measures to prevent the debris entering the product.
- Do not use this product in places where there are cyclic temperature changes.
  Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
  If using in a location directly exposed to sunlight, shade the product from the sunlight.
  Otherwise failure or malfunction can result.
- Keep within the specified fluid and ambient temperatures range.
  If the fluid freezes, it may cause damage and malfunction of the switch, so please take measures to prevent freezing.
  When a fluid at a lower temperature than the ambient temperature is supplied, the product can break due to condensation and malfunction. Keep the product from having condensation.
  Protection against freezing is necessary.
  Avoid sudden temperature change even within specified temperature. Otherwise failure or malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  This can cause operating failure.

∗Adjustment and Operation

- Connect a load before turning the power supply on.
- Do not short-circuit the load.
  Although error is displayed when the product load has a short circuit, generated over current lead to cause the damage of the product.
- Do not press the setting buttons with a sharp pointed object.
  It may damage the setting buttons.
- Supply the power when there is no flow.
- The product is compulsory turned off for 3 seconds after the power is supplied.
- Perform settings suitable for the operating conditions.
  Incorrect settings can cause operational failure.
  For each setting of the flow switch, refer to Operation Manual from the SMC website.
  (Display integrated type: PF3W7, remote sensor type sensor: PF3W5)
- During the initial setting and flow rate setting, the product will switch the measurement output with the condition before setting.
  Confirm the output has no adverse effect on machinery and equipment before setting.
  Stop the control system before setting if necessary.
- Do not touch the LCD display during operation.
  The display can vary due to static electricity.
- For adjustment, operation and setting of the flow switch, refer to Operation Manual from the SMC website. (Display integrated type: PF3W7, remote sensor type sensor: PF3W5)
- The product is a flow meter using Karman vortex. The flow meter using Karman vortex has lower output frequency at excess flow state. Do not use the product within the excess flow area in the chart below.



∗Maintenance

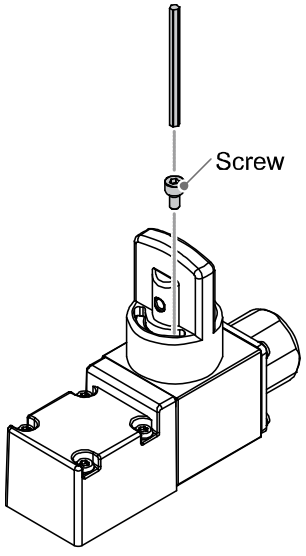
- Turn off the power supply, stop the fluid and check the safety before performing any maintenance.
  There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  There is a risk of unexpected malfunction of components due to the malfunction of equipment and machinery.
- Do not use solvents such as benzene, thinner etc. to clean the product.
  They could damage the surface of the product and erase the indication on the product.
  Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

∗Handling of flow adjustment valve

- When flow is adjusted with the flow adjustment valve, do not apply excessive force to rotate it.
  This can damage the valve mechanism.
- When fixing the valve of the flow adjustment valve, do not apply excessive force to rotate the fixing knurl.
  This can damage the knurl and valve mechanism.
- After adjusting the flow, be sure to check that there is no water leakage.
  After adjusting the flow, water leakage may occur due to the stability of the seal in the valve. If water leakage occurs, open and close the valve several times to readjust it, and check that there is no water leakage.
- The flow rate adjustment valve of this product is not suitable for applications which require constant adjustment of flow rate.
  Fluid leakage may be generated when the internal seal reaches the end of its life due to wearing. Therefore, take measures to protect peripheral equipment, ensure maintenance space and pay attention to the piping design.
- The flow rate adjustment valve of this product is not suitable for applications which require reducing the flow rate to zero completely. When it is necessary to set the flow rate to zero, select the product with a stop valve.
- Do not lift it by gripping the knob of the flow adjustment valve.
  Hold the main piping plate when handling it.
- If fluids with high temperature are flowed, the flow adjustment valve itself will also become hot, which leads to a burn. Therefore, use the flow adjustment valve with special care.

∗How to handle the stop valve

- When the flow rate is adjusted to zero using the top valve, do not rotate the valve with an excessive force.
  The valve construction might be broken.
  The maximum rotation angle of the stop valve is 90°.
- When the stop valve handle is held, do not tighten the screw with an excessive.
  The handle and valve construction might be broken.
- Screws are prepared by the user.



Flow range	Applicable screws	Tightening torque
04	Equivalent to M3 (L=6)	0.04 to 0.05 N•m
20		
40	Equivalent to M4 (L=10)	0.09 to 0.10 N•m

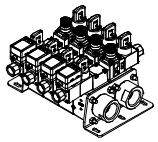
- The stop valve of the product is not suitable for adjusting the flow rate. When the flow rate needs to be adjusted, please select the product with flow adjustment valve.
- Do not hold the handle of the stop valve when it is carrying around.
  Hold the main piping plate when handling it.
- If fluids with high temperature are applied, the stop valve itself will also become hot, which may cause burns. Take special care.

Model Indication and How to Order

●Integrated type: Basic type

PF3WB □ □ □ - □ □ □ □ - □ - □ □ - □

Integrated type (basic type)



Arrangement

Symbol	Station	Rated flow range (Flow range)		
		04	20	40
01	1 station	●	●	●
02	2 stations	●	●	●
03	3 stations	●	●	●
04	4 stations	●	●	●
05	5 stations	●	●	●
06	6 stations	●	●	-
07	7 stations	●	●	-
08	8 stations	●	●	-
09	9 stations	●	●	-
10	10 stations	●	●	-

Main piping/Attachment thread type

Symbol	Content
Nil	Rc
N	NPT
F	G*1

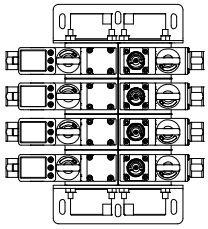
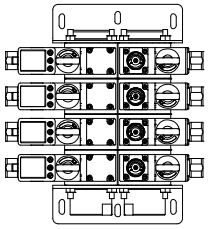
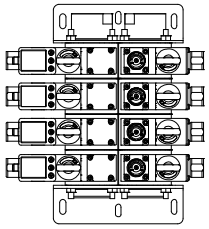
*1: ISO228 equivaient

Supply unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

*: The supply unit is not suitable for the flow switch.
*: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate and stopping the flow rate.
*: The stop valve of this product is not suitable for adjusting the flow rate.

Main piping

B	D	U
U side: Open	U side: Close	U side: Open
		
D side: Open	D side: Open	D side: Close

U side: UP, D side: DOWN
*: The port size for opening is 1 inch.

Return unit flow switch unit specification: Refer to Table 2

Lead wire for return unit flow switch/Option

Symbol	Content
Nil	With lead wire with M8 connector (3 m)
N	Without lead wire with M8 connector
Q	With M12-M8 conversion lead wire (0.1 m) *3

*3: Cable with M12 connector (3 m) is also available.
Please refer to the SMC web catalogue for details.
*: Lead wire for the flow switch is included.

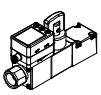
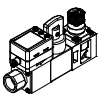
Return unit flow switch output specification: Refer to Table 1

Port size

Symbol	Port size	Rated flow range (Flow range)		
		04	20	40
03	3/8	●	△ *2	-
04	1/2	-	●	△ *2
06	3/4	-	-	●

*2: Made to Order.

Return unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

*: A flow switch is mounted to the return unit.
(The figures show some examples of the integrated type.)
*: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate and stopping the flow rate.
*: The stop valve of this product is not suitable for adjusting the flow rate.

Rated flow range (Flow range)

Symbol	Rated flow range (Flow range)
04	0.5 to 4 L/min
20	2 to 16 L/min
40	5 to 40 L/min

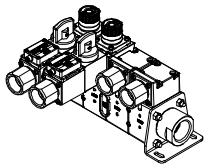
Return unit flow switch type

5	7
Remote sensor	Integrated display type
	

●Integrated type: Straight type

PF3WC □ □ □ – □ □ □ □ – □ – □ □ – □

Integrated type (straight type)



Arrangement

Symbol	Station	Rated flow range (Flow range)		
		04	20	40
01	1 station	●	●	●
02	2 stations	●	●	●
03	3 stations	●	●	●
04	4 stations	●	●	●
05	5 stations	●	●	●

Main piping/Attachment thread type

Symbol	Content
Nil	Rc
N	NPT
F	G*1

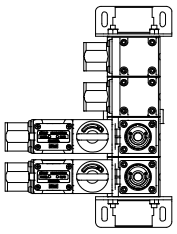
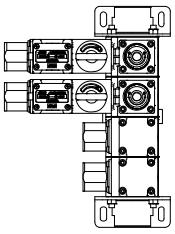
*1: ISO228 equivaient

Supply unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

*: The supply unit is not suitable for the flow switch.
*: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate and stopping the flow rate.
*: The stop valve of this product is not suitable for adjusting the flow rate.

Layout

D	U
U side: Open Supply unit	U side: Open Return unit
	
D side: Open Return unit	D side: Open Supply unit

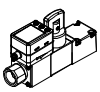
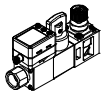
U side: UP, D side: DOWN
*: Port size is 1 inch.

Port size

Symbol	Port size	Rated flow range (Flow range)		
		04	20	40
03	3/8	●	△*2	-
04	1/2	-	●	△*2
06	3/4	-	-	●

*2: Made to Order.

Return unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

*: A flow switch is mounted to the return unit.
(The figures show some examples of the integrated type.)
*: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate and stopping the flow rate.
*: The stop valve of this product is not suitable for adjusting the flow rate.

Rated flow range (Flow range)

Symbol	Rated flow range (Flow range)
04	0.5 to 4 L/min
20	2 to 16 L/min
40	5 to 40 L/min

Return unit flow switch type

5	7
Remote sensor	Integrated display type
	

Return unit flow switch
unit specification: Refer to Table 2

Lead wire for return unit flow switch/Option

Symbol	Content
Nil	With lead wire with M8 connector (3 m)
N	Without lead wire with M8 connector
Q	With M12-M8 conversion lead wire (0.1 m)*3

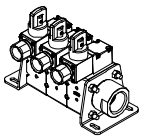
*3: Cable with M12 connector (3 m) is also available.
Please refer to the SMC web catalogue for details.
*: Lead wire for the flow switch is included.

Return unit flow switch
output specification: Refer to Table 1

●Remote type: Supply type

PF3WS □ □ □ – □ □ – □

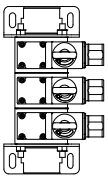
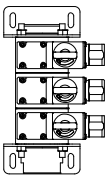
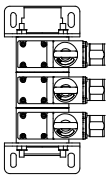
Remote type (supply type)



Arrangement

Symbol	Station	Rated flow range (Flow range)		
		04	20	40
01	1 station	●	●	●
02	2 stations	●	●	●
03	3 stations	●	●	●
04	4 stations	●	●	●
05	5 stations	●	●	●
06	6 stations	●	●	-
07	7 stations	●	●	-
08	8 stations	●	●	-
09	9 stations	●	●	-
10	10 stations	●	●	-

Main piping

B	D	U
U side: Open	U side: Close	U side: Open
		
D side: Open	D side: Open	D side: Close

U side: UP, D side: DOWN

∗: The port size for opening is 1 inch.

Port size

Symbol	Port size	Rated flow range (Flow range)		
		04	20	40
03	3/8	●	△ ∗2	-
04	1/2	-	●	△ ∗2
06	3/4	-	-	●

∗2: Made to Order.

Rated flow range (Flow range)

Symbol	Rated flow range (Flow range)
04	0.5 to 4 L/min
20	2 to 16 L/min
40	5 to 40 L/min

Supply unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

∗: The supply unit is not suitable for the flow switch.

∗: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate and stopping the flow rate.

∗: The stop valve of this product is not suitable for adjusting the flow rate.

Main piping/Attachment thread type

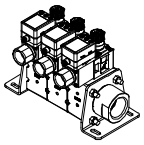
Symbol	Content
Nil	Rc
N	NPT
F	G∗1

∗1: ISO228 equivaient

●Remote type: Return type

PF3WR □ □ □ – □ □ □ – □ – □ □ – □

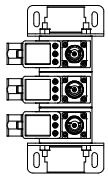
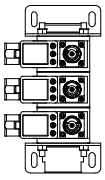
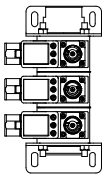
Remote type (return type)



Arrangement

Symbol	Station	Rated flow range (Flow range)		
		04	20	40
01	1 station	●	●	●
02	2 stations	●	●	●
03	3 stations	●	●	●
04	4 stations	●	●	●
05	5 stations	●	●	●
06	6 stations	●	●	-
07	7 stations	●	●	-
08	8 stations	●	●	-
09	9 stations	●	●	-
10	10 stations	●	●	-

Main piping

B	D	U
U side: Open	U side: Close	U side: Open
		
D side: Open	D side: Open	D side: Close

U side: UP, D side: DOWN

∗: The port size for opening is 1 inch.

Main piping/Attachment thread type

Symbol	Content
Nil	Rc
N	NPT
F	G∗1

∗1: ISO228 equivaient

Rated flow range (Flow range)

Symbol	Rated flow range (Flow range)
04	0.5 to 4 L/min
20	2 to 16 L/min
40	5 to 40 L/min

Return unit flow switch type

5	7
Remote sensor	Integrated display type
	

Flow switch unit specification:
Refer to Table 2

Lead wire for return unit flow switch/Option

Symbol	Content
Nil	With lead wire with M8 connector (3 m)
N	Without lead wire with M8 connector
Q	With M12-M8 conversion lead wire (0.1 m)∗3

∗3: Cable with M12 connector (3 m) is also available.
Please refer to the SMC web catalogue for details.

∗: Lead wire for the flow switch is included.

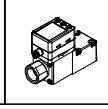
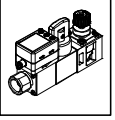
Flow switch output specification:
Refer to Table 1

Port size

Symbol	Port size	Rated flow range (Flow range)		
		04	20	40
03	3/8	●	△∗2	-
04	1/2	-	●	△∗2
06	3/4	-	-	●

∗2: Made to Order.

Return unit construction

Symbol	Nil	S	P	W
Flow adjustmet	-	●	-	●
Stop valve	-	-	●	●
				

∗: A flow switch is mounted to the return unit.
(The figures show some examples of the integrated type.)

∗: This flow adjustment valve is not suitable for applications which equire constant adjustment of flow rate and stopping the flow rate.

∗: The stop valve of this product is not suitable for adjusting the flow rate.

Table 1. Return unit flow switch output specification

Type	Symbol	OUT1	OUT2		Temp. sensor
		Flow rate	Flow rate	Temp.	
Remote sensor	1	Analogue 1 to 5 V	–	–	None
	2	Analogue 4 to 20 mA	–	–	
	1T	Analogue 1 to 5 V	–	Analogue 1 to 5 V	With temp. sensor
	2T *1	Analogue 4 to 20 mA	–	Analogue 4 to 20 mA	
Integrated display type	A	NPN	NPN	–	None
	B	PNP	PNP	–	
	C	NPN	Analogue 1 to 5 V	–	
	D	NPN	Analogue 4 to 20 mA	–	
	E	PNP	Analogue 1 to 5 V	–	
	F	PNP	Analogue 4 to 20 mA	–	
	G *1	NPN	External input *2	–	
	H *1	PNP	External input *2	–	
	AT	NPN	(NPN) ⇔ *3 NPN		With temp. sensor
	BT	PNP	(PNP) ⇔ *3 PNP		
	CT	NPN	(Analogue 1 to 5 V) ⇔ *3 Analogue 1 to 5 V		
	DT	NPN	(Analogue 4 to 20 mA) ⇔ *3 Analogue 4 to 20 mA		
	ET	PNP	(Analogue 1 to 5 V) ⇔ *3 Analogue 1 to 5 V		
	FT	PNP	(Analogue 4 to 20 mA) ⇔ *3 Analogue 4 to 20 mA		

∗: When the remote sensor and remove type monitor are combined (PF3W3 series), select the flow rate with analogue output 1 to 5 V (When the output signal is “1”, select “1T”).

Type	Symbol	OUT1	OUT2	Temp. sensor
		Flow rate/temp. *5	Flow rate/temp. *5	
Integrated display type (IO-Link compliant *4)	L *1	IO-Link/switch output (N/P)	–	None
	L2 *1	IO-Link/switch output (N/P)	Switch output (N/P)	
	LT	IO-Link/switch output (N/P)	–	With temp. sensor
	L2T *1	IO-Link/switch output (N/P)	Switch output (N/P)	

∗1: Made to Order.

∗2: External input: resets the accumulated value, peak value and bottom value.

∗3: When the temperature sensor is equipped, either of temperature output or flow rate output can be selected only for OUT2. The default setting is temperature output.

∗4: IO-Link is only available in the display integrated type.

∗5: When “without temperature sensor (symbol: “L”, “L2”) is selected, temperature output and setting cannot be performed.

Table 2. Return unit flow switch unit specification

Type	Symbol	Instantaneous flow	Accumulated flow	Temp.
Remote sensor	Nil	L/min	–	°C
	G *1	L/min (gal/min)	–	°C (°F)
Integrated display type	M	L/min	L	°C
	G *1	gal/min	gal	°C
	F *1	gal/min	gal	°F
	J *1	L/min	L	°F
Integrated display type (IO-Link compatible)	Nil*1	gal/min	gal	°C
	M	L/min	L	°C

*: In accordance with the New Weights and Measures Act, use of the unit conversion function is not permitted in products for use in Japan.

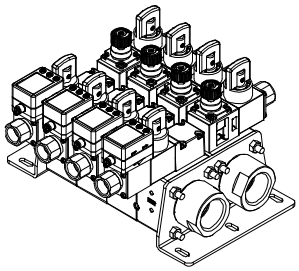
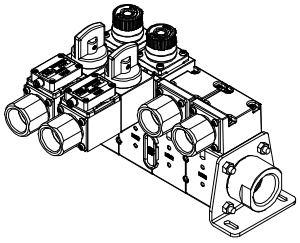
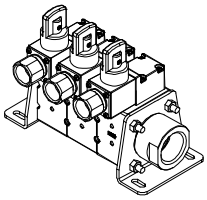
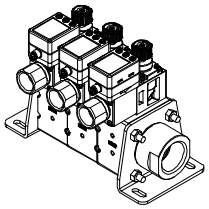
- Remote sensor: [Nil]
- Integrated display type: [M]
- Integrated display type (IO-Link compatible): [M]

Reference: 1 [L/min] ⇔ 0.2642 [gal/min], 1 [gal/min] ⇔ 3.785 [L/min]

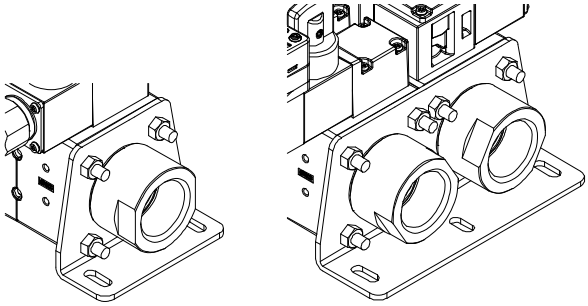
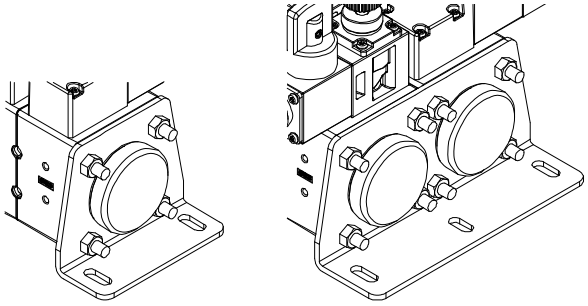
°F = 9/5 °C + 32

*1: Made to Order.

