

# Flow Controller for Water

New



IP65

For the stepless control of water flow rate in proportion to electrical signals

Flow rate control accuracy

$\pm 5\%$  F.S.

Response time

10 s or less

Parts in contact with fluid: Grease-free

38 mm

FC3W504-R03-A1  
 FLOW CONTROL RANGE: 0.5-16 L/min  
 OPERATION PRESS.: 0.2-0.4 MPa  
 MAX. PRESS.: 0.6 MPa  
 SUP. (BROWN(+)) DC24V CLASS2  
 (BLUE(-)) GND  
 WHITE (IN1) A.I. 1-5V  
 GRAY (IN2) SIGNAL INPUT  
 BLACK (OUT) A.O. 1-5V  
 SMC IN → OUT

## Variations

Series	Rated control flow rate range [L/min]					Port size	
	0.5	2	4	16	3/8	1/2	
FC3W504	[Bar chart showing range from 0.5 to 4 L/min]					●	—
FC3W520		[Bar chart showing range from 2 to 16 L/min]				●	●

**FC3W Series**



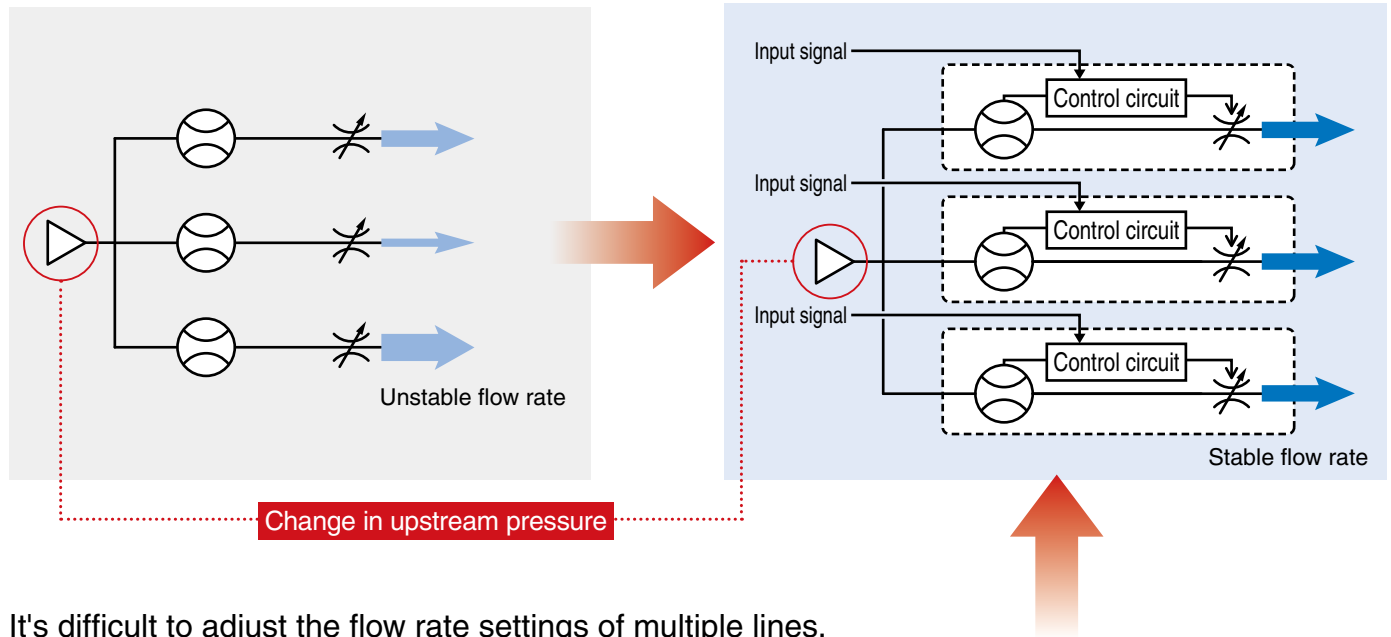
CAT.ES100-160A



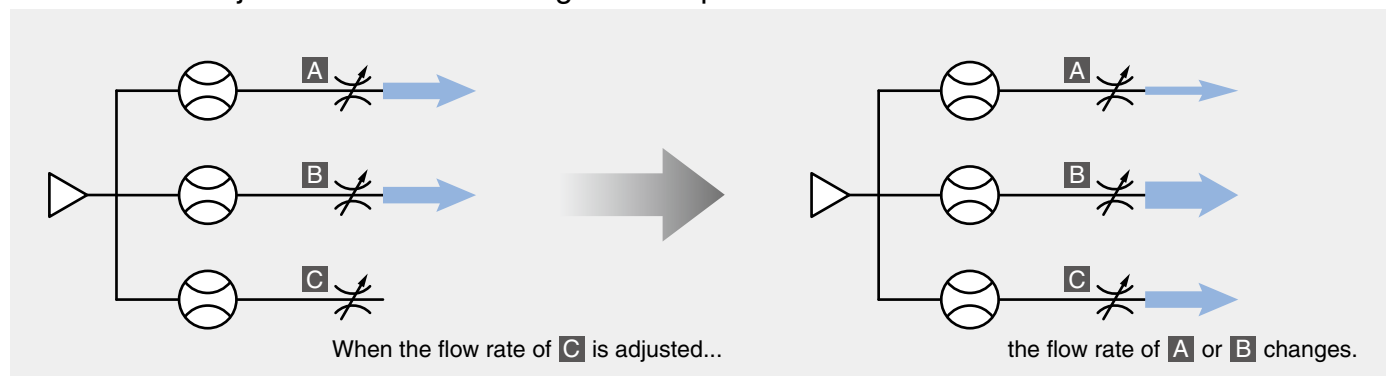
With manual valve control, when the upstream pressure changes, the flow rate of each line becomes unstable, making adjustment difficult.

With an FC3W

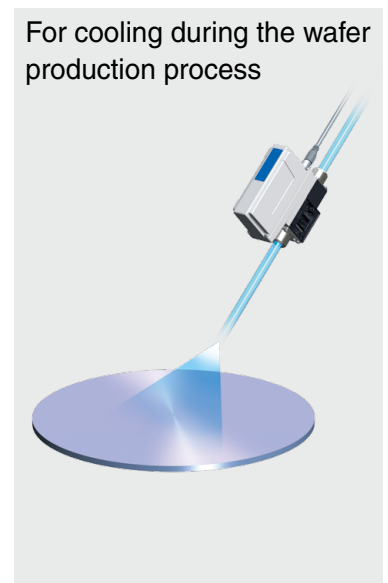
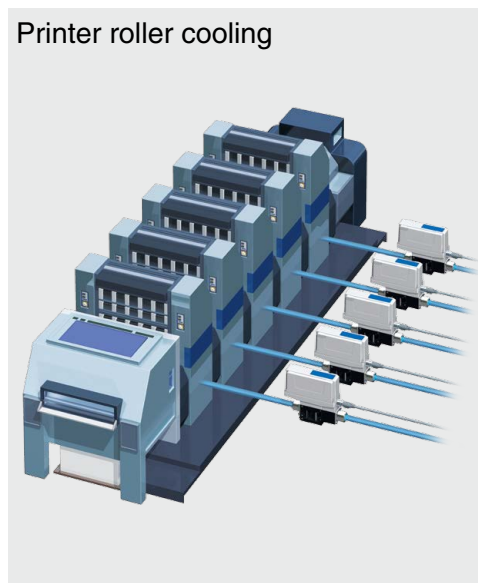
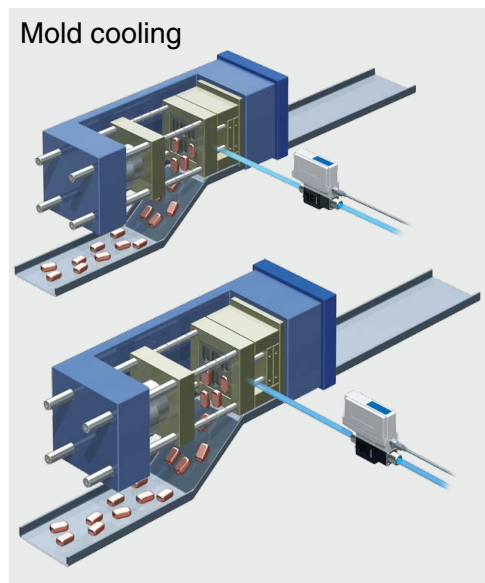
The flow rate of each line is adjusted to a stable value when the upstream pressure changes.



It's difficult to adjust the flow rate settings of multiple lines.