Manifold type

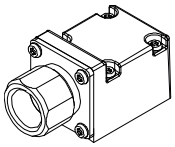
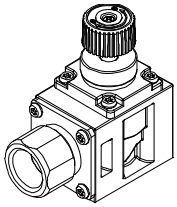
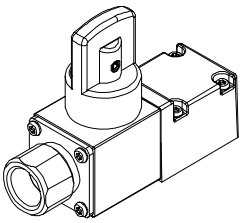
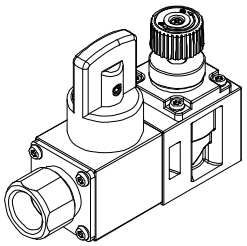
B	C	S	R
Integrated type (Basic type) 	Integrated type (Straight type) 	Remote type (Supply type) 	Remote type (Return type) 

Main piping

B/D/U	D/U
Open 	Close 

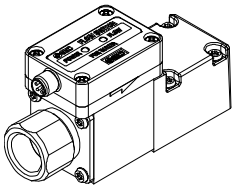
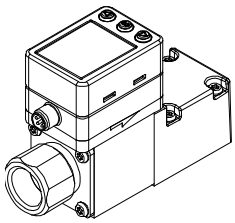
∗: Manifold type: C is not applicable to “close”.

Supply unit (manifold type: B/C/S)
Unit construction

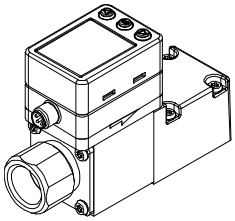
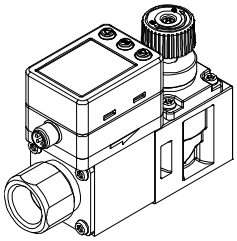
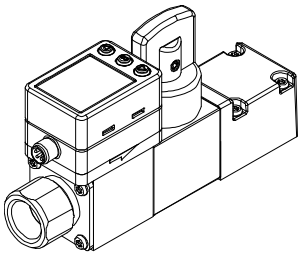
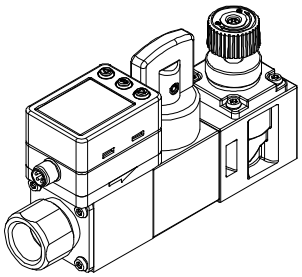
Nil	S	P	W
Attachment only 	With flow adjustment valve 	Stop valve 	With flow adjustment valve/ stop valve 

∗: Supply unit is not applicable to the flow switch.

Return unit (manifold type: B/C/R)
Flow switch type

5	7
Remote sensor	Integrated display type
	

Unit construction

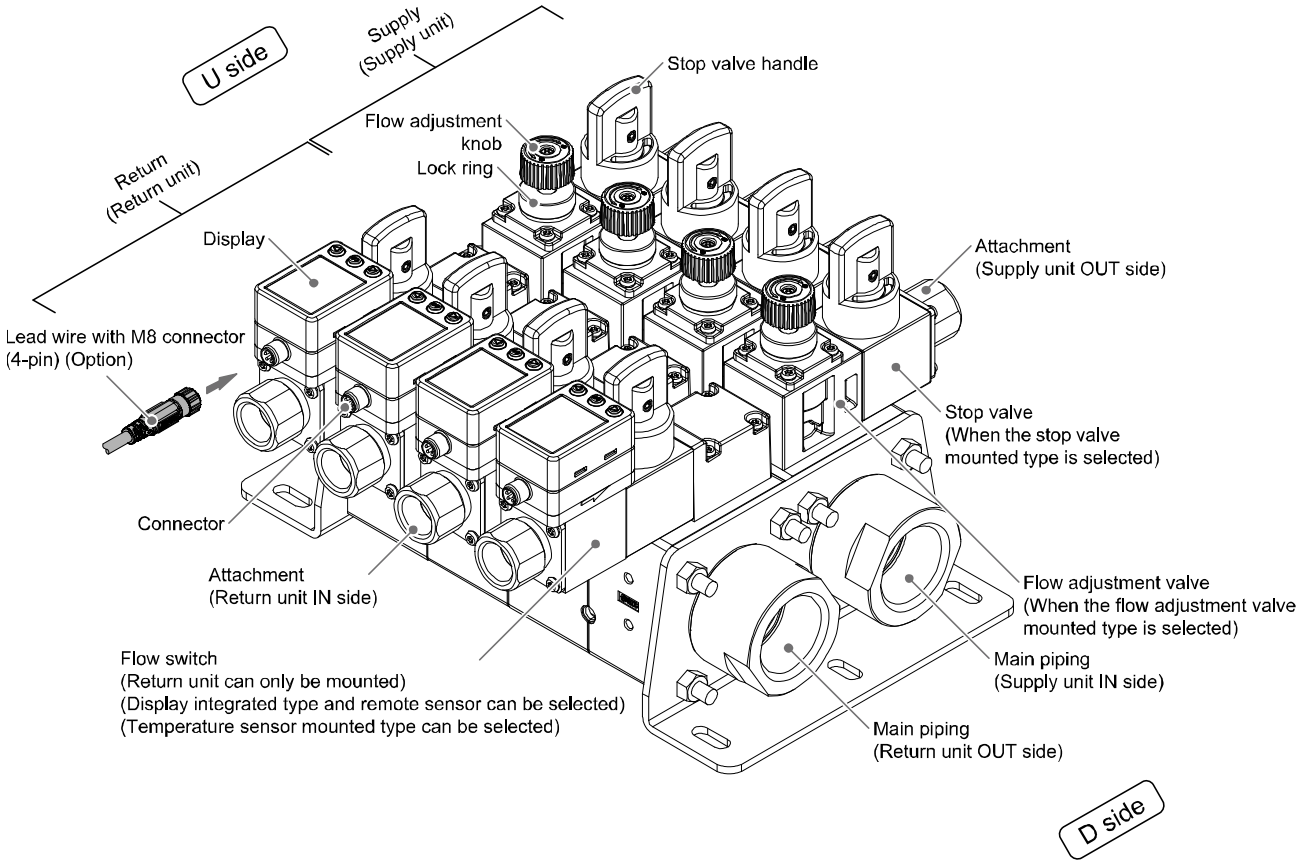
無記号	S	P	W
Attachment only	With flow adjustment valve	Stop valve	With flow adjustment valve/ stop valve
			

∗: When the display integrated type is mounted.

Options/Part number
If an option is required independently, order using the following part number.

Option	Part number	Remarks
Lead wire with M8 connector	ZS-40-A	Lead wire length: 3 m
Lead wire with M12-M8 connector	ZS-40-M12M8-A	Lead wire length: 0.1 m

Summary of Product parts



∗: The figure is the PF3WB series.
The summary of product parts of the PF3WC/S/R series do not change.

Element	Description
Supply (Supply unit)	This unit supplies the fluid from the supply side main piping to the application. Flow adjustment valve and stop valve can be combined to compose the of the equipment. ∗: The supply unit is not suitable for the flow switch.
Return (Return unit)	This unit returns the fluid exhausted from the application. Flow adjustment valve and stop valve can be combined to compose the of the equipment.
Flow switch	This switch displays or outputs the flow rate when flow is applied. ∗: Applicable to integrated display type/remote sensor type. (Temp. sensor mounted type can be selected) ∗: IO-Link compatible (Integrated display type only) ∗: Cannot be used for the supply unit.
Display	For the integrated display type, it displays flow rate, set value and errors. For the remote type, POWER indicator and FLOW indicator are mounted. For display, refer to Operation Manual from the SMC website. (Display integrated type: PF3W7, remote sensor type sensor: PF3W5)
Connector	This connects the lead wires. As for the connector pin numbers (on the product), refer to Operation Manual from the SMC website. (Display integrated type: PF3W7, remote sensor type sensor: PF3W5)
Lead wire with M8 connector	Lead wire for supply power to and obtaining output from the flow switch
Flow adjustment value	Orifice mechanism to adjust the flow rate. ∗: This flow adjustment valve is not suitable for applications which require constant adjustment of flow rate. ∗: This product is not suitable for stopping the flow rate. ∗: Applicable to supply/return unit.
Flow adjustment knob	This knob is for adjusting the flow rate.
Lock ring	This is used for holding the flow adjustment valve.
Stop valve	This is the mechanism part for stopping the flow rate. ∗: Not suitable for adjusting the flow rate. ∗: Applicable to supply/return unit.
Stop valve handle	This handle is for stopping the flow rate. When the handle is rotated by 90°, it is possible to stop the flow rate.
Attachment	This connects the piping of the supply/return units.
Main piping	This connects the piping of the manifold body. Open or close cannot be selected. ∗: PF3WC series is not applicable to “Close”. ∗: It is not possible to change the main piping after order.

■Definition and terminology

	Terms	Meaning
A	Accumulated flow (Integrated display type)	The total amount of fluid that has passed through the device. If an instantaneous flow of 10 L/min continues for 5 minutes, the accumulated flow will be 10 × 5 = 50 L.
	Accumulated flow external reset (Integrated display type)	A function to reset the accumulated flow to zero by using an external signal.
	Accumulated pulse output (Integrated display type)	A type of output where a pulse is generated every time a predefined accumulated flow passes. It is possible to calculate the total accumulated flow by counting the pulses.
	Analogue output	Outputs a value proportional to the flow rate. When the analogue output is in the range 1 to 5 V, it will vary between 1 to 5 V according to the rate of flow. The same for analogue output of 4 to 20 mA.
	Attachment	This metal parts connects the piping of the supply/return units.
C	Cavitation	A phenomenon that may occur in a fluid moving at high speed. In the parts of the fluid where the pressure is low, vapour bubbles form and then rapidly collapse. If cavitation is present for a prolonged period, exposed surfaces will be damaged; this is called cavitation damage or erosion.
	Chattering (Integrated display type)	The problem of the switch output turning ON and OFF repeatedly around the set value at high frequency due to the effect of pulsation.
D	Delay time (Integrated display type: IO-Link)	The time from when the flow rate applied to the flow switch reaches the set value, to when the ON-OFF output actually begins working. Setting the Delay time can prevent the output from chattering.
	Digital filter (Integrated display type: IO-Link)	Function to add digital filtering to the fluctuation of flow rate value. Smooth the fluctuation of displayed value for sharp start up or fall of the flow rate. When the function is valid, digital filtering is reflected to the ON/OF F of the switch output. Output chattering or flicker in the measurement mode display can be reduced by setting the digital filter. The time indicates when the set value is 90% in relation to the step input.
	Display flow range (Integrated display type)	The range of measured values that can be displayed for a product with a digital display.
F	FLOW indicator (Remote sensor)	This indicator visually detects the flow condition. The higher the flow rate, the faster the flashing speed. (This might display errors.)
	Fluid temp.	Range of fluid temp. that can be measured by the product.
	F.S. (Full span, Full scale)	Stands for "full span" or "full scale", and indicates varied display value and analogue output range at rated value. For example, when analogue output is 1 to 5 V, F.S. = 5[V] - 1[V] = 4[V], (ref. 1%F.S. = 4[V] x 1% = 0.04[V])
H	Holding of accumulated flow (Integrated display type)	A function to store the accumulated flow value in the product's internal memory. The flow value will be stored at a set time interval of either 2 or 5 minutes. When the power supply is turned on, the stored accumulated flow value will be displayed and accumulated flow will continue from that point.
	Hysteresis (Integrated display type)	The difference between ON and OFF points used to prevent chattering. Hysteresis can be effective in avoiding the effects of pulsation.
	Hysteresis mode (Integrated display type)	Mode where the switch output will turn ON when the flow is greater than the set value, and will turn off when the flow falls below (set value – hysteresis value).
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.
	Internal voltage drop (Integrated display type)	The voltage drop across the product (and therefore not applied to the load), when the switch output is ON. The voltage drop will vary with load current, and ideally should be 0 V.

	Terms	Meaning
K	Karman vortex	When an object is placed in a fluid stream, a vortex will be created in the fluid on the downstream side. This vortex is called a Karman vortex. The frequency at which the vortices are generated is proportional to the fluid velocity, therefore it is possible to calculate the fluid flow rate by measuring the Karman vortex frequency.
	Key-lock function (Integrated display type)	This function prevents the set value from being changed by mishandling.
M	Main piping	This metal part connects the piping of the manifold body.
	Measured fluid	The fluid(s) that the product can measure.
	Min. setting unit (Integrated display type)	This shows the resolution of set and display values. If the minimum setting unit is 0.01 L/min, the display will change in 0.01 L/min steps, e.g. 0.50…..0.51…..0.52 L/min.
O	Operating humidity range	Humidity range in which the product can operate.
	Operating pressure range	Pressure range in which product is operable.
	Operating temp. range	Ambient temp. range in which product is operable.
P	Part in contact with fluid (wetted part)	A part that comes into physical contact with the fluid.
	POWER indicator (Remote sensor)	This indicator confirms for application of the power supply. This lights up when the power is supplied. (Output specification identification and errors might be displayed immediately after the power is supplied.) Remote sensor
	Pressure characteristics	Indicates the change in the display value and analogue output when fluid pressure changes.
	Proof pressure	Burst pressure at which the product is electrically or mechanically damaged.
R	Rated flow range	The flow range within which the product will meet all published specifications.
	Rated pressure range	The pressure range that satisfies the specifications.
	Repeatability	Reproducibility of the display or analogue output value, when the measured quantity is repeatedly increased and decreased.
	Response time	Integrated display type: Time from when the target flow is applied until the flow reaches 90% of the set value. Remote type sensor: Time from when the target flow is applied until the analogue output reaches 90% of the set value.
S	Set flow range (Integrated display type)	The range of ON/OFF threshold values that can be set for those products with a switch output.
	Switch output (Integrated display type)	Output type that has only 2 conditions, ON or OFF. When in the ON condition an indicator light will show, and any connected load will be powered. When in the OFF condition, there will be no indicator light and no power supplied to the load.
T	Temp. characteristics	Indicates the change in the display value and analogue output caused by ambient temp. changes.
U	Unit selection function (Integrated display type)	A function to select display units other than the international unit (SI unit) specified in the new Japanese measurement law. Flow can only be displayed by SI units in Japan.
W	Water hammer	A momentary steep pressure increase due the spread of pressure by closing a contactor such as a valve for an extremely short time while there is a flow. This pressure increase is known as water hammer or impact pressure.
	Window comparator mode (Integrated display type)	An operating mode in which the switch output is turned on and off depending on whether the flow is inside or outside the range of two set values.

Mounting and Installation

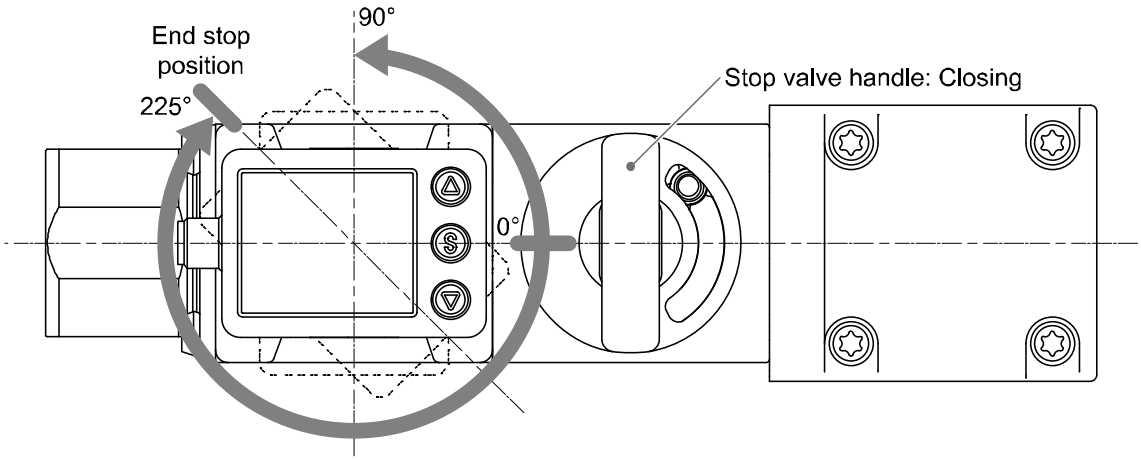
Installation

- Use the product within the specified operating pressure and temperature range.
- Proof pressure could vary according to the fluid temperature. Check the characteristics data for operating pressure and proof pressure.

Mounting

- Never mount the product in a place that will be used as a scaffold during piping.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the flow switch.
- Check the flow characteristics data for pressure loss and the straight inlet pipe length effect on accuracy (page 61), to determine inlet piping requirements.
- Do not sharply reduce the piping size.
- The monitor with integrated display can be rotated **only for flow range: 40 (5 to 40 L/min)**. It can be set at 90° intervals clock and anticlockwise, and also at 45° and 225° clockwise. Rotating the display with excessive force will damage the end stop.

●Integrated display type Monitor rotation diagram

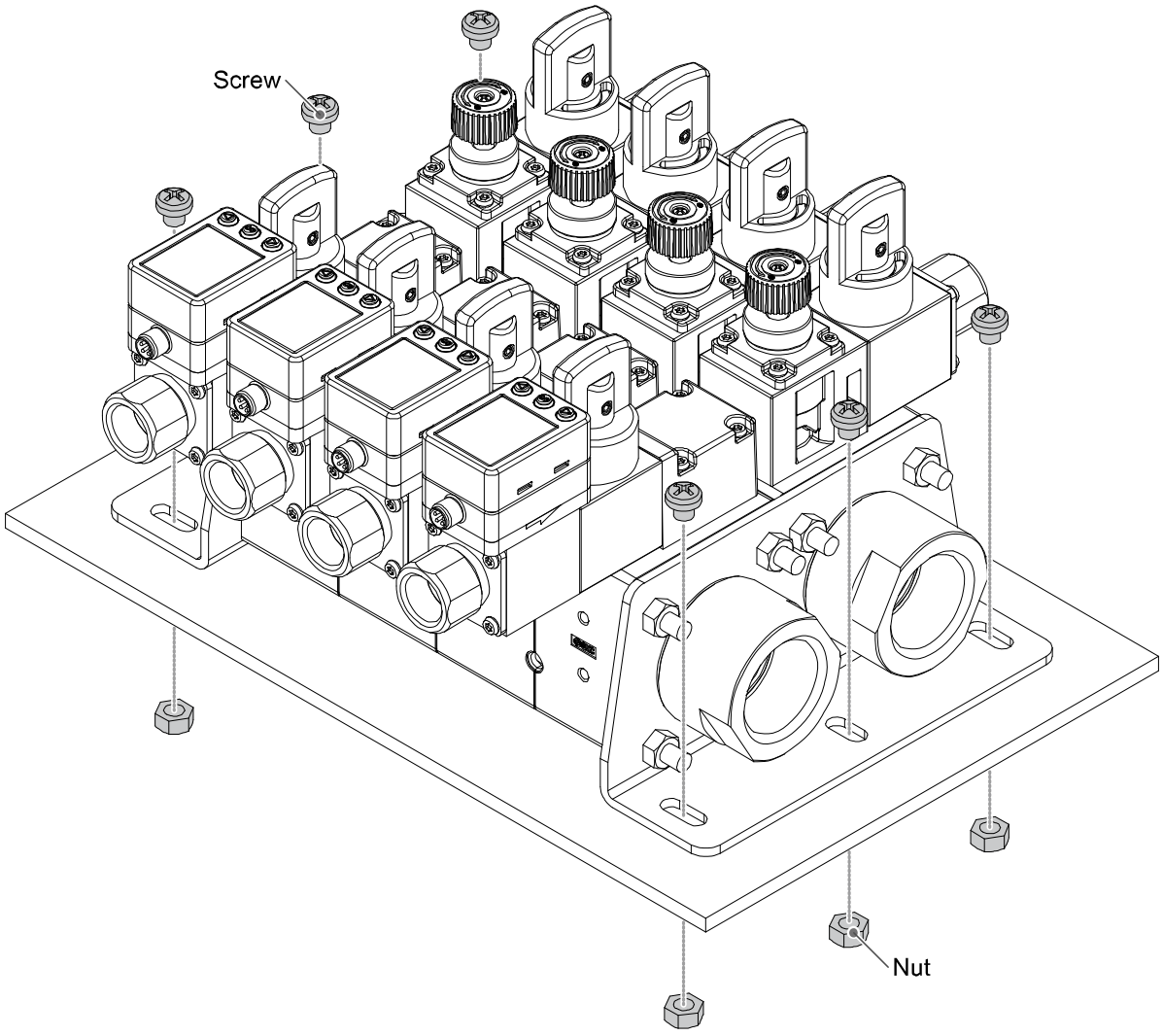


■Installation

Direct mounting (PF3W704/720/740)

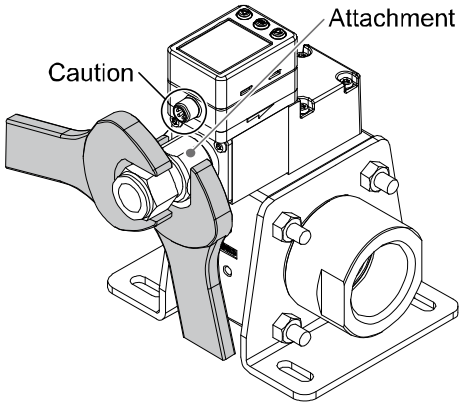
- When mounting the product, mount it to the main piping with screws using the mounting holes (equivalent to M6).
- Mounting plate thickness is approximately 3 mm.
- Screws and nuts are prepared by the user.
- Refer to Dimensions (page 63) for the dimensions of the mounting part.

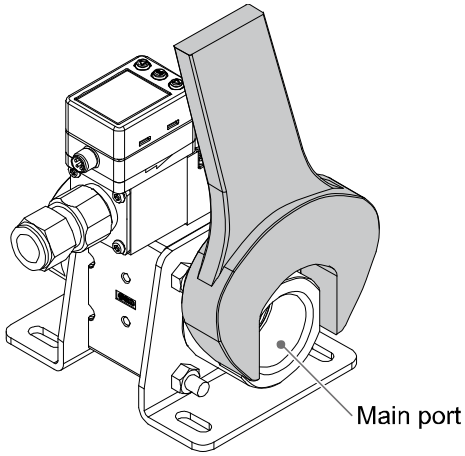
Product number	Manifold type	Qty
PF3WB	Integrated type: Basic type	6
PF3WC	Integrated type: Straight type	4
PF3WS	Remote type: Supply type	4
PF3WR	Remote type: Return type	4



■Piping

For piping of the product, hold the piping with a wrench on the metal part of the piping (piping attachment and main port of the main piping), which is integrated to the piping.
Use a wrench on other parts may damage the product.
Specifically, make sure that the spanner does not damage the M8 connector.
The connector can be easily damaged.





Width across flats of attachment

3/8	20.9 mm
1/2	23.9 mm
3/4	29.9 mm

With across flats of the main port

1	41 mm

After hand tightening, tighten the hexagon head bolt 2 to 3 rotations by using a spanner.
Refer to the table below for the tightening torque.

Nominal thread size	Tightening torque
Rc(NPT)3/8	15 to 20 N•m
Rc(NPT)1/2	20 to 25 N•m
Rc(NPT)3/4	28 to 30 N•m
Rc(NPT)1	36 to 38 N•m

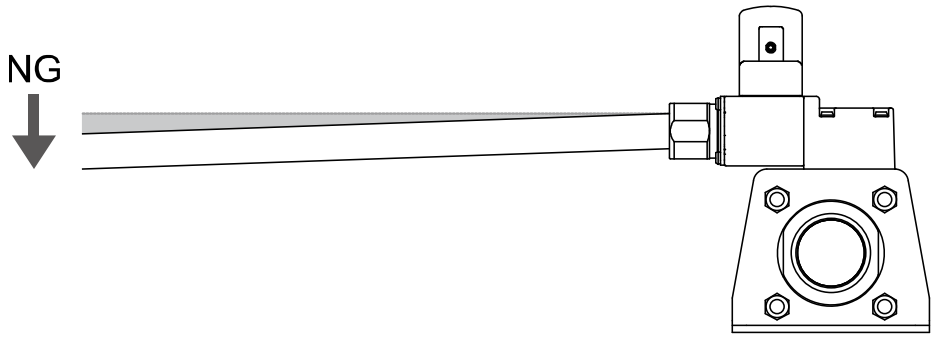
If the tightening torque is exceeded, the product can be broken. If the correct tightening torque is not applied, the fittings may become loose.

Avoid any sealing tape getting inside the piping.
Ensure there is no leakage from loose piping.

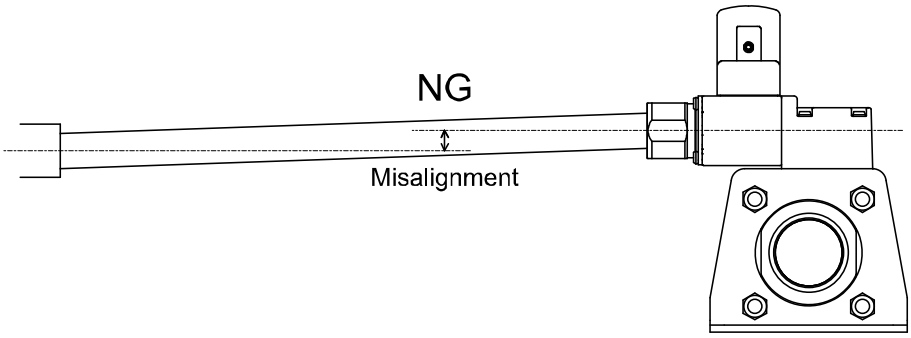
⚠ Caution

The product body is made of resin. The installation and piping of the product must satisfy the following requirements.
This may cause damage, breakage and/or water leakage of the product.

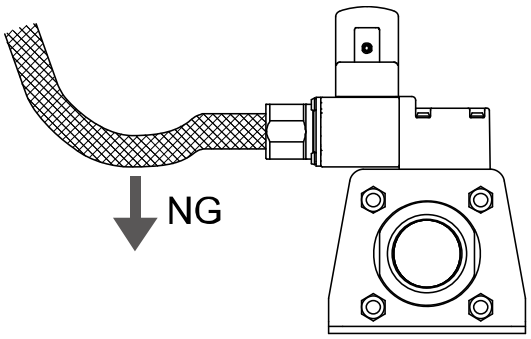
•No load should be directly applied to the product.



•Do not install piping to the product with a misalignment.
A permanent load will be applied to the product after piping.

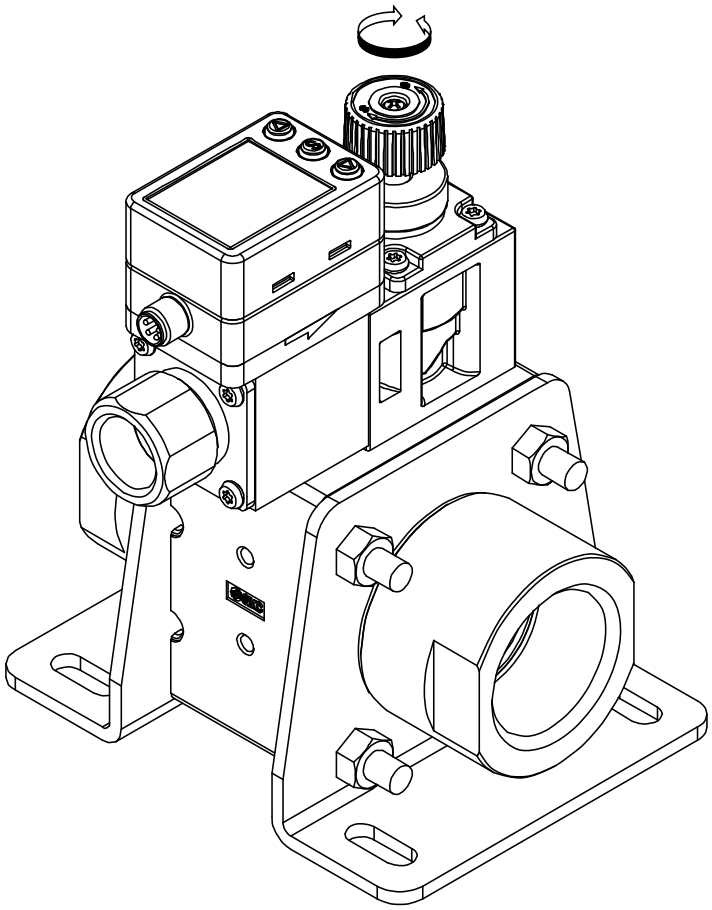


•When a flexible hose is used for the piping, the hose must be fixed with a bracket etc.
If it is not fixed, the load weight of the flexible hose and the fluid will be applied to the product.



How to adjust the flow rate (when a flow adjustment valve is mounted)

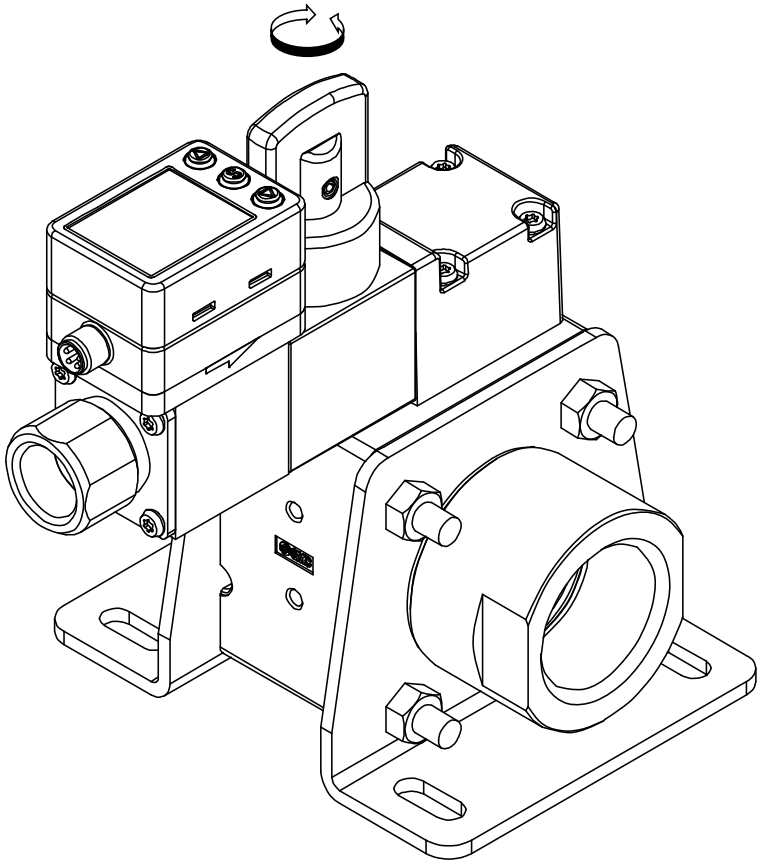
(1) Rotate the knob of the valve to adjust the flow rate to the target value.
(2) Be sure to confirm that there is no fluid leakage generated after adjustment.
(When fluid leakage is generated, open and close the valve several times for re-adjustment, and confirm that there is no fluid leakage.)
(3) Tighten the lock ring to fix the valve as necessary.



The flow adjustment valve is not designed for applications that require daily and repetitive adjustment.
If the valve is adjusted frequently, fluid may leak due to wear of the internal seal.

How to stop the flow (for stop valve)

(1) Rotate the handle by 90° to stop the flow.
(2) Check that there is no water leakage after stopping the flow.
(3) When holding the handle, screws need to be prepared by the user. Refer to the Operation Manual (page 11) for the applicable size and tightening torque.



When closing and opening are repeated frequently, water leakage may occur due to wear of the internal seals.

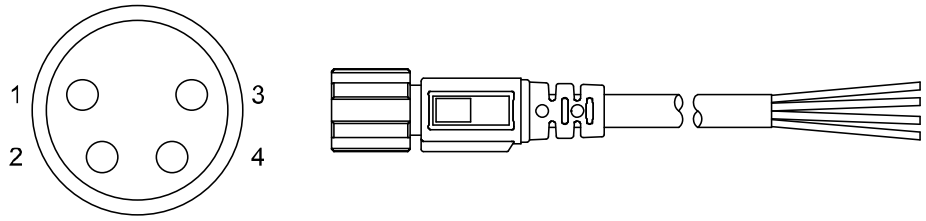
■Wiring

Wiring of connector

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

Use separate routes for the Flow switch wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.

Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply. When a switch-mode power supply is connected to the product, switching noise will be superimposed and the product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and ferrite core, between the switch-mode power supply and the product, or by using a series power supply instead of a switch-mode power supply.



Pin number of the connector
(On the lead wire)

Integrated display type (PF3W7)/Remote type sensor (PF3W5)

Pin No	Integrated display type (PF3W7)	Remote type sensor (PF3W5)	Lead wire colour
1	DC(+)	DC(+)	Brown
2	OUT2	N.C./temp. analogue output	White
3	DC(−)	DC(−)	Blue
4	OUT1	Flow rate analogue output	Black

When PF3W7 (IO-Link) is used

•SIO mode setting

Pin No	Name	Lead wire colour	Function
1	DC(+)	Brown	12 to 24 VDC
2	N.C./OUT2	White	Not connected/Switch output 2 (SIO)
3	DC(−)	Blue	0 V
4	OUT1	Black	Switch output 1

•IO-Link mode setting

Pin No	Name	Lead wire colour	Function
1	L+	Brown	18 to 30 VDC
2	N.C./OUT2	White	Not connected/Switch output 2 (SIO)
3	L−	Blue	0 V
4	C/Q	Black	Communication data (IO-Link)/Switch output 1 (SIO)

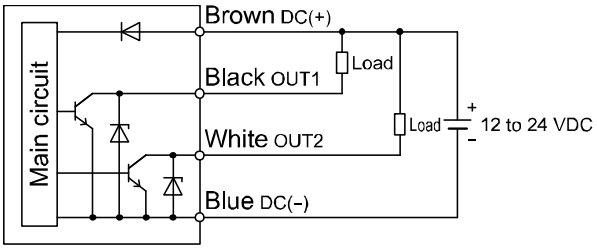
∗: When using the lead wire with M8 connector included with the PF3W7 series.

Tighten the connector by hand.

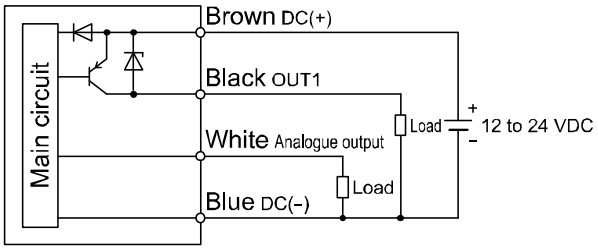
•Examples of Internal Circuit and Wiring

Integrated display type

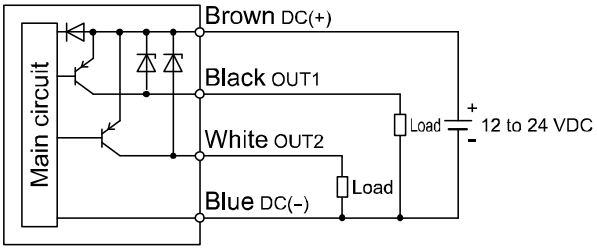
-A(T)
NPN (2 outputs)



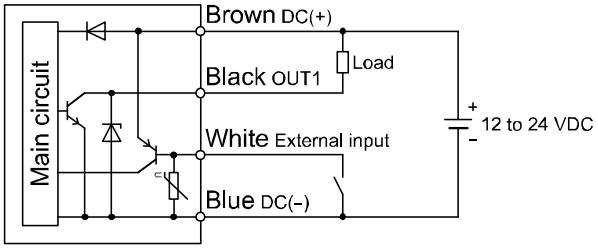
-E(T)/F(T)
E(T): PNP + Analogue voltage output
F(T): PNP + Analogue current output



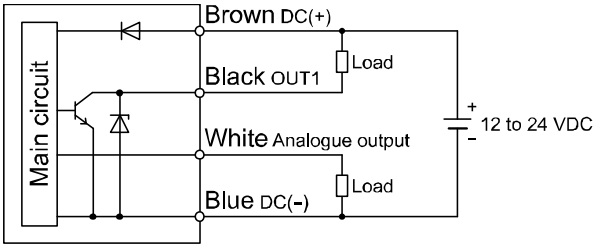
-B(T)
PNP (2 outputs)



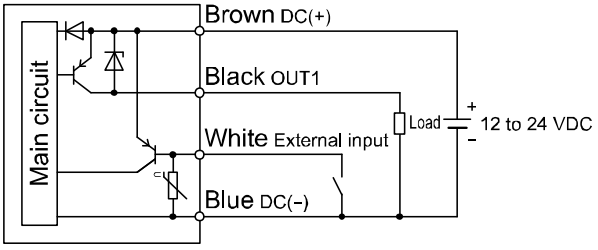
-G
NPN + External input



-C(T)/D(T)
C(T): NPN + Analogue voltage output
D(T): NPN + Analogue current output

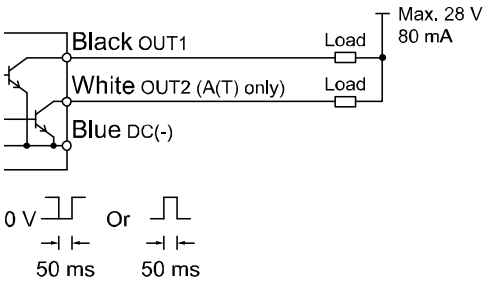


-H
PNP + External input

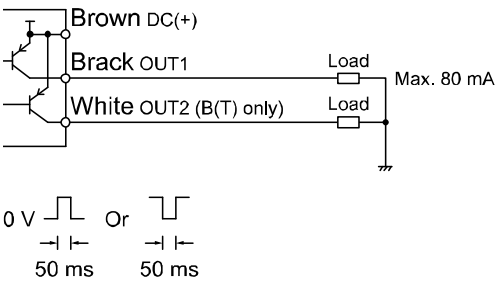


Example of wiring for accumulated pulse output

-A(T)/C(T)/D(T)/G
A(T): NPN (2 outputs)
C(T), D(T): NPN + Analogue output
G: NPN + External input



-B(T)/E(T)/F(T)/H
B(T): PNP (2 outputs)
E(T), F(T) : PNP + Analogue output
H: PNP + External input

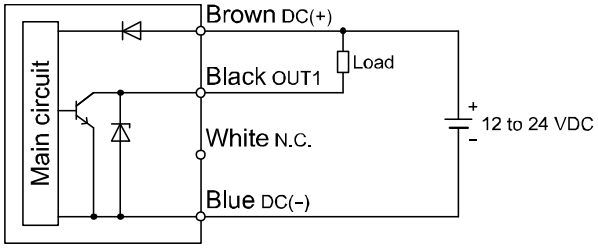


Integrated display type (IO-Link)

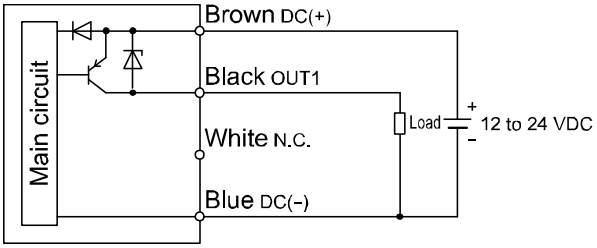
-L(T)

Using as a switch output (without using as an IO-Link = SIO mode)