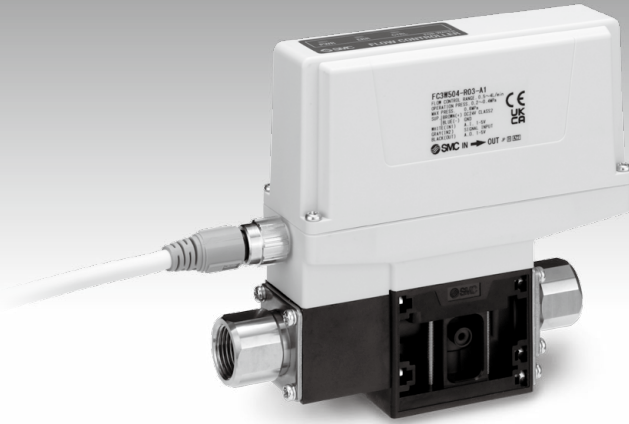


## Application Examples



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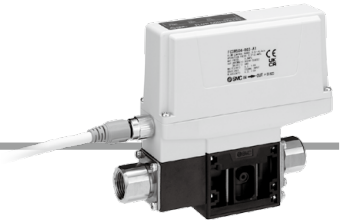
## Flow Controller for Water *FC3W Series*



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# Flow Controller for Water

# FC3W Series



## How to Order

**FC3W5** **04** - **R** **03** - **A1** **C** - **R** **Y**

### Rated control flow rate range

Symbol	Rated control flow rate range
<b>04</b>	0.5 to 4 L/min
<b>20</b>	2 to 16 L/min

### Thread type

Symbol	Thread type
<b>R</b>	Rc
<b>N</b>	NPT
<b>F</b>	G

### Port size

Symbol	Port size	Rated control flow rate range	
		04	20
<b>03</b>	3/8	●	●
<b>04</b>	1/2	—	●

### Input/Output specifications

Symbol	IN1	IN2	OUT1
<b>A1</b>	Voltage 1 to 5 V	External input (Control stop)	Voltage 1 to 5 V
<b>A2</b>	Current 4 to 20 mA		Current 4 to 20 mA
<b>A3</b>	Voltage 0 to 10 V		Voltage 0 to 10 V

### Operation manual

Symbol	Operation manual
<b>Y</b>	None
<b>Z</b>	With operation manual

### Option 2 (Bracket)

Symbol	Bracket
<b>R</b>	With bracket
<b>N</b>	None

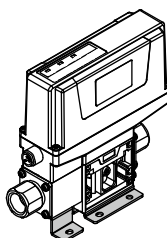
\* The bracket does not come mounted to the product.  
6 mounting screws (3 x 8 L) are shipped with the product for mounting.

### Option 1 (Lead wire)

Symbol	Cable
<b>C</b>	Lead wire with M12 connector (3 m)
<b>N</b>	None

## Options/Part Nos.

When optional parts are required separately, use the following part numbers to place an order.

Description	Part no.	Note
Bracket	ZS-54-A	 With 6 mounting screws (3 x 8 L)
Lead wire with M12 connector	ZS-53-A	5 cores, 3 m