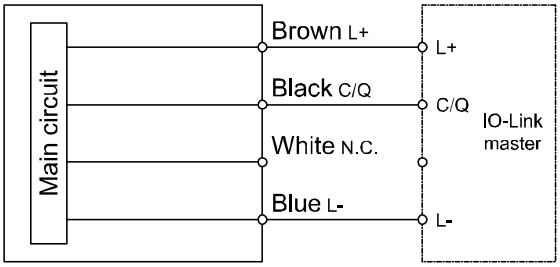
NPN setting



PNP setting



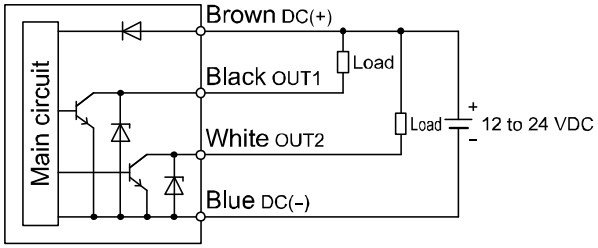
Used as IO-Link device



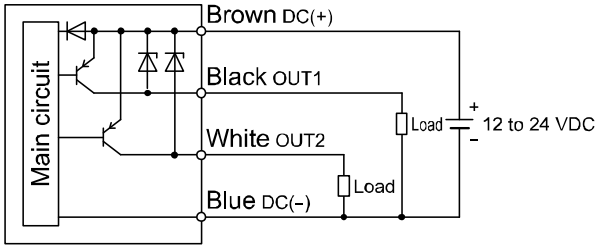
-L2(T)

Using as a switch output (without using as an IO-Link = SIO mode)

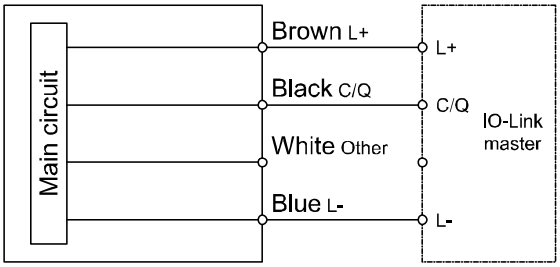
NPN setting



PNP setting



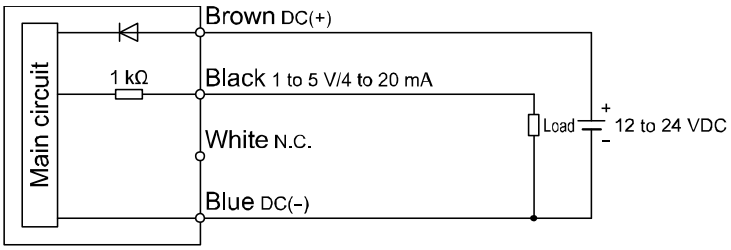
Used as IO-Link device



Remote sensor

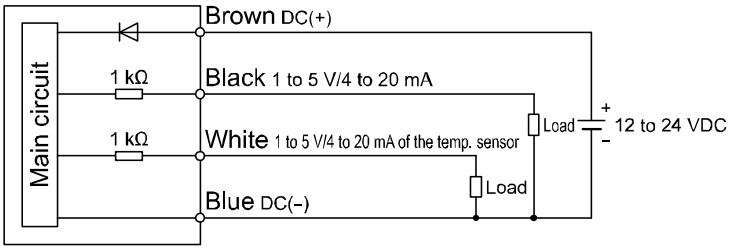
-1/2

1: Analogue voltage output
2: Analogue current output



-1T/2T

1T: Analogue voltage output (with temperature sensor output)
2T: Analogue current output (with temperature sensor output)



Other Settings

Refer to the operation manual, available from the SMC website (URL https://www.smcworld.com) for settings below.

- **Flow switch flow setting and functions**
  - Integrated display type: PF3W7
  - Integrated display type (IO-Link compatible): PF3W7-L
  - Remote type sensor: PF3W5

- **IO-Link function**
  - Integrated display type (IO-Link compatible): PF3W7-L

Maintenance

How to reset the product after a power cut or when the power has been unexpectedly removed
When the flow switch is the integrated display type, the condition before the power cut will be remained.
The output condition also recovers to that before the power cut or de-energizing, but may change depending on the operating environment.
Therefore, check the safety of the whole system before operating the product.

Disclaimer for Usage of the Replacement Unit

For the water manifold, a replacement unit is available in order to facilitate maintenance and repairs. Refer to the replacement manual (Document No. PF※※-PSY0047) for the replacement unit product numbers, replacement procedures, and instructions.
As the replacement unit is a replacement part for SMC's water manifold, it cannot be used in other products or applications. Therefore, use of parts in other products or applications after the disassembly and reassembly of the manifold when replacing the unit will render the warranty invalid.

Troubleshooting

If an operation failure of the product occurs, please confirm the cause of the troubles from the following table. If a cause applicable to the troubles 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 (installation etc). Please consult SMC.

Cross-reference for troubleshooting

Fault	Detail	Possible cause	Item to check	Recommended action
Incorrect display (Integrated display type)	No display	Incorrect wiring	Check if the brown wire DC(+) and blue wire DC(−) are connected correctly.	Correct the wiring.
		Loose connector	Check that the connector is connected.	Connect the connector.
	The display is unstable.	Foreign matter has entered or got stuck inside the flow passage of the sensor.	Confirm whether foreign matter may enter.	We recommend a filter with filtration of approx. 40 mesh.
		Piping is connected in the wrong direction.	Confirm whether the mounting direction of the product corresponds to the flow direction.	Make the mounting direction correspond to the flow direction.
		Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Pulsation in the flow.	Confirm whether the supply pressure fluctuates, or whether pulsation is generated due to the characteristics of the compressor or pump used as the pressure source.	Change to a pump that has less pulsation. Install a tank to reduce the pressure fluctuation. Change the piping to elastic piping such as rubber hose.
	Incorrect display	Foreign matter has entered or got stuck inside the flow passage of the sensor.	(1) Confirm whether foreign matter may enter. (2) Confirm whether any foreign matter has got stuck inside.	We recommend a filter with filtration of approx. 40 mesh. Remove foreign matter.
		Piping is connected in the wrong direction.	Confirm whether the mounting direction of the product corresponds to the flow direction.	Make the mounting direction correspond to the flow direction.
		Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Pulsation in the flow.	Check if there is supply pressure fluctuation or pressure pulsation due to the characteristics of the compressor or pump acting as the pressure source.	Change to a pump with less pulsation. Install a tank to reduce the pressure fluctuation. Change to elastic piping such as rubber hoses.
	Flow does not start.	The flow adjustment valve is closed.	Check the condition of the flow adjustment valve.	Open the flow adjustment valve to get appropriate flow.
		Stop valve is closed.	Check for the stop valve.	Open the stop valve.

Fault	Detail	Possible cause	Item to check	Recommended action
Incorrect display	Even though the flow rate is zero, it is displayed.	Operation of pump while the flow adjustment valve is closed.	Check the condition of the flow adjustment valve and pump.	Open the flow adjustment valve slightly, and let the pulsation (pressure) from the pump escape.
		Pumps are operated while the stop valve is closed.	Check the status of the stop valve and pump.	Open the stop valve slightly, and relieve the pulsation (pressure) from the pump.
Incorrect output	No output	Incorrect wiring	Check if the brown wire DC(+), blue wire DC(−), black wire(OUT1) and white wire(OUT2) are connected correctly.	Correct the wiring.
		Loose connector	Check that the connector is connected.	Connect the connector.
		The flow adjustment valve is closed.	Check the condition of the flow adjustment valve.	Open the flow adjustment valve to get appropriate flow.
		Stop valve is closed.	Check for the stop valve.	Open the stop valve.
	Output is unstable.	Foreign matter has entered or got stuck inside the flow passage of the sensor.	(1) Confirm whether foreign matter may enter. (2) Confirm whether any foreign matter has got stuck inside.	We recommend a filter with filtration of approx. 40 mesh. Remove foreign matter.
		Piping is connected in the wrong direction.	Confirm whether the mounting direction of the product corresponds to the flow direction.	Make the mounting direction correspond to the flow direction.
		Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Pulsation in the flow.	Confirm whether the supply pressure fluctuates, or whether pulsation is generated due to the characteristics of the compressor or pump used as the pressure source.	Change to a pump that has less pulsation. Install a tank to reduce the pressure fluctuation. Change the piping to elastic piping such as rubber hose.
		Liquid leakage	Check for liquid leaks due to insufficient tightening of the screw at the piping and/or improper sealing.	Tighten to the specified torque when piping and/or apply the seal tape once again.
		Noise	Confirm that there is no power line or high voltage line that can be a noise source in the wiring route.	Do not route wires and cables together with power or high voltage cables.
	Output is unstable. (Integrated display type)	Hysteresis value too low.	Confirm to what level the hysteresis is set.	Increase the hysteresis set value.
Push buttons not operating. (Integrated display type)	No reaction when the buttons are pressed.	Key-lock mode is activated.	Check if "LoC" displayed when the button is pressed.	Chancel the key-lock function. Please refer to the Operation Manual on the SMC website for the integrated display type PF3W7.

Fault	Detail	Possible cause	Item to check	Recommended action
Improper operation of the external input. (Integrated display type)	No reaction to the external Input.	Incorrect wiring	Check if the brown wire DC(+), blue wire DC(−), black wire(OUT1) and white wire(OUT2) are connected correctly.	Correct the wiring.
		The input duration is too short.	Confirm whether the input line is connected to GND for a minimum of 30 msec.	When the external input is applied, the input line must be connected to GND for a minimum of 30 msec.
Incorrect display (Remote sensor)	The indicator does not turn ON.	Incorrect wiring	Check if the brown wire DC(+) and blue wire DC(−) are connected correctly.	Correct the wiring.
	Flow indicator LED is unstable.	Foreign matter has entered or got stuck inside the flow passage of the sensor.	(1) Confirm whether foreign matter may enter. (2) Confirm whether any foreign matter has got stuck inside.	We recommend a filter with filtration of approx. 40 mesh. Remove foreign matter.
		Piping is connected in the wrong direction.	Confirm whether the mounting direction of the product corresponds to the flow direction.	Make the mounting direction correspond to the flow direction.
		Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Pulsation in the flow.	Confirm whether the supply pressure fluctuates, or whether pulsation is generated due to the characteristics of the compressor or pump used as the pressure source.	Change to a pump that has less pulsation. Install a tank to reduce the pressure fluctuation. Change the piping to elastic piping such as rubber hose.
		Noise	Confirm that there is no power line or high voltage line that can be a noise source in the wiring route.	Do not route wires and cables together with power or high voltage cables.
Incorrect temp. sensor displays. (Integrated display type)	The temp. is not displayed.	Setting condition of the sub screen	Check the content of the sub screen.	Set the sub screen to the temp. display. Please refer to the Operation Manual on the SMC website for the integrated display type PF3W7.
		Connector loose	Check that the connector is connected.	Connect the connector.
	Incorrect display	Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Foreign matter	Check if foreign matter is stuck to the sensor.	Remove foreign matter.

Fault	Detail	Possible cause	Item to check	Recommended action
Incorrect temp. sensor output.	Output is unstable.	Insufficient water supply	Confirm whether the fluid path is full.	Fill up the fluid path.
		Foreign matter	Check if foreign matter is stuck to the sensor.	Remove foreign matter.
Improper operation of the flow adjustment valve.	It is not possible to adjust with flow adjustment valve.	Lock the flow adjustment valve	Check the condition of the flow adjustment valve and its lock ring.	Loose the lock ring and adjust flow rate. (page 28.)
		Insufficient supply pressure	Check flow rate characteristics of the supply pressure and flow rate adjustment valve.	Increase supply pressure.
Stop valve fails.	Stop valve does not stop the flow rate.	Stop valve is locked.	Check for the screw mounted for holding the handle.	Stop the flow rate by loosening the screw.
		Foreign matter	Check that foreign matter is not stuck to the stop valve.	Remove foreign matter.

○Troubleshooting list (IO-Link communication)

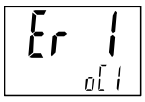
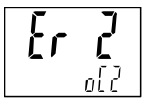
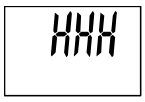
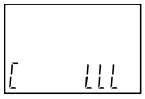
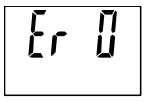
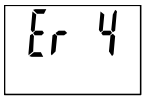
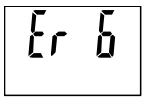
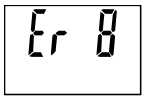
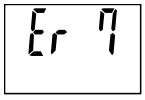
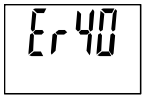
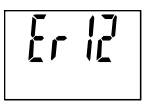
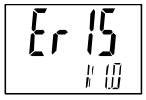
Problem	Description	Problem possible causes	Investigation method	Countermeasures
IO-Link indicator light : OFF	–	incorrect wiring	Check the connection of the connector.	Correct the cable wiring.
		Power supply error from the IO-Link master	Check the power supply voltage from the IO-Link master.	Supply 18 to 30 VDC to the IO-Link master.
IO-Link indicator light : Flashing	ModE ***	Communication is not established. IO-Link wiring failure	Check the connection and cable condition of the IO-Link cable.	Additionally tighten the IO-Link cable. (Replace the cable if it is broken.)
IO-Link indicator light : Flashing	Er 15 V 1.0	IO-Link master and product version are not matched.	Check the IO-Link version of the master and device.	Align the master IO-Link version to the device. *1
	ModE Strt ModE PrE	Communication mode is not transferred to the Operation mode.	Check the setting of the data storage access lock and data storage backup level of the master.	Release the data storage access lock. Or deactivate the setting of the data storage backup level of the master port.
	ModE LoC	Backup and restore required during data storage lock	Check the data storage lock.	Release the data storage lock.
Data is swapped by byte.	–	Program data assignment is incorrect.	Check that the Endian type on the master upper level communication transmission format is Big Endian type or Little Endian type.	Assign the program data based on the Endian type of the transmission format of the master upper level communication. Or set to the master byte swap setting.

*1: When the product is connected to the master with version "V1.0", error Er15 is generated.

○Error indication function

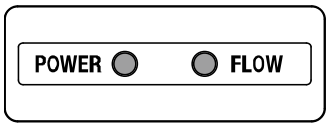
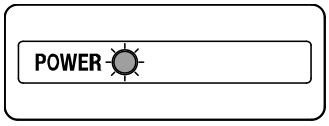
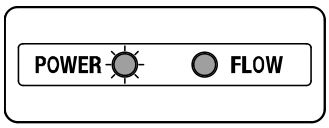
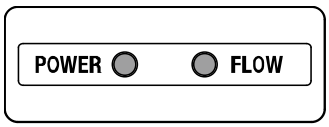
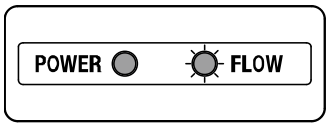
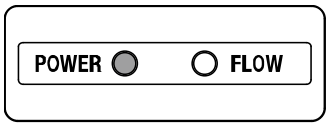
This function is to display error location and content when a problem or error has occurred.

•Integrated display type

Error	Error displayed	Description	Measures
OUT1 over current error		A load current applied to the switch output has exceeded the max. value (OUT1).	Turn the power off and remove the cause of the over current. Then turn the power on again.
OUT2 over current error		A load current applied to the switch output has exceeded the max. value (OUT2).	
Excessive instantaneous flow		The applied flow rate is above approx. 140% of maximum rated flow.	Reset applied flow to a level within the display range.
Excessive accumulated flow		The accumulated flow range is exceeded. (The decimal point position changes depending on the flow range.)	Reset the accumulated flow once. (Press the SET and DOWN button for 1 second or longer.)
Temp. upper limit exceeded		The fluid temp. is above 110 °C.	Reduce the fluid temp.
Temp. lower limit under		The fluid temp. is below -10 °C.	Rise the fluid temp.
System error	   	Displayed if an internal data error has occurred.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
System error (IO-Link)	 	Displayed if an internal data error has occurred.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
Temp. sensor failure		The temp. sensor is damaged.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
Version does not match (IO-Link)		Version of master and IO-Link does not match. Mismatch because master version is 1.0.	Align the master IO-Link version to the device.

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

•Remote type sensor

Error Name	LED display	Type	Troubleshooting
Flow rate upper limit is exceeded	 POWER indicator: Green is ON FLOW indicator: Red is ON	The applied flow rate is above approx. 110% of maximum rated flow rate.	Adjust flow to within the rated flow range.
Outside the temp. measurement range	 POWER indicator: Flashing Red	The fluid temp. is lower than -10 °C or exceeds 110 °C.	Adjust the fluid temp. to within the rated temp. range.
"Flow rate upper limit exceeded" and "Outside the temp. measurement range" occur together.	 POWER indicator: Flashing Red FLOW indicator: Red is ON	Refer to above.	Refer to above.
System error	 POWER indicator: Red is ON FLOW indicator: Red is ON	Internal data error has occurred.	Turn the power off and turn it on again. If the failure cannot be solved, contact SMC for repair.
	 POWER indicator: Red is ON FLOW indicator: Flashing Red		
	 POWER indicator: Red is ON FLOW indicator: OFF	The temp. sensor is damaged.	

If the error cannot be reset after the above measures are taken, then please contact SMC

Specifications

Manifold common specifications

Model		PF3WB	PF3WC	PF3WS	PF3WR
Manifold specifications		Integrated type		Remote type	
Arrangement		1 to 10 station *1	Supply: 1 to 5 station Return: 1 to 5 station	1 to 10 station *1	1 to 10 station *1
Unit	Rated flow range	0.5 to 4 L/min, 2 to 16 L/min, 5 to 40 L/min			
	Supply unit construction	With flow adjustment valve/stop valve			–
	Return unit construction	Flow switch With flow adjustment valve Stop valve		–	Flow switch With flow adjustment valve Stop valve
Fluid	Applicable fluid	Water and ethylene glycol solution with a viscosity of 3 mPa•s(3 cP) or less *2			
	Fluid temp.	0 to 90 °C (No freezing and condensation)			
Pressure spec.	Operating pressure range *3	0 to 1 MPa			
	Proof pressure *3	1.5 MPa			
	Pressure loss	Refer to graph of pressure loss			
Environment	Enclosure	IP65			
	Operating temp. range	0 to 50 °C (No freezing and condensation)			
	Operating humidity range	Operation, Storage: 85%R.H. (No condensation)			
Standard		CE/UKCA marked			
Materials in contact with fluid		PPS, SUS304, FKM			
		Grease free			
Piping port size *4	Main piping	1			
	Attachment	3/8, 1/2, 3/4			

∗1: When the flow range of 40 (rated flow range: 5 to 40 L/min) is selected in the supply/return unit, it is possible to mount 5 stations at a maximum.

∗2: Please refer to the chart of measurement range of ethylene glycol aqueous solution on page 51. Measurement is possible as long as the fluid does not corrode the wetted parts, and viscosity is 3 mPa•s (3 cP) or less. Be aware that water leakage may happen due to internal seal shrinkage or swelling depending on kinds of fluid.

∗3: The operating pressure range and proof pressure vary depending on the fluid temperature. Refer to the chart on page 60.

∗4: If a reduced piping diameter or the piping layout cause a restriction, it may not satisfy the specifications.

∗: •The form of the G thread (including the major and minor diameter and pitch of the internal thread) is based on JIS B0202 (ISO228-1).
•Products indicated as ISO1179-1 (G thread for hydraulics) or ISO16030 (G thread for pneumatics) are based on JIS B0202 (ISO228-1) for effective depth of thread, seat surface area, surface roughness and squareness.
•For ISO1179-1 (G thread for hydraulics), the withstand pressure is specified for each product. SMC do not guarantee the withstand pressure specified in ISO1179-1, ISO1179-2, ISO1179-3, or ISO1179-4.
•For ISO16030 (G thread for pneumatics), the withstand pressure is specified for each product. SMC do not guarantee the withstand pressure specified in ISO16030.

∗5: Any products with tiny scratches, smears, or display colour variation or brightness which does not affect the performance are verified as conforming products.

Integrated display type: PF3W7 series

Model			PF3W704	PF3W720	PF3W740
Applicable fluid			Water and ethylene glycol solution with a viscosity of 3 mPa•s(3 cP) or less *1		
Detection method			Karman vortex		
Rated flow range			0.5 to 4 L/min	2 to 16 L/min	5 to 40 L/min
Display flow range			0.35 to 5.50 L/min (Flow under 0.35 L/min is displayed as "0.00“.)	1.7 to 22.0 L/min (Flow under 1.7 L/min is displayed as "0.0“.)	3.5 to 55.0 L/min (Flow under 3.5 L/min is displayed as "0.0“.)
Switch point range			0.35 to 5.50 L/min	1.7 to 22.0 L/min	3.5 to 55.0 L/min
Min. setting unit			0.01 L/min	0.1 L/min	
Conversion of accumulated pulse (Pulse width = 50 ms)			0.05 L/pulse	0.1 L/pulse	0.5 L/pulse
Fluid temp.			0 to 90 °C (No freezing and condensation)		
Display unit			L/min for real-time flow and L for accumulated flow		
Accuracy			±3%F.S. max. Display and analogue output		
Repeatability			±2%F.S. *2		
Temp. characteristics			±5%F.S. (25 °C reference)		
Operating pressure range *3			Refer to graph of operating pressure and proof pressure		
Proof pressure *3			Refer to graph of operating pressure and proof pressure		
Pressure loss			Refer to graph of pressure loss		
Accumulated flow range *4			99999999.9 L		999999999 L
			By 0.1 L	By 0.5 L	By 1 L
Switch output			Select from NPN or PNP open collector output		
	Max. load current		80 mA		
	Max. applied voltage		28 VDC		
	Internal voltage drop		NPN: 1 V max. (at 80 mA load current) PNP: 1.5 V max. (at 80 mA load current)		
	Response time *2*5		0.5 s/1 s/2 s		
	Output protection		Short circuit protection		
	Output mode	Flow	Selects one of the output (hysteresis or window comparator mode), the output for the accumulated flow and the accumulated pulse output.		
		Temp.	Selects the output for fluid temp. (hysteresis or window comparator mode).		

Model		PF3W704	PF3W720	PF3W740
Analogue output	Response time *6	0.5 s/1 s/2 s		
	Voltage output	Output voltage: 1 to 5 V, Output impedance: 1 kΩ		
	Current output	Output current: 4 to 20 mA Maximum load impedance: 300 Ω for 12 VDC, 600 Ω for 24 VDC		
Hysteresis		Variable		
External input		Voltage free input of 0.4 V or less (reed or solid state type) for 30 ms or longer		
Display method		2-screen display (Main screen: 4-digit, 7-segment, 2-colour; red/green, Sub screen: 6-digit, 11-segment, White) Display updating frequency 5 times/sec.		
Indicator light		Output 1 and 2: Orange		
Power supply voltage		12 to 24 VDC ±10%		
Current consumption		50 mA or less		
Environment	Enclosure	IP65		
	Operating temp. range	0 to 50 °C (No freezing and condensation)		
	Operating humidity range	Operation, Storage: 35 to 85%R.H. (No condensation)		
	Withstand voltage *7	1000 VAC, for 1 minute between the terminals and housing		
	Insulation resistance	50 MΩ min. (with 500 VDC) between the terminals and housing		
Standard and regulations		CE/UKCA marked		
Material of wetted part		PPS, SUS304, FKM		
		Grease free		

∗1: Please refer to the chart of measurement range of ethylene glycol aqueous solution on page 51. Measurement is possible as long as the fluid does not corrode the wetted parts, and viscosity is 3 mPa•s (3 cP) or less. Be aware that water leakage may happen due to internal seal shrinkage or swelling depending on kinds of fluid.

∗2: When 0.5 s is selected for the switch output response time, the repeatability becomes ±3%F.S.

∗3: The operating pressure range and proof pressure vary depending on the fluid temperature. Refer to the chart on page 60.

∗4: The accumulated value will be cleared by turning off the power supply. It is possible to select the function to memorize it. (Every 2 or 5 minutes.)
When 5 minutes interval is selected, take into consideration the maximum number of times it is possible to write to the memory device (electronic part), which is 1 million times (In case of 24-hour communication, 5 minutes × access cycle (1 million cycles) = 18.50 million = approx. 35 years). Calculate the life in your operating conditions before using the memorizing function and use within this range.

∗5: The response time is when the set value is 90% in relation to the step input. (The value will be 7 s for the temperature sensor output.)

∗6: The response time is when the set value reaches 90% in relation to the step input. Linked with the response time of the switch output. (The value will be 7s for the temperature sensor output)

∗7: When the temperature sensor is used, it will be 250 VAC.

Integrated display type <IO-Link>
Body specification (Flow unit: L)

Model			PF3W704	PF3W720	PF3W740
Applicable fluid			Water and ethylene glycol solution with a viscosity of 3 mPa•s(3 cP) or less *1		
Detection method			Karman vortex		
Rated flow range			0.5 to 4 L/min	2 to 16 L/min	5 to 40 L/min
Display flow range			0.35 to 5.50 L/min (Flow under 0.35 L/min is displayed as "0.00“.)	1.7 to 22.0 L/min (Flow under 1.7 L/min is displayed as "0.0“.)	3.5 to 55.0 L/min (Flow under 0.35 L/min is displayed as "0.0“.)
Switch point range			0.35 to 5.50 L/min	1.7 to 22.0 L/min	3.5 to 55.0 L/min
Min. setting unit			0.01 L/min	0.1 L/min	
Conversion of accumulated pulse (Pulse width = 50ms)			0.05 L/pulse	0.1 L/pulse	0.5 L/pulse
Fluid temp.			0 to 90 °C (No freezing and condensation)		
Display unit			L/min for real-time flow and L for accumulated flow		
Accuracy			±3%F.S.		
Repeatability			±2%F.S. *2		
Temp. characteristics			±5%F.S. (25 °C reference)		
Operating pressure range *3			Refer to graph of operating pressure and proof pressure		
Proof pressure *3			Refer to graph of operating pressure and proof pressure		
Pressure loss			Refer to graph of pressure loss		
Accumulated flow range *4			999,999,999.9 L		9,999,999,999 L
			By 0.1 L		By 1 L
Switch output			Select from NPN or PNP open collector output		
	Max. load current		80 mA		
	Max. applied voltage		30 V (during NPN output)		
	Internal voltage drop		1.5 V or less (Load current 80 mA)		
	Delay time *5		3.5 ms or less Variable 0 to 60 s/0.01 step		
	Hysteresis	Hysteresis mode	Variable from 0		
		Window comparator mode			
	Output protection		Short circuit protection		
	Output mode	Flow	Select from hysteresis mode, window comparator mode, accumulated output mode, accumulated pulse output mode, error output and switch off.		
		Temp.	Selects the output for fluid temp. (hysteresis or window comparator mode).		

Model		PF3W704	PF3W720	PF3W740
Display method		2-screen display (main screen, sub screen) Main screen: 4-digit, 7-segment, 2-colour; red/green Sub screen: 9-digit, 11-segment (5th digit is 7-segment only), White Display updating frequency 5 times/sec.		
Indicator light		Output 1 and 2: Orange		
Power supply voltage	Used as switch output device	12 to 24 VDC, including ripple (p-p) 10%		
	Used as IO-Link device	18 to 30 VDC, including ripple (p-p) 10%		
Current consumption		50 mA max.		
Digital filter *6		Select from 0.5 s/1.0 s/2.0 s/5.0 s/10.0 s/15.0 s/20.0 s/30.0 s		
Environment	Enclosure	IP65		
	Operating temp. range	0 to 50 °C (No freezing and condensation)		
	Operating humidity range	Operation, Storage: 35 to 85%R.H. (No condensation)		
	Withstand voltage *7	1000 VAC, for 1 minute between the terminals and housing		
	Insulation resistance	50 MΩ min. (with 500 VDC) between the terminals and housing		
Standards and regulations		CE/UKCA marked		
Material of fluid contact parts		PPS, SUS304, FKM		
		Grease free		
Communication spec. (During IO-Link mode)	IO-Link type	Device		
	IO-Link version	V1.1		
	Communication speed	COM2 (38.4 kbps)		
	Min. cycle time	3.5 ms		
	Process data length	Input Data: 6 byte, Output Data: 0 byte		
	On request data communication	Available		
	Data storage function	Available		
	Event function	Available		
	Vendor ID	131(0x0083)		
	Device ID *8	L(2): 352(0x0160) L(2)T: 357(0x0165)	L(2): 353(0x0161) L(2)T: 358(0x0166)	L(2): 354(0x0162) L(2)T: 359(0x0167)

∗1: Please refer to the chart of measurement range of ethylene glycol aqueous solution on page 51. Measurement is possible as long as the fluid does not corrode the wetted parts, and viscosity is 3 mPa•s (3 cP) or less. Be aware that water leakage may happen due to internal seal shrinkage or swelling depending on kinds of fluid.

∗2: When 0.5 s is selected in the digital filter setting, the repeatability will be ±3%F.S.

∗3: The operating pressure range and proof pressure vary depending on the fluid temperature. Refer to the chart on page 60.

∗4: The accumulated value will be cleared by turning off the power supply. It is possible to select the function to memorize it. (Every 2 or 5 minutes.)
When 5 minutes interval is selected, take into consideration the maximum number of times it is possible to write to the memory device (electronic part), which is 3.7 million times (In case of 24-hour communication, 5 minutes × access cycle (3.7 million cycles) = 18.50 million = approx. 35 years). Calculate the life in your operating conditions before using the memorizing function and use within this range.

∗5: Digital filter value is not included.

∗6: The response time is when the set value is 90% in relation to the step input. (The value will be 7 s for the temperature sensor output.)

∗7: When the temperature sensor is used, it will be 250 VAC.

∗8: The Device ID varies depending on the product No.

Specifications of temperature sensor

Items	Specifications
Rated temp. range	0 to 100 °C ∗1
Setting/display temp. range	-10 to 110 °C
Min. setting/display unit	1 °C
Display unit	°C
Display accuracy	±2 °C
Analogue output accuracy	±3%F.S.
Response	7 s ∗2
Ambient temp. characteristics	±5%F.S.

∗1: The rated temperature range is only for the temperature sensor. As a whole product, the fluid temperature range is specified as 0 to 90 °C.

∗2: The response time is only for the temperature sensor.

Flow specification of the specified order (Flow unit: gal)

Model		PF3W704	PF3W720	PF3W740
Rated flow range		0.13 to 1.06 gal/min	0.53 to 4.23 gal/min	1.3 to 10.6 gal/min
Instantaneous flow	Display flow range	0.09 to 1.45 gal/min (Flow under 0.09 L/min is displayed as "0.00“.)	0.45 to 5.81 gal/min (Flow under 0.45 L/min is displayed as "0.00“.)	0.9 to 14.5 gal/min (Flow under 0.9 L/min is displayed as "0.0“.)
	Setting flow range	0.09 to 1.45 gal/min	0.45 to 5.81 gal/min	0.9 to 14.5 gal/min
	Min. setting/ display unit	0.01 gal/min		0.1 gal/min
Accumulated flow	Setting/ display flow unit	99999999.9 gal	999999999 gal	
	Min. setting/ diplay unit	0.1 gal	1 gal	
Conversion of accumulated pulse		0.01 gal/pulse	0.05 gal/pulse	0.1 gal/pulse

Temperature specification of the specified order (Temperature unit: ºF)

Rated temp. range *	32 to 212 ºF
Setting/display temp. range	14 to 230 ºF
Min. setting/display unit	1 ºF

*: The rated temperature range is only for the temperature sensor. As a whole product, the fluid temperature range is specified as 0 to 90 ºC.

Body specification (Flow unit: G)

Model	PF3W704	PF3W720	PF3W740
Rated flow range	0.13 to 1.06 gal/min	0.53 to 4.23 gal/min	1.3 to 10.6 gal/min
Display flow range	0.09 to 1.45 gal/min (Flow under 0.09 L/min is displayed as "0.00".)	0.45 to 5.81 gal/min (Flow under 0.45 L/min is displayed as "0.00".)	0.9 to 14.5 gal/min (Flow under 0.9 L/min is displayed as "0.00".)
Setting flow range	0.09 to 1.06 gal/min	0.45 to 5.81 gal/min	0.9 to 14.5 gal/min
Min. setting unit	0.01 L/min		0.1 L/min
Accumulated flow range	99,999,999.99 gal	999,999,999.9 gal	
	By 0.01 gal	By 0.1 gal	
Conversion of accumulated pulse	0.01 gal/pulse	0.05 gal/pulse	0.1 gal/pulse

Remote sensor type: PF3W5 series

Model		PF3W504	PF3W520	PF3W540
Applicable fluid		Water and ethylene glycol solution with a viscosity of 3 mPa•s (3 cP) or less *1		
Detection method		Karman vortex		
Rated flow range		0.5 to 4 L/min	2 to 16 L/min	5 to 40 L/min
Fluid temp.		0 to 90 °C (No freezing and condensation)		
Accuracy		±3%F.S.		
Repeatability		±2%F.S.		
Temp. characteristics		±5%F.S. (25 °C reference)		
Operating pressure range *2		Refer to graph of operating pressure and proof pressure		
Proof pressure *2		Refer to graph of operating pressure and proof pressure		
Pressure loss		Refer to graph of pressure loss		
Analogue output	Response time *3	1 s		
	Voltage output	Output voltage: 1 to 5 V, Output impedance: 1 kΩ		
	Current output	Output current: 4 to 20 mA Maximum load impedance: 300 Ω for 12 VDC, 600 Ω for 24 VDC		
Indicator light		LED for power supply, LED for flow rate indicator (Flashing speed changes depending on the flow rate.), LED for other error display		
Power supply voltage		12 to 24 VDC ±10%		
Current consumption		30 mA or less		
Environment	Enclosure	IP65		
	Operating temp. range	0 to 50 °C (No freezing and condensation)		
	Operating humidity range	Operation, Storage: 35 to 85%R.H. (No condensation)		
	Withstand voltage *4	1000 VAC, for 1 minute between the terminals and housing		
	Insulation resistance	50 MΩ min. (with 500 VDC) between the terminals and housing		
Standards and regulations		CE/UKCA marked		
Material of wetted part		PPS, SUS304, FKM		
		Grease free		

∗1: Please refer to the chart of measurement range of ethylene glycol aqueous solution on page 51. Measurement is possible as long as the fluid does not corrode the wetted parts, and viscosity is 3 mPa•s (3 cP) or less. Be aware that water leakage may happen due to internal seal shrinkage or swelling depending on kinds of fluid.

∗2: The operating pressure range and proof pressure vary depending on the fluid temperature. Refer to the chart on page 60.

∗3: The response time is when the set value is 90% in relation to the step input. (The value will be 7 s for the temperature sensor output.)

∗4: When the temperature sensor is used, it will be 250 VAC.

Specifications of temperature sensor

Items	Specifications
Rated temp. range	0 to 100 ºC *1
Analogue output accuracy	±3%F.S.
Response	7 s *2
Ambient temp. characteristics	±5%F.S.

∗1: The rated temperature range is only for the temperature sensor. As a whole flow switch, the fluid temperature range is specified as 0 to 90 ºC.

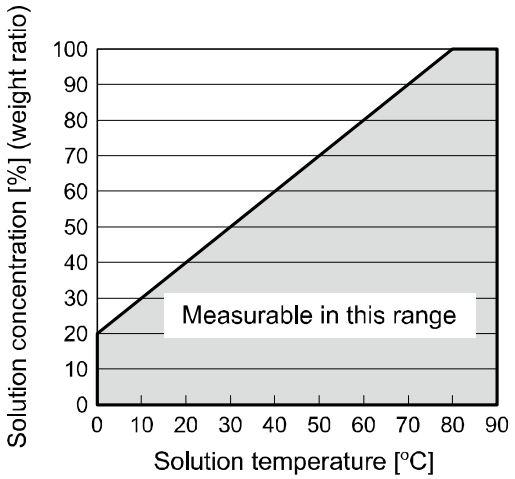
∗2: The response time is only for the temperature sensor.

Specifications: lead wire with M8 connector (ZS-40-A)

Items		Specifications
Conductor	Nominal cross section area	AWG23
	Outside diameter	Approx. 0.72 mm
Insulator	Outside diameter	Approx. 1.14 mm
	Colours	Brown, White, Black, Blue
Sheath	Outer diameter	ϕ3.4 mm

■Characteristics graph

Measurable range of ethylene glycol aqueous solution (reference value)



Flow characteristics for 1 station (pressure loss)

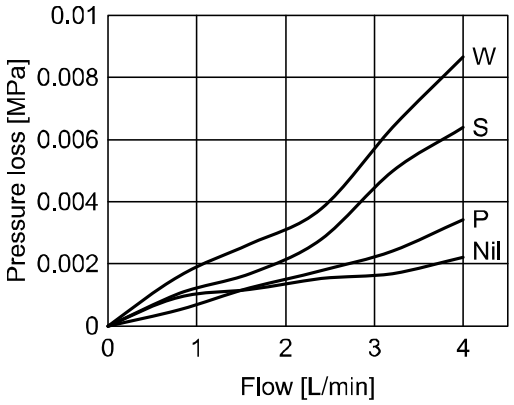
Nil: Without unit
S: Flow adjustment valve
P: Stop valve
W: Flow adjustment valve + Stop valve

•Supply unit

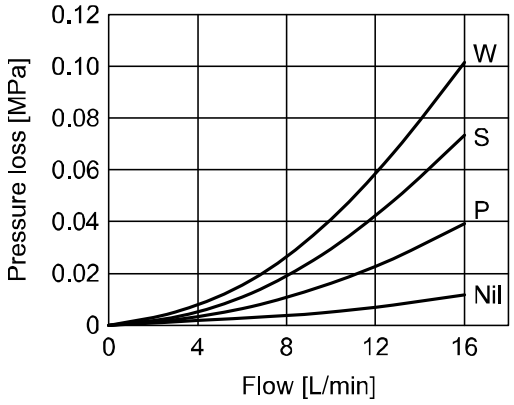
Cv value

Rated flow range (Flow range)	Unit construction			
	Nil	S	P	W
0.5 to 4 L/min (Symbol 04)	2.04	1.20	1.65	1.03
2 to 16 L/min (Symbol 20)	3.31	1.31	1.80	1.11
5 to 40 L/min (Symbol 40)	6.36	3.57	2.49	2.17

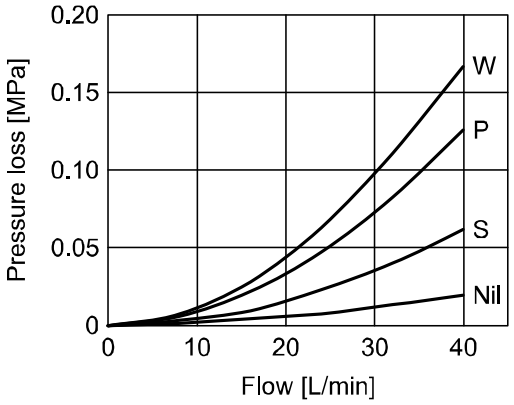
Flow range: 0.5 to 4 L/min (symbol 04)



Flow range: 2 to 16 L/min (symbol 20)



Flow range: 5 to 40 L/min (symbol 40)