## Specifications

Model		FC3W504	FC3W520
Fluid	Applicable fluid	Water	
	Fluid temperature range	0 to 50°C (No freezing or condensation)	
Flow	Flow rate detection method	Karman vortex	
	Rated control flow rate range*1	0.5 to 4.0 L/min	2.0 to 16.0 L/min
	Leakage when fully closed*2	0.4 L/min or less	1.0 L/min or less
Control specification	Control accuracy*3	±5% F.S.	
	Control dead band*4	Flow rate command value: Within ±2% F.S.	
	Repeatability	±5% F.S.	
	Temperature characteristics	±5% F.S. (0 to 50°C, 25°C reference)	
	Settling time*5	10 s or less within ±5% F.S. of flow command	
	Operation when power is cut off*6	Maintains valve opening position	
Pressure	Operating pressure range*7	0.2 to 0.4 MPa	
	Min. operating differential pressure	0.2 MPa	
	Proof pressure	0.6 MPa	
Analog input*8 (Flow rate command)	Voltage	Input type	1 to 5 VDC/0 to 10 VDC
		Input impedance	Approx. 1 kΩ
	Current	Input type	4 to 20 mA DC
		Input impedance	250 Ω or less
Analog output (Flow rate output)	Voltage	Output type	1 to 5 VDC/0 to 10 VDC
		Output impedance	Approx. 1 kΩ
	Current	Output type	4 to 20 mA DC
		Load impedance	50 to 600 Ω
External input (Control stop input)	Input type	Non-voltage input (0.4 V or less), Input time: 30 ms or more	
	Operation	Flow rate control operation stop (maintains valve opening position)	
Electrical	Power supply voltage	24 VDC ±10%	
	Current consumption*9	0.1 A or less (at control stop/at control settling) 0.5 A or less (during control operation)	
Indicator LED		PWR (green): Power status display ERR (Red): Error status display CTRL (green): Control status display	
Environmental resistance	Enclosure	IP65	
	Operating temperature range	0 to 50°C (No freezing or condensation)	
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)	
	Withstand voltage	1000 VAC for 1 min between terminals and housing	
Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing	
Standards		CE/UKCA marking	
Main materials of parts in contact with fluid		Fluororubber, Stainless steel 304, Stainless steel 303, PP + PE, POM, PPS	
Piping		3/8 (Rc, NPT, G)	3/8, 1/2 (Rc, NPT, G)
Weight	Body	Approx. 480 g	Approx. 500 g
	Bracket	Approx. 50 g	
	Lead wire (3 m)	Approx. 180 g	

\*1 Outside the rated control flow rate range, operation may become unstable.

\*2 This product is not suitable for applications in which the flow rate needs to be at exactly 0.  
If it is necessary to completely shut off the flow rate, install a stop valve, etc. separately.

\*3 Includes a control dead band (F.S. ±2%)

\*4 Control operation is stopped when the control flow rate is ±2% F.S. of the flow rate command value (control dead band).

\*5 Operating pressure: 0.3 MPa, Flow rate command value: Changes from 0% to 100% in steps  
The settling time may be longer in other operating conditions.

\*6 When the power is turned OFF, the control valve operation is stopped to maintain the valve opening position.

\*7 Outside the operating pressure range, normal control operation may not be possible.

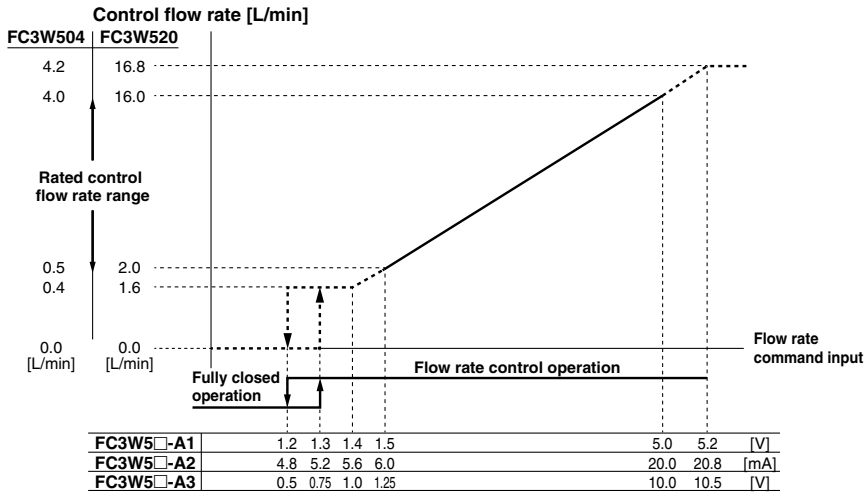
\*8 When the analog input terminal is open (no signal is input), the valve is fully closed.

\*9 If there is an abnormal control operation, such as when there is no supply pressure, the supply current may exceed the specification value.