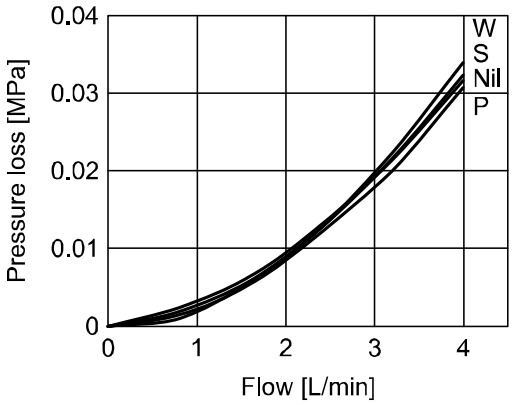
•Return unit

∗: The flow path of the integrated display type and remote sensor type is common

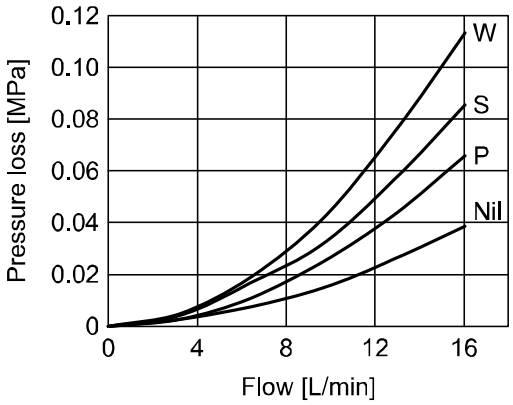
Cv 値

Rated flow range (Flow range)	Unit construction			
	Nil	S	P	W
0.5 to 4 L/min (Symbol 04)	0.50	0.49	0.50	0.48
2 to 16 L/min (Symbol 20)	1.79	1.21	1.38	1.05
5 to 40 L/min (Symbol 40)	4.57	3.11	2.42	2.04

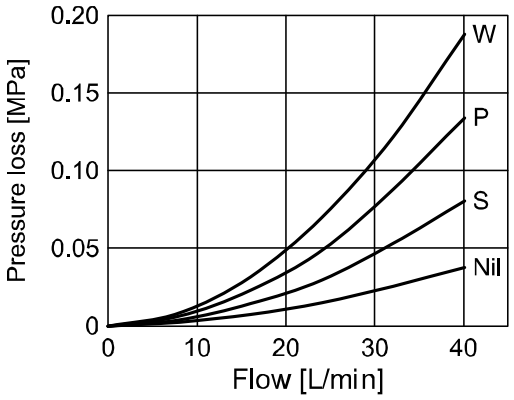
Flow range: 0.5 to 4 L/min (symbol 04)



Flow range: 2 to 16 L/min (symbol 20)



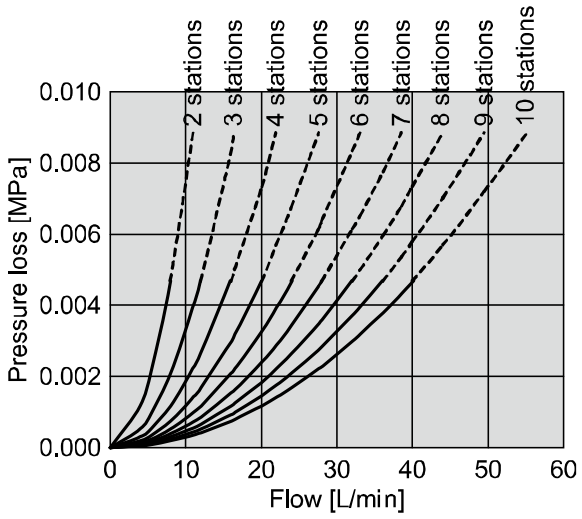
Flow range: 5 to 40 L/min (symbol 40)



■Flow rate characteristics for several supply units

Flow range: 0.5 to 4 L/min (symbol 04) (reference value)

Nil



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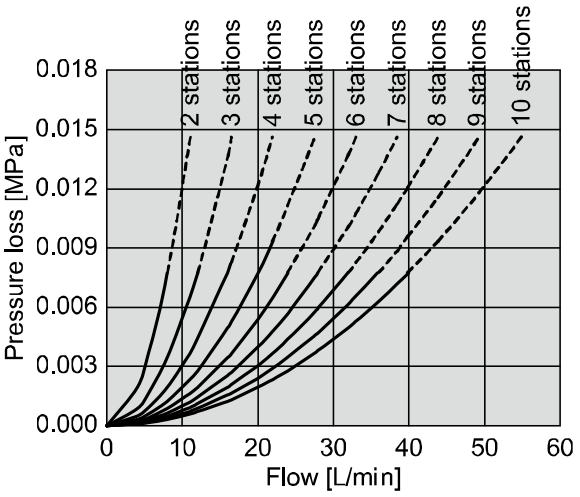
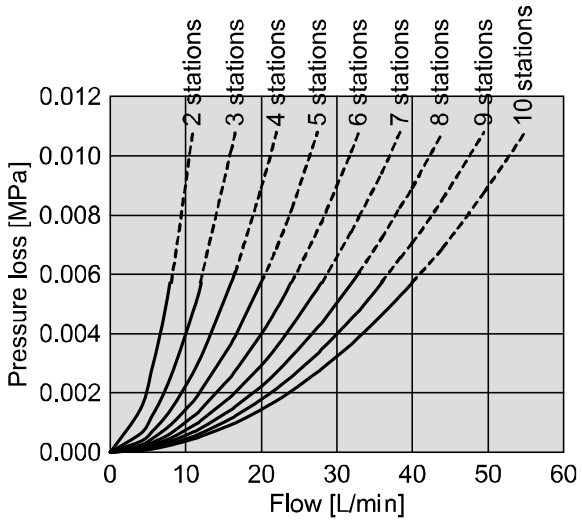


P



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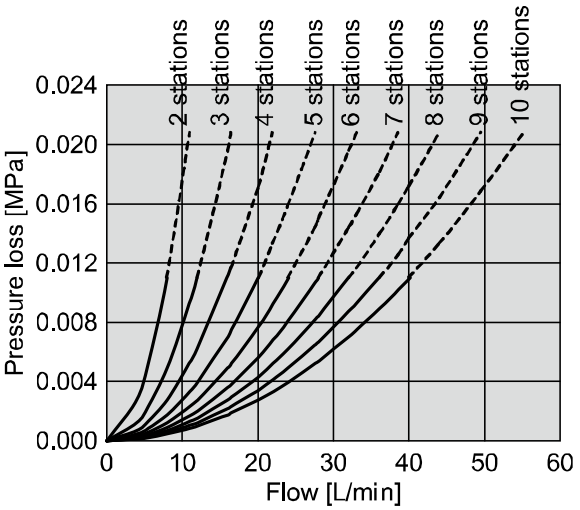
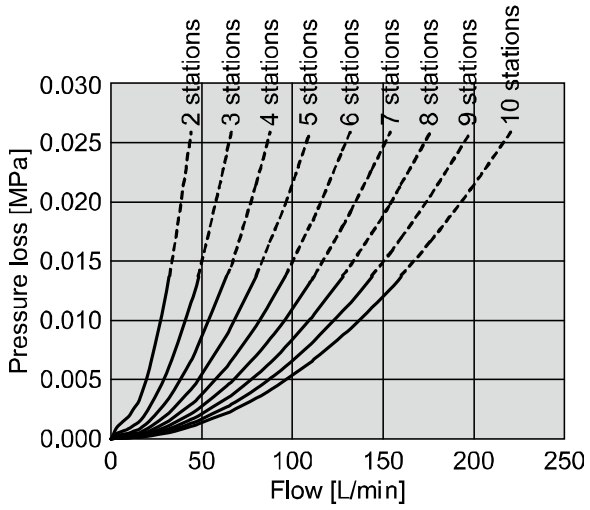


Flow range: 2 to 16 L/min (symbol 20) (reference value)

Nil



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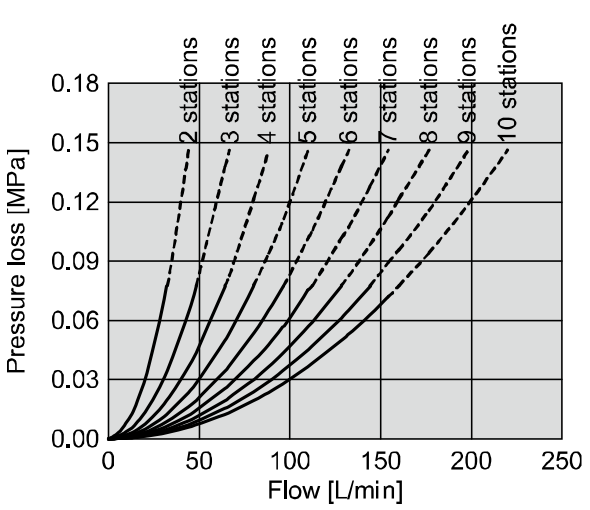
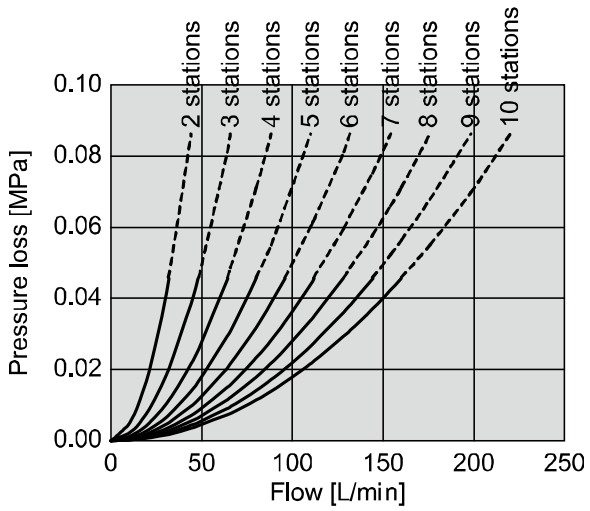
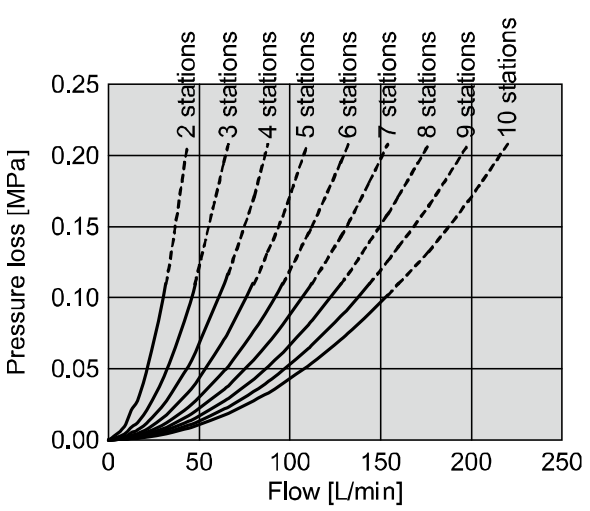


P

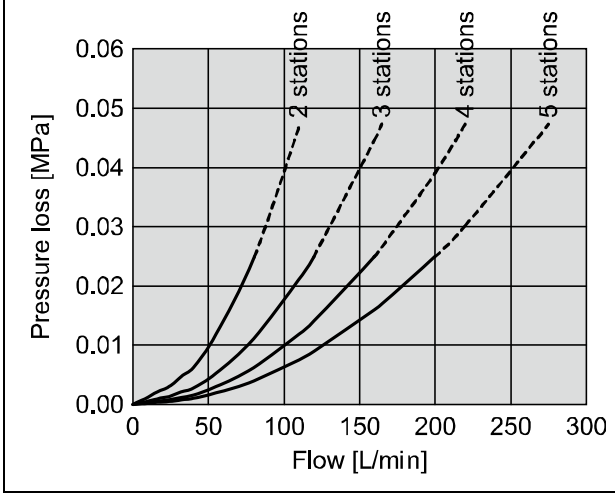


W



Flow range: 5 to 40 L/min (symbol 40) (reference value)

Nil



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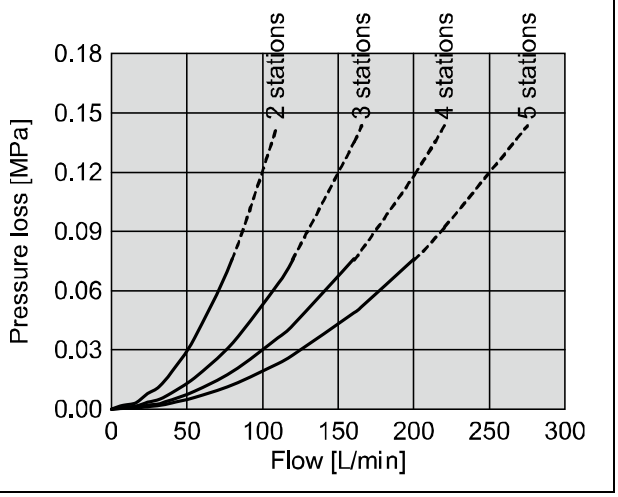

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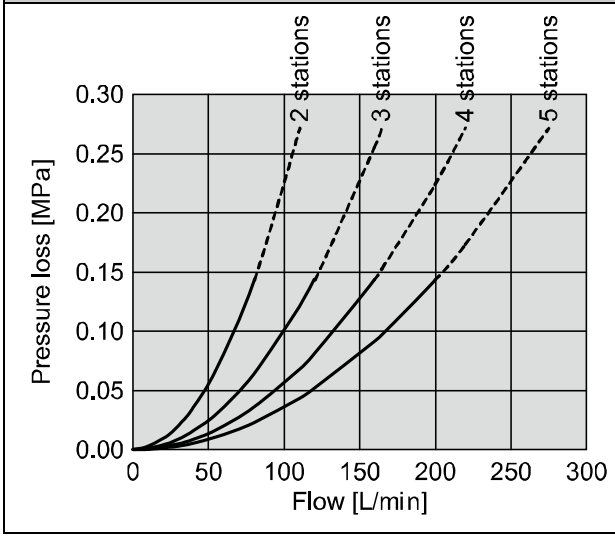

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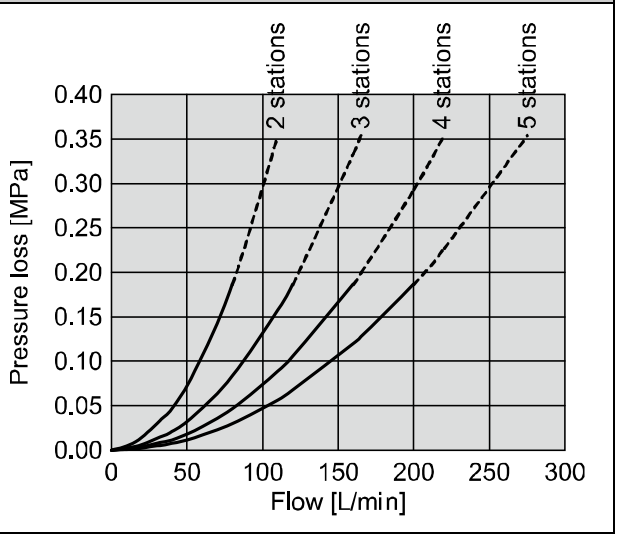
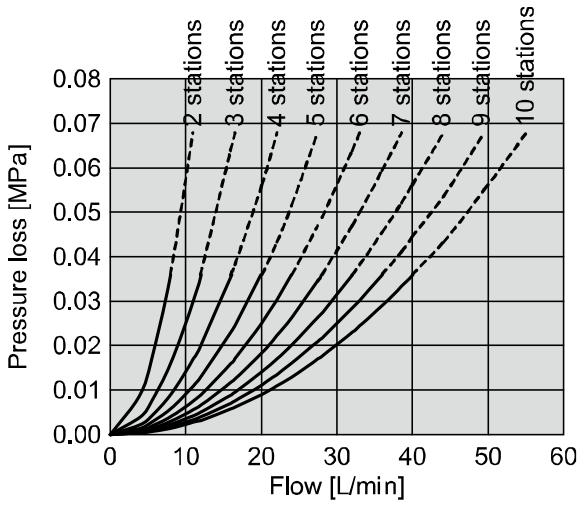


■Total flow characteristics for several return units

Flow range: 0.5 to 4 L/min (symbol 04) (reference value)

Nil



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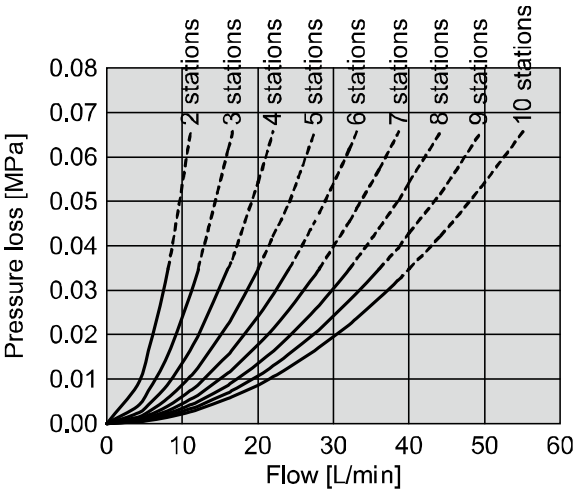

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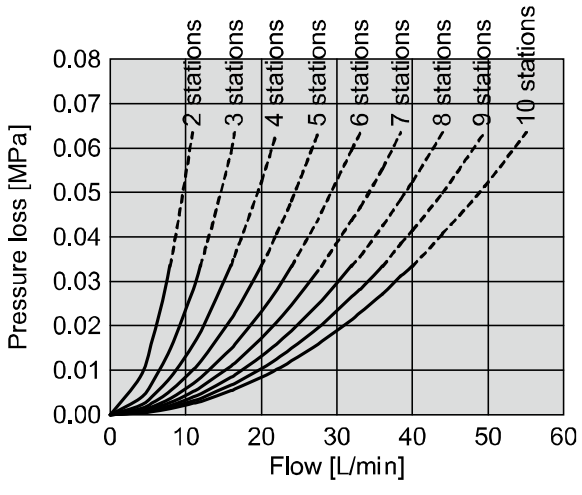

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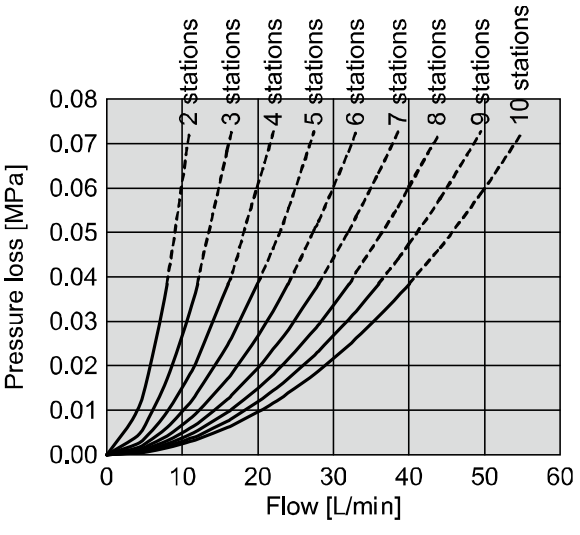
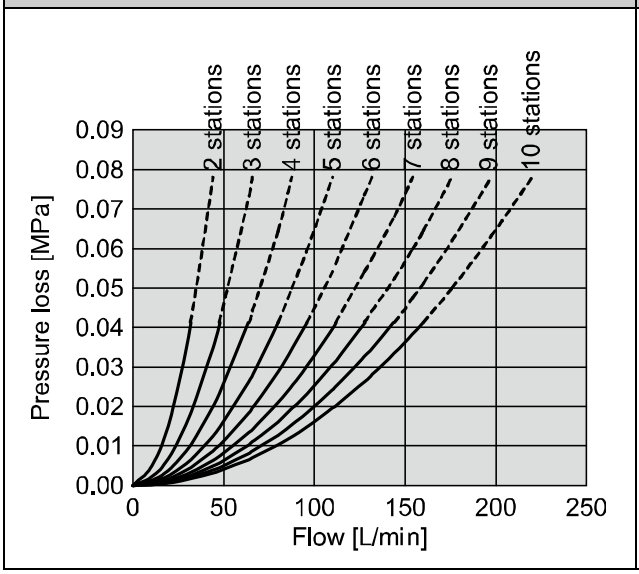


Flow range: 2 to 16 L/min (symbol 20) (reference value)