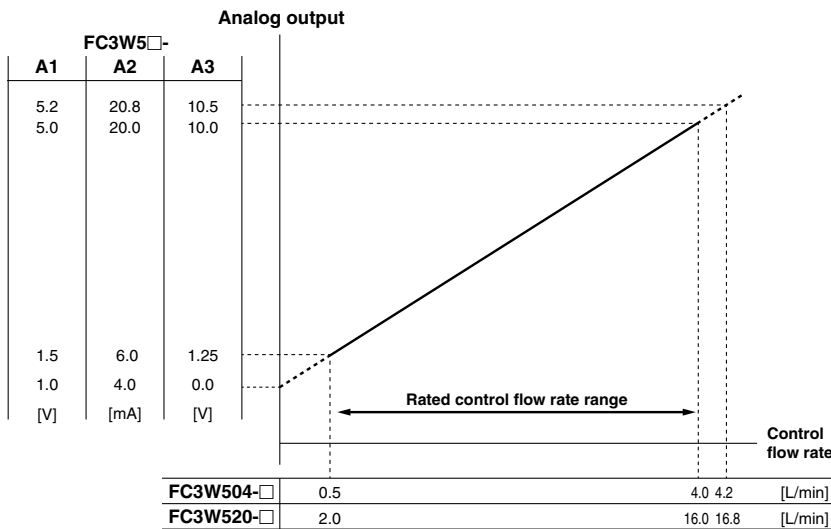
\* Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

# FC3W Series

## Flow Rate Command Input and Control Flow Rate



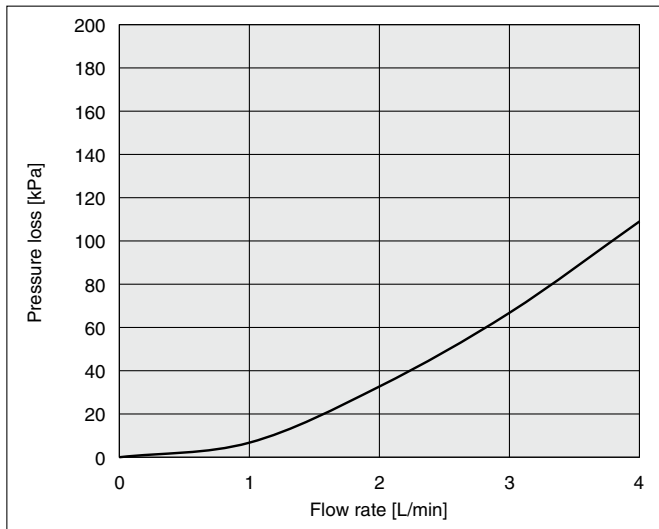
## Control Flow Rate and Analog Output



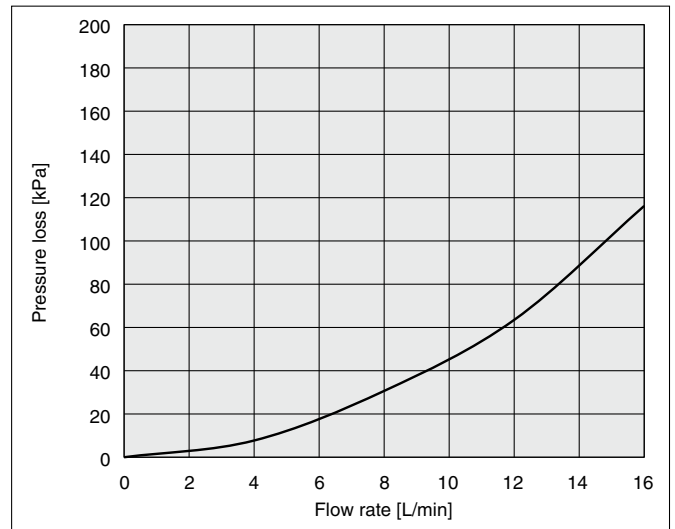
\* When using 0-10 V output (model A3), keep the current flowing into the analog output wire below 20  $\mu$ A. If a current higher than 20  $\mu$ A flows, large errors may occur in the output area of approx. 0.5 V or less.