Nil



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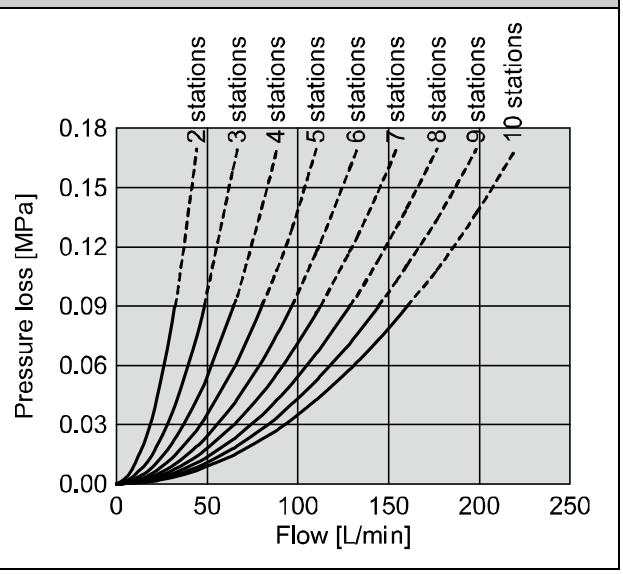

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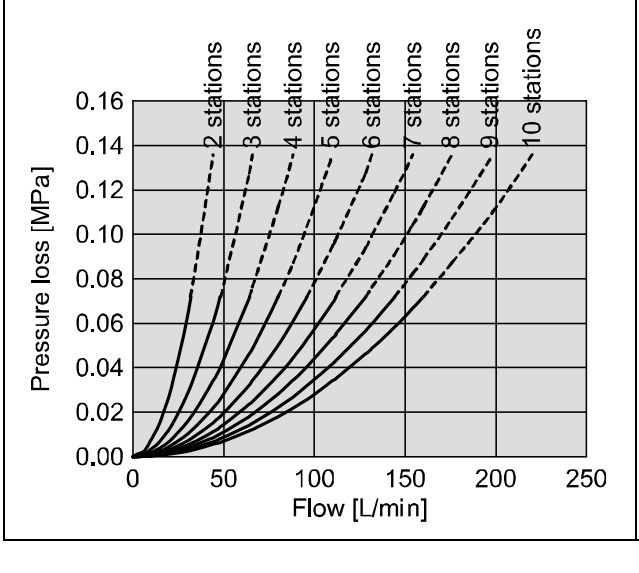

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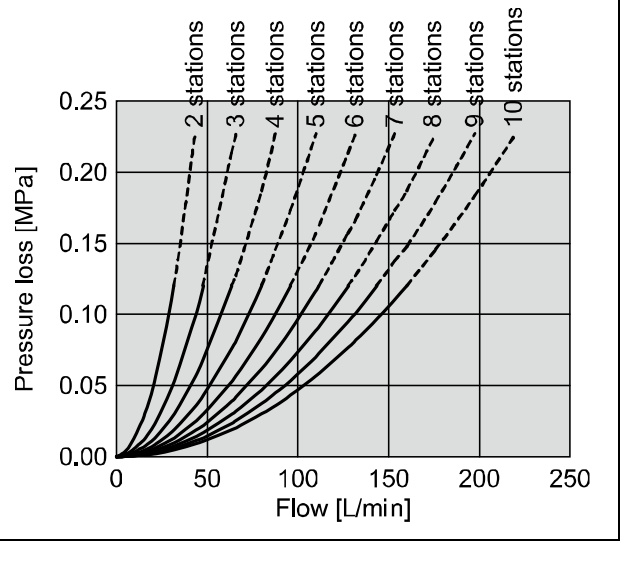
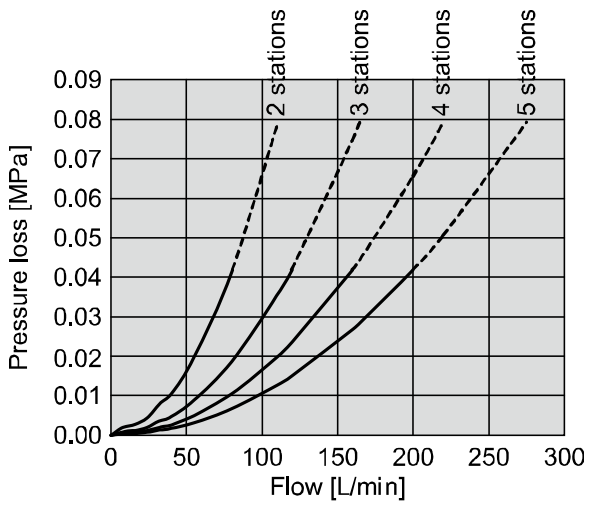


Flow range: 5 to 40 L/min (symbol 40) (reference value)

Nil



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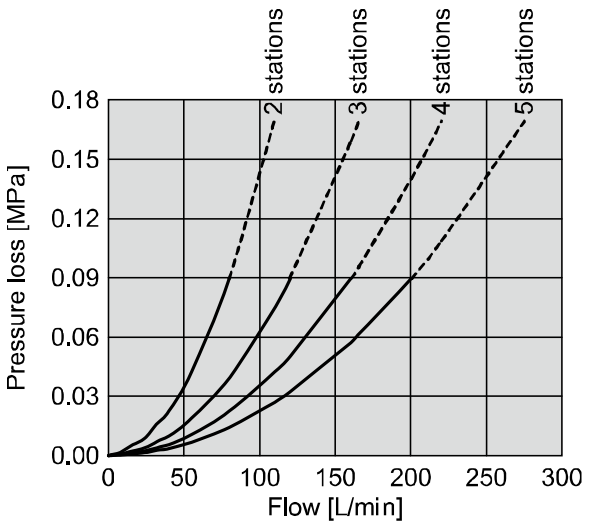

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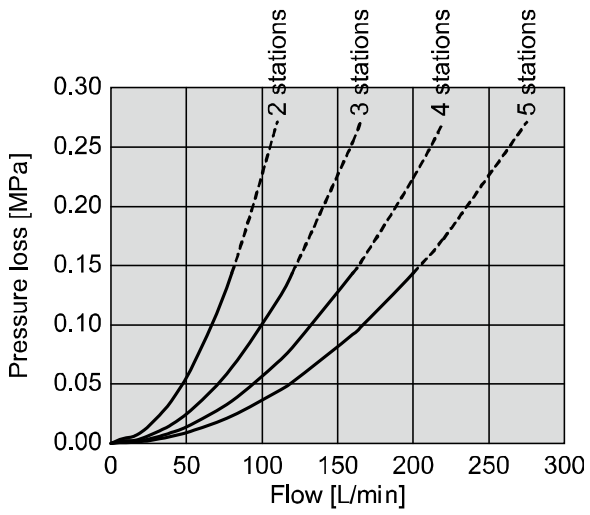

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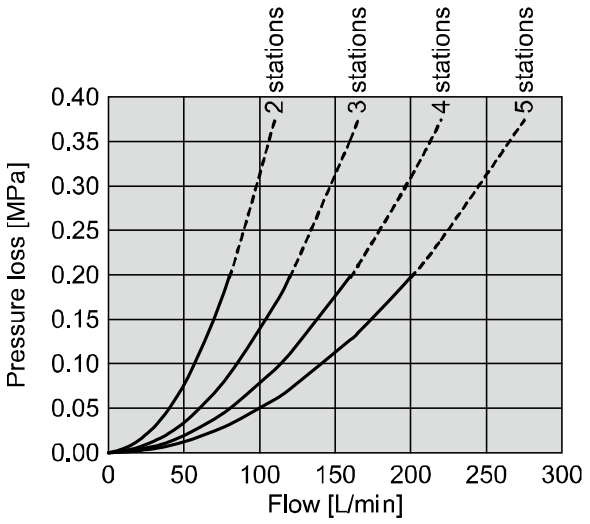
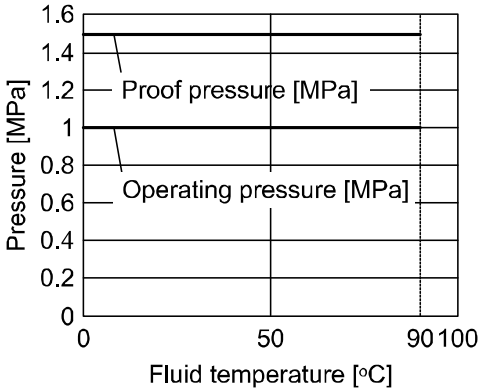


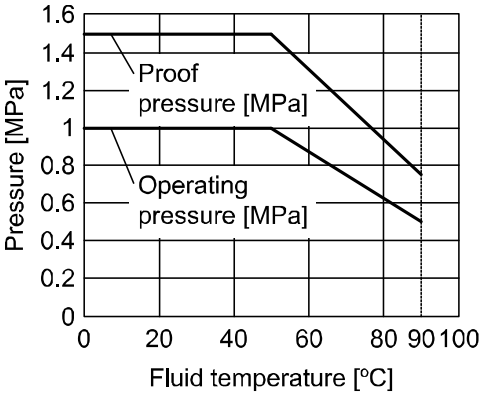
Operating pressure and proof pressure

Nil: Without unit
S: Flow adjustment valve
P: Stop valve
W: Flow adjustment valve + Stop valve

Unit construction: Nil



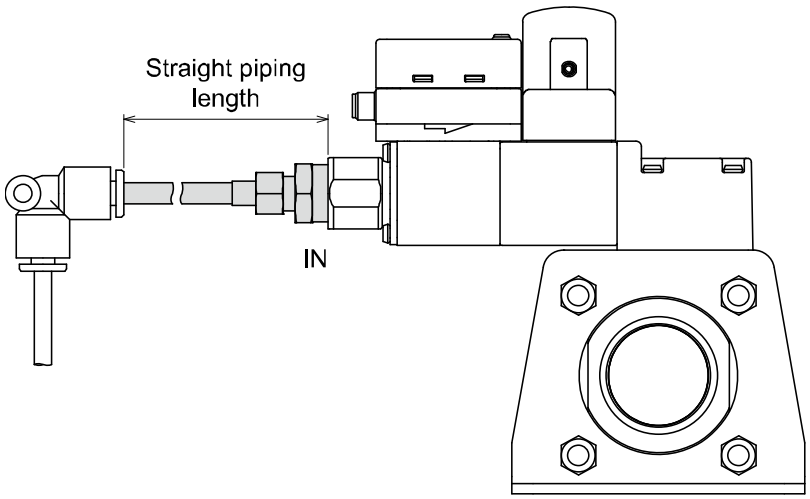
Unit construction: S/P/W



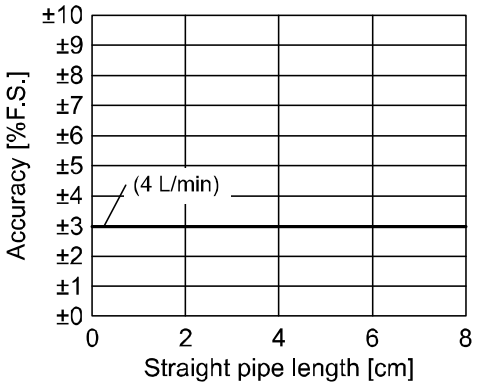
Straight inlet pipe length and accuracy (reference value)

Metal attachment

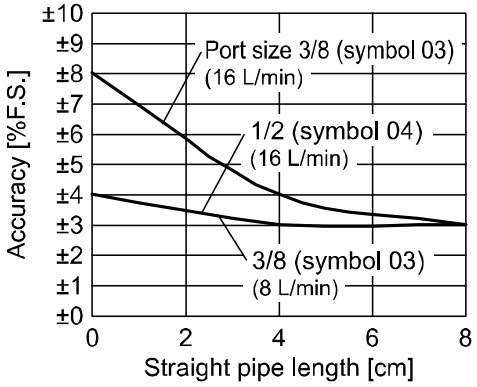
- The smaller the piping size, the more the product is affected by the straight piping length.
- Fluid pressure has almost no effect.
- The smaller the flow rate, the less the product is affected by the straight piping length.
- The straight piping length shall be 8 cm or longer in order to maintain ±3%F.S. of the specification.



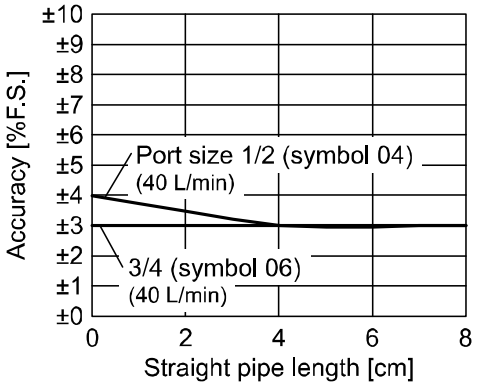
Flow range: 0.5 to 4 L/min (symbol 04)
Pressure: 0.3 MPa
Piping bore size: ϕ12



Flow range: 2 to 16 L/min (symbol 20)
Pressure: 0.3 MPa
Piping bore size: ϕ12



Flow range: 5 to 40 L/min (symbol 40)
Pressure: 0.3 MPa
Piping bore size: ϕ16



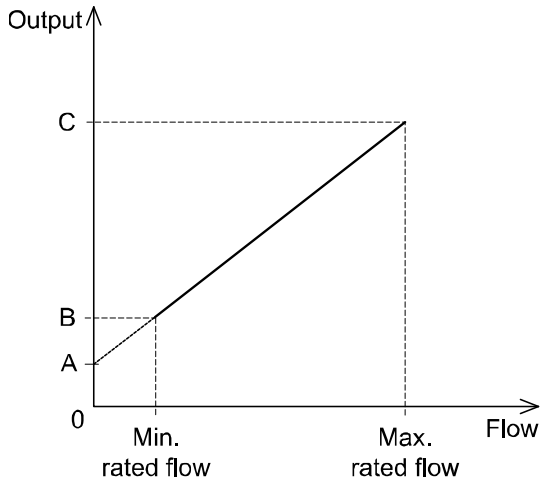
■Analogue output

Analogue output (Flow)

(PF3W704/720/740)

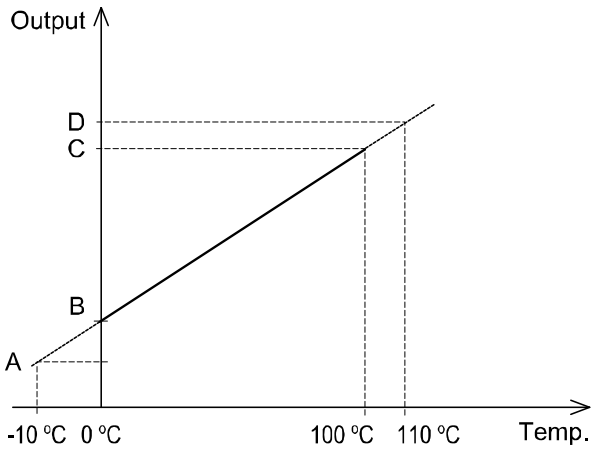
	A	B	C
Voltage output	1 V	1.5 V	5 V
Current output	4 mA	6 mA	20 mA

Model	Rated flow [L/min]	
	Minimum	Maximum
PF3W704/PF3W504	0.5	4
PF3W720/PF3W520	2	16
PF3W740/PF3W540	5	40



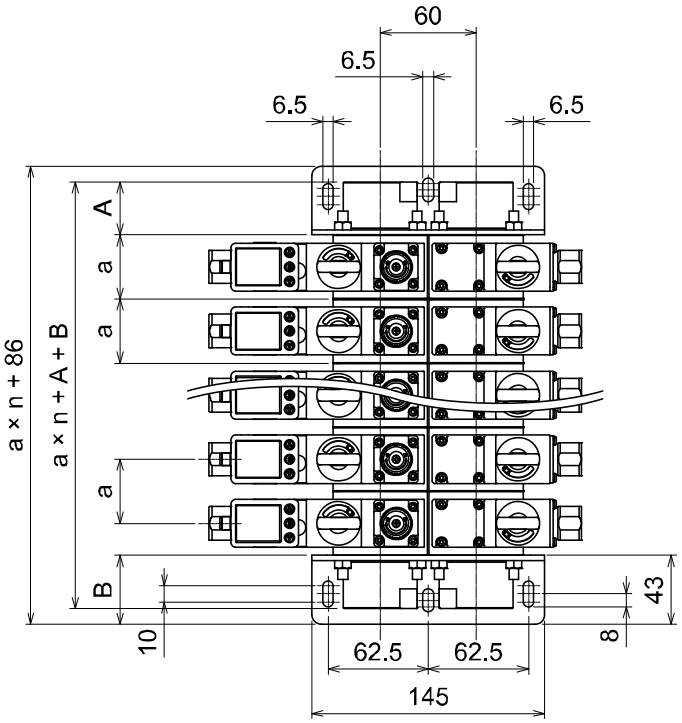
Analogue output (Fluid temperature)

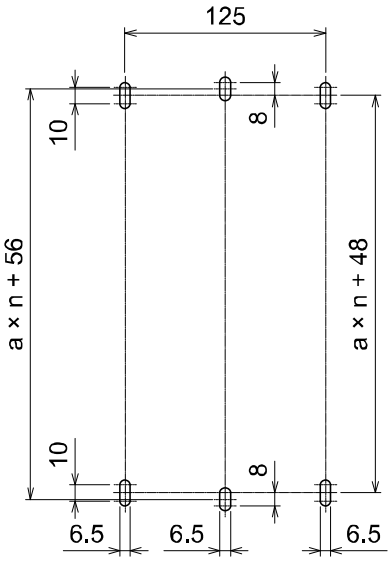
	A	B	C	D
Voltage output	0.6 V	1 V	5 V	5.4 V
Current output	2.4 mA	4 mA	20 mA	21.6 mA



■Dimensions

•Position of the front/mounting hole
Integrated type (basic type): PF3WB





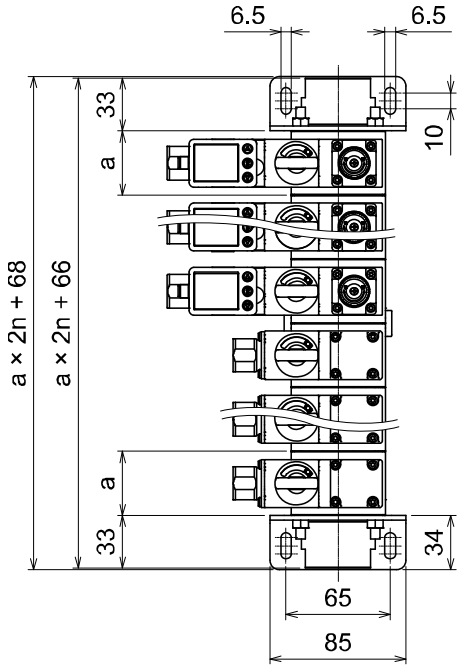
Mounting dimensions

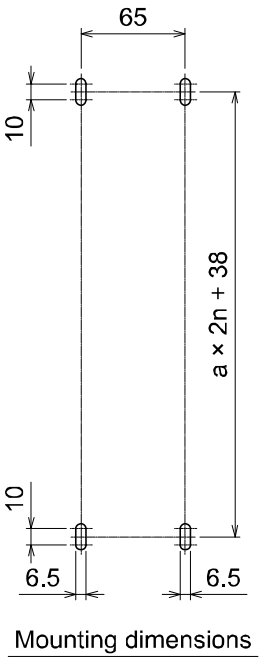
n: Stations

(mm)

Flow range (L/min)	A		B		a
	Open	Close	Open	Close	
0.5 to 4 (symbol 04)	33	14	33	14	40
2 to 16 (symbol 20)	33	14	33	14	40
5 to 40 (symbol 40)	33	14	33	14	45

Integrated display type (straight type): PF3WC





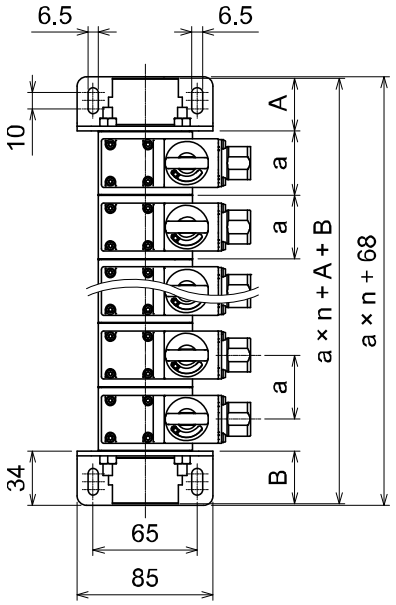
Mounting dimensions

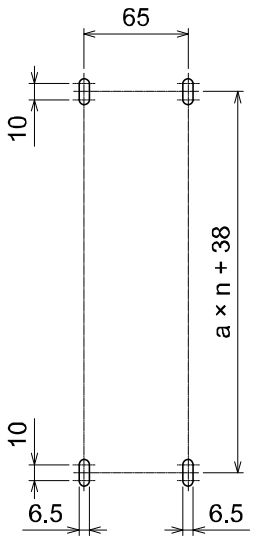
n: Stations

(mm)

Flow range (L/min)	a
0.5 to 4 (symbol 04)	40
2 to 16 (symbol 20)	40
5 to 40 (symbol 40)	45

Remote sensor type (supply type): PF3WS





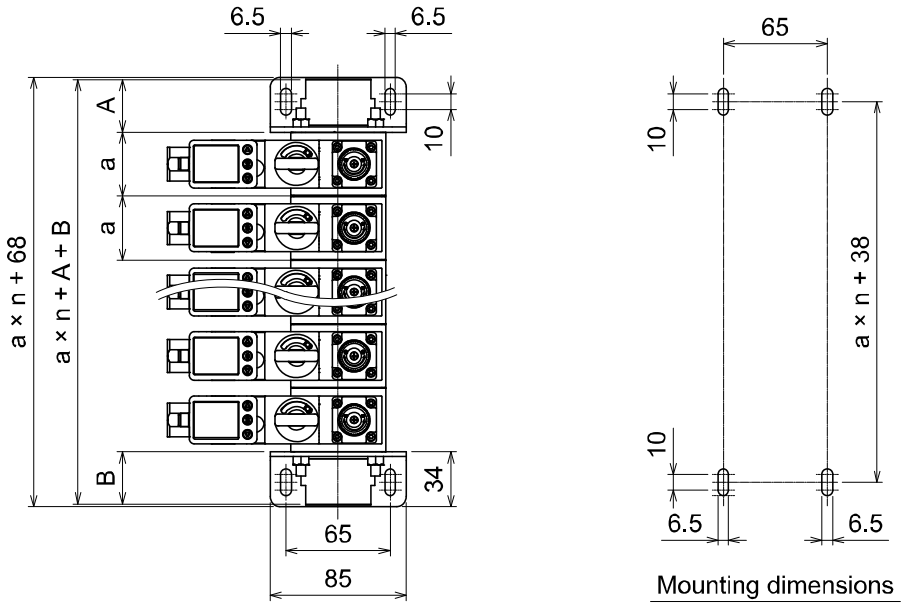
Mounting dimensions

n: Stations

(mm)

Flow range (L/min)	A		B		a
	Open	Close	Open	Close	
0.5 to 4 (symbol 04)	33	14	33	14	40
2 to 16 (symbol 20)	33	14	33	14	40
5 to 40 (symbol 40)	33	14	33	14	45

Remote sensor type (return type): PF3WR



n: Stations

(mm)

Flow range (L/min)	A		B		a
	Open	Close	Open	Close	
0.5 to 4 (symbol 04)	33	14	33	14	40
2 to 16 (symbol 20)	33	14	33	14	40
5 to 40 (symbol 40)	33	14	33	14	45

•Side view

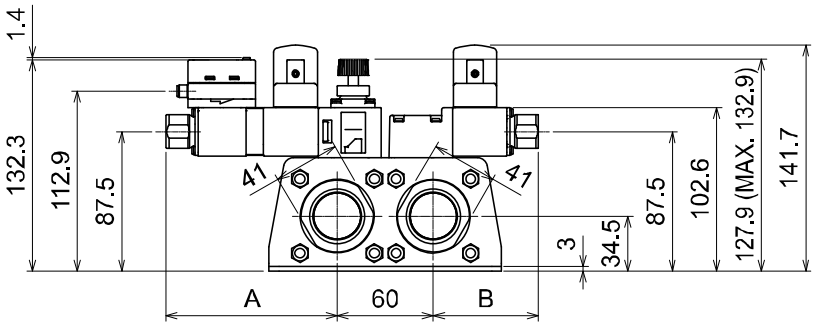
Integrated display type (Basic type): PF3WB

Flow range: 0.5 to 4 L/min (symbol 04)/2 to 16 L/min (symbol 20)

Supply unit　Unit construction: P (with stop valve)

Return unit　Flow switch: Integrated display (with temperature sensor)

Unit construction: W (with flow adjustment valve and stop valve)



A: Total length of the return unit

(mm)

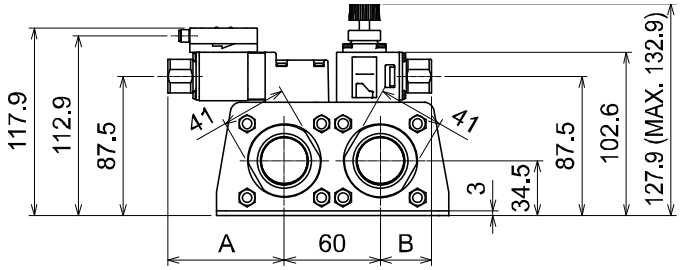
Flow switch type	Temp. sensor	Flow range	Port size	Unit construction			A
				Symbol	Flow adjustment valve	Stop valve	
Remote sensor/ Integrated display type	Nil	0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	61.9
				S	●	–	61.9
				P	–	●	95.9
				W	●	●	95.9
	Yes			Nil	–	–	72.9
				S	●	–	72.9
				P	–	●	106.9
				W	●	●	106.9
	Nil	2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	65.9
				S	●	–	65.9
				P	–	●	99.9
				W	●	●	99.9
	Yes			Nil	–	–	76.9
				S	●	–	76.9
				P	–	●	110.9
				W	●	●	110.9

B: Total length of the supply unit

(mm)

Flow range	Port size	Unit construction			B
		Symbol	Flow adjustment valve	Stop valve	
0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	31.9
		S	●	–	31.9
		P	–	●	65.9
		W	●	●	65.9
2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	35.9
		S	●	–	35.9
		P	–	●	69.9
		W	●	●	69.9

Supply unit Unit construction: S (with flow adjustment valve)
Return unit Flow switch: Remote sensor type (with temperature sensor)
Unit construction: Nil



A: Total length of the return unit

(mm)

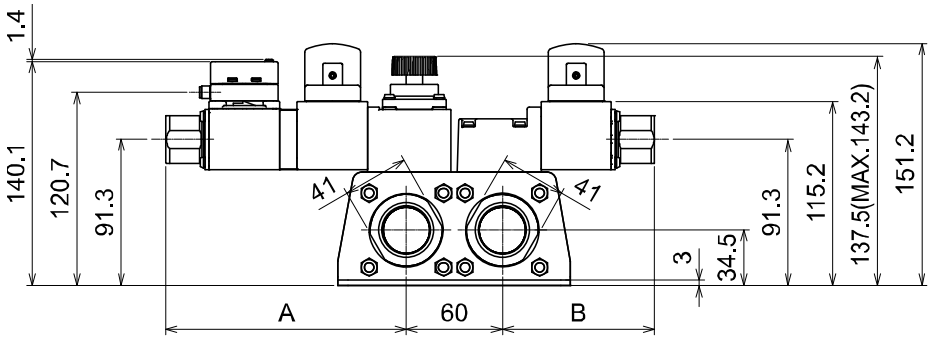
Flow switch type	Temp. sensor	Flow range	Port size	Unit construction			A
				Symbol	Flow adjustment valve	Stop valve	
Remote sensor/ Integrated display type	Nil	0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	61.9
				S	●	–	61.9
				P	–	●	95.9
				W	●	●	95.9
	Yes			Nil	–	–	72.9
				S	●	–	72.9
				P	–	●	106.9
				W	●	●	106.9
	Nil	2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	65.9
				S	●	–	65.9
				P	–	●	99.9
				W	●	●	99.9
	Yes			Nil	–	–	76.9
				S	●	–	76.9
				P	–	●	110.9
				W	●	●	110.9

B: Total length of the supply unit

(mm)

Flow range	Port size	Unit construction			B
		Symbol	With flow adjustment valve	Stop valve	
0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	31.9
		S	●	–	31.9
		P	–	●	65.9
		W	●	●	65.9
2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	35.9
		S	●	–	35.9
		P	–	●	69.9
		W	●	●	69.9

•Integrated display type (Basic type): PF3WB
Flow range: 5 to 40 L/min (symbol 40)
Supply unit Unit construction: P (with stop valve)
Return unit Flow switch: Integrated display type (with temperature sensor)
Unit construction: W (with flow adjustment valve and stop valve)



A: Total length of the return unit

(mm)

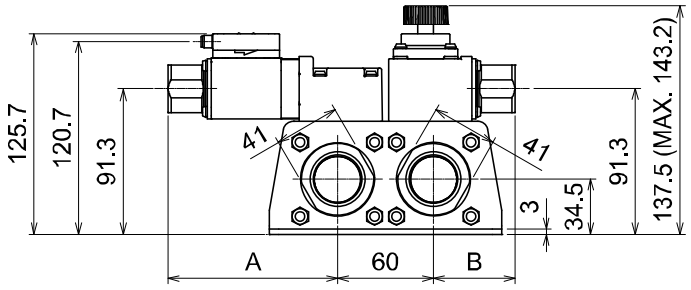
Flow switch type	Temp. sensor	Flow range	Port size	Unit construction			A
				Symbol	Flow adjustment valve	Stop valve	
Remote sensor/ Integrated display type	Nil	5 to 40 L/min (symbol 40)	1/2 (symbol 04) 3/4 (symbol 06)	Nil	–	–	95
				S	●	–	95
				P	–	●	139
				W	●	●	139
	Yes			Nil	–	–	106
				S	●	–	106
				P	–	●	150
				W	●	●	150

B: Total length of the supply unit

(mm)

Flow range	Port size	Unit construction			B
		Symbol	Flow adjustment valve	Stop valve	
5 to 40 L/min (symbol 40)	1/2 (symbol 04) 3/4 (symbol 06)	Nil	–	–	51
		S	●	–	51
		P	–	●	95
		W	●	●	95

Supply unit Unit construction: S (with flow adjustment valve)
Return unit Flow switch: Remote sensor type (with temperature sensor)
Unit construction: Nil



A: Total length of the return unit

(mm)

Flow switch type	Temp. sensor	Flow range	Port size	Unit construction			A
				Symbol	Flow adjustment valve	Stop valve	
Remote sensor/ Integrated display type	Nil	5 to 40 L/min (symbol 40)	1/2 (symbol 04) 3/4 (symbol 06)	Nil	–	–	95
				S	●	–	95
				P	–	●	139
				W	●	●	139
	Yes			Nil	–	–	106
				S	●	–	106
				P	–	●	150
				W	●	●	150

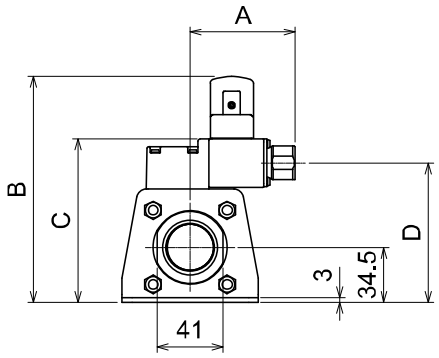
B: Total length of the supply unit

(mm)

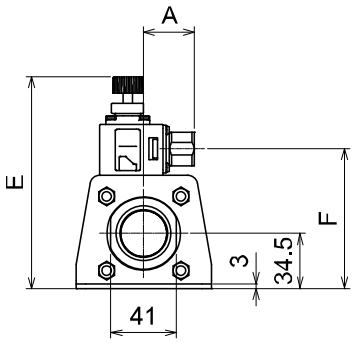
Flow range	Port size	Unit construction			B
		Symbol	Flow adjustment valve	Stop valve	
5 to 40 L/min (symbol 40)	1/2 (symbol 04) 3/4 (symbol 06)	Nil	–	–	51
		S	●	–	51
		P	–	●	95
		W	●	●	95

Integrated display type (straight type): PF3WC supply side/Remote sensor type (supply type): PF3WS

Unit construction : P (with stop valve)



Unit construction: S (with flow adjustment valve)



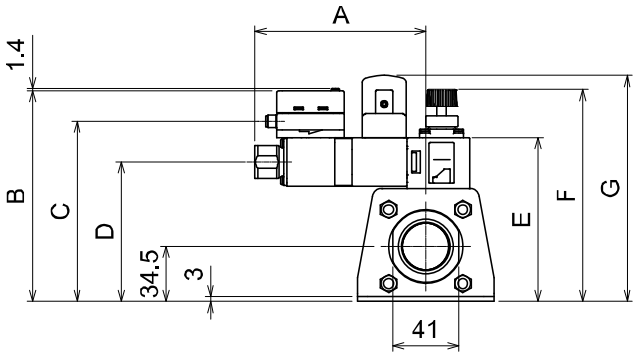
A: Total length of the supply unit

(mm)

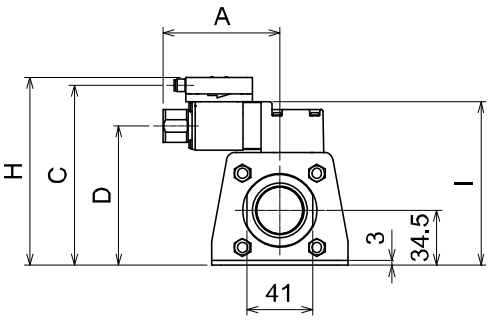
Flow range	Port size	Unit construction			A	B	C	D	E	F
		Symbol	Flow adjustment valve	Stop valve						
0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	31.9	141.7	102.6	87.5	127.9 (Max. 132.9)	87.5
		S	●	–	31.9					
		P	–	●	65.9					
		W	●	●	65.9					
2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	35.9	141.7	102.6	87.5	127.9 (Max. 132.9)	87.5
		S	●	–	35.9					
		P	–	●	69.9					
		W	●	●	69.9					
5 to 40 L/min (symbol 40)	1/2 (symbol 04) 3/4 (symbol 06)	Nil	–	–	51	151.2	111.5	91.3	137.5 (Max. 143.2)	91.5
		S	●	–	51					
		P	–	●	95					
		W	●	●	95					

Remote sensor type (return type): PF3WR/Integrated display type (straight type): PF3WC return side

Flow switch: Integrated display type (with temperature sensor)
Unit construction: W (with flow adjustment valve and stop valve)



Flow switch: Remote sensor part (with temperature sensor)
Unit construction: Nil

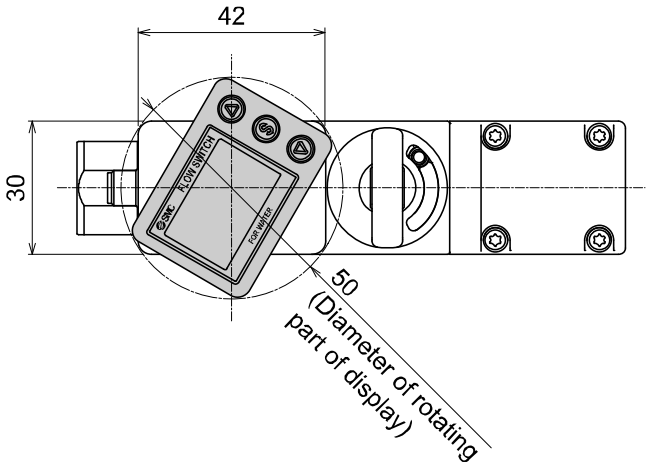


A: Total length of the return unit

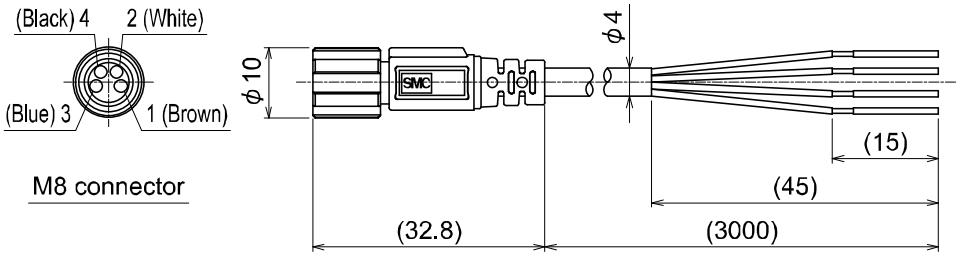
(mm)

Flow switch type	Temp. sensor	Flow range	Port size	Unit construction			A	B	C	D	E	F	G	H	I
				Symbol	Flow adjustment valve	Stop valve									
Remote sensor/ Integrated display type	Nil	0.5 to 4 L/min (symbol 04)	3/8 (symbol 03)	Nil	–	–	61.9	132.3	112.9	87.5	102.6	127.9 (Max. 132.9)	141.7	117.9	102.6
				S	•	–	61.9								
				P	–	•	95.9								
				W	•	•	95.9								
	Yes			Nil	–	–	72.5								
				S	•	–	72.5								
				P	–	•	106.9								
				W	•	•	106.9								
	Nil	2 to 16 L/min (symbol 20)	3/8 (symbol 03) 1/2 (symbol 04)	Nil	–	–	65.9	132.3	112.9	87.5	102.6	127.9 (Max. 132.9)	141.7	117.9	102.6
				S	•	–	65.9								
				P	–	•	99.9								
				W	•	•	99.9								
	Yes			Nil	–	–	76.9								
				S	•	–	76.9								
				P	–	•	110.9								
				W	•	•	110.9								
	Nil	5 to 40 L/min (symbol 40)	1/2 (symbol 03) 3/4 (symbol 06)	Nil	–	–	95	140.1	120.7	91.3	110.1	137.5 (Max. 143.2)	151.2	125.7	111.5
				S	•	–	95								
				P	–	•	139								
				W	•	•	139								
	Yes			Nil	–	–	106								
				S	•	–	106								
				P	–	•	150								
				W	•	•	150								

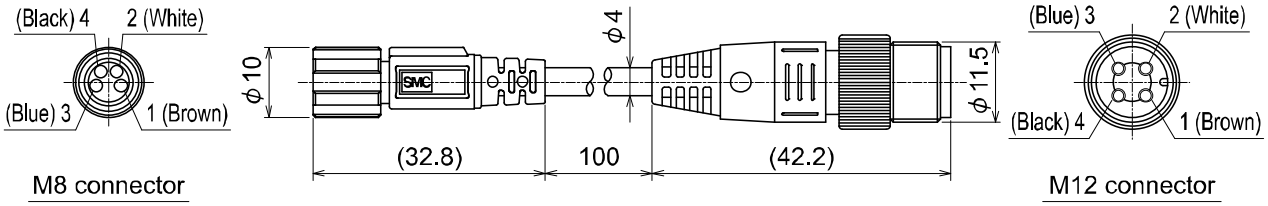
Rotation range of the display (integrated display type)



Dimensions of lead wire with M8 connector (ZS-40-A)



Dimensions of lead wire with M12-M8 connector (ZS-40-M12M8-A)



Revision history
A: Contents revised in several places [June 2019] B: Contents are added [August 2021] C: Contents are added [May 2024]

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