## Pressure Loss

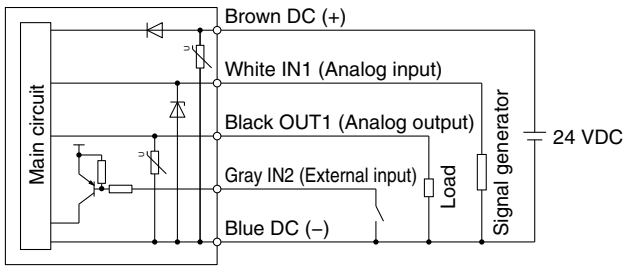
### FC3W504-□



### FC3W520-□

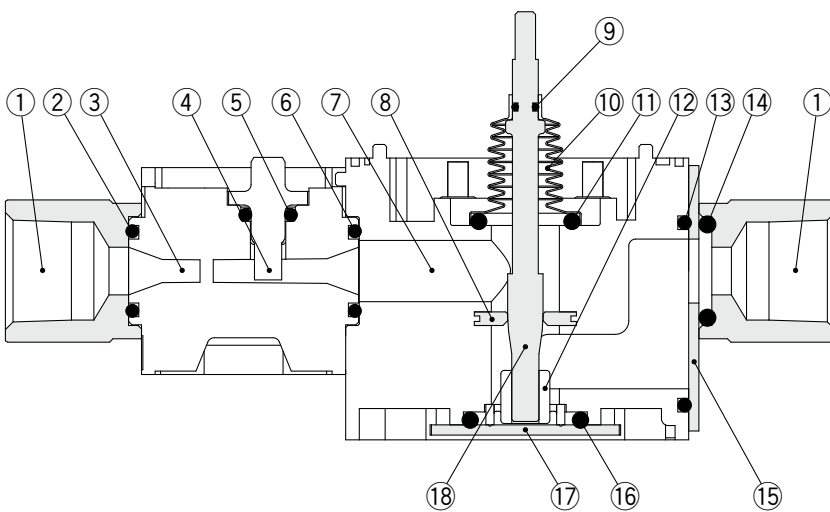


## Internal Circuits and Wiring Examples



Model	IN1 (Analog input)	IN2 (External input)	OUT1 (Analog output)
FC3W5□-□□-A1□-□□	1-5 V	Voltage input below 0.4 V: Control stopped (maintains valve opening position) Open: Control start	1-5 V
FC3W5□-□□-A2□-□□	4-20 mA		4-20 mA
FC3W5□-□□-A3□-□□	0-10 V		0-10 V

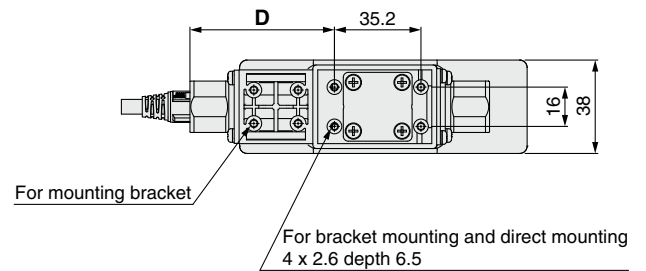
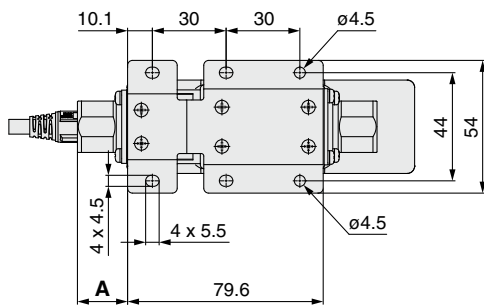
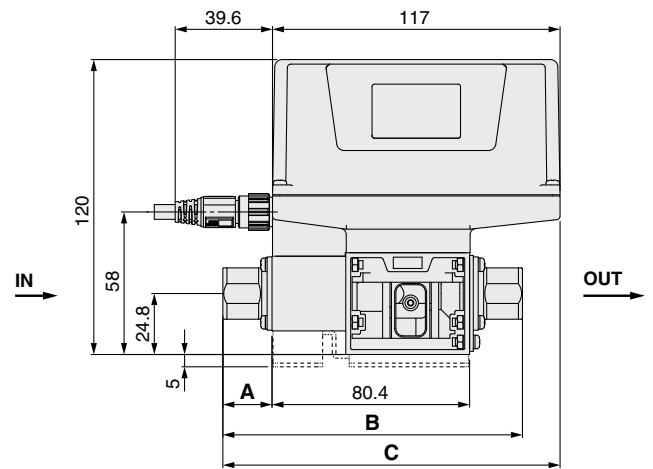
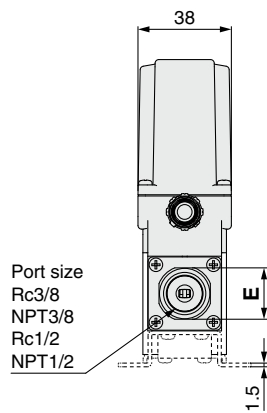
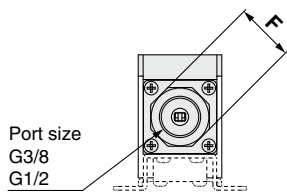
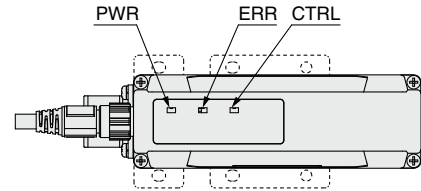
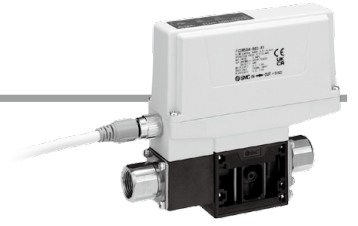
## Construction: Parts in Contact with Fluid



No.	Description	Material
1	Fittings	Stainless steel 304
2	O-ring	Fluororubber
3	Sensor body	PPS
4	Sensor	PPS
5	O-ring	Fluororubber
6	O-ring	Fluororubber
7	Control valve body	PPS
8	Orifice	Stainless steel 303
9	O-ring	Fluororubber
10	Bellows	PP + PE
11	O-ring	Fluororubber
12	Needle guide	POM
13	O-ring	Fluororubber
14	O-ring	Fluororubber
15	Piping plate	Stainless steel 304
16	O-ring	Fluororubber
17	Bottom plate	Stainless steel 304
18	Needle	Stainless steel 304

# FC3W Series

## Dimensions



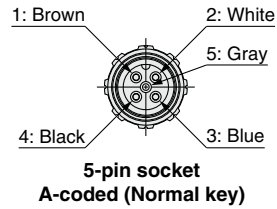
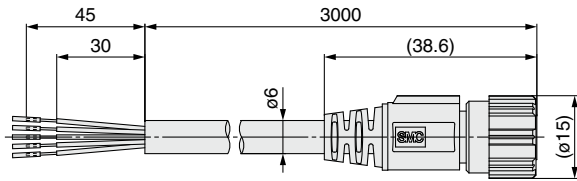
Model	Port size	A	B	C	D	E	F
FC3W504-R03-□	Rc3/8	20	121.9	137.2	58.8	20.9	—
FC3W504-N03-□	NPT3/8	20	121.9	137.2	58.8	20.9	—
FC3W504-F03-□	G3/8	20	121.9	137.2	58.8	—	23.9
FC3W520-R03-□	Rc3/8	24	129.9	141.2	62.8	20.9	—
FC3W520-N03-□	NPT3/8	24	129.9	141.2	62.8	20.9	—
FC3W520-F03-□	G3/8	24	129.9	141.2	62.8	—	23.9
FC3W520-R04-□	Rc1/2	24	129.9	141.2	62.8	23.9	—
FC3W520-N04-□	NPT1/2	24	129.9	141.2	62.8	23.9	—
FC3W520-F04-□	G1/2	24	129.9	141.2	62.8	—	26.9

[mm]



## Dimensions

### Lead wire with M12 connector (Optional part number: ZS-53-A)



Pin no.	Pin description	Wire color	Note
1	DC (+)	Brown	DC 24 [V]
2	IN1	White	Analog input (Flow rate command input)
3	DC (-)	Blue	0 [V]
4	OUT1	Black	Analog output (Flow rate output)
5	IN2	Gray	External input (Control stop input)

### Cable Specifications

<b>Conductor</b>	Nominal cross section	5 x AWG21
	Outside diameter	Approx. 0.9 mm
<b>Insulator</b>	Outside diameter	Approx. 1.7 mm
<b>Sheath</b>	Material	PVC
<b>Finished outside diameter</b>		ø6 mm
<b>Min. bending radius</b>		60 mm

## Functions

### ■ Analog input function (Flow rate command)

Allows for the control of the flow rate according to the analog voltage/current flow rate command

### ■ Analog output function (Flow rate output)

Allows for the output of the analog voltage/current corresponding to the current control flow rate value

### ■ External input function (Control stop input)

Allows for the valve opening position to be immediately maintained via external input

This prevents the valve body from fully opening when the flow supply is cut off, such as when the pump is stopped or when the valve is shut off, thus shortening the control setting time when the pump is restarted.

In addition, as repeated unnecessary valve operation can be prevented, it will lead to an improvement in product life.

### ■ LED display function

This product features a built-in power ON status display LED, error display LED, and control status display LED.

## Operating Life

The operating life of this product is 1 million operations under the following conditions.

<b>Target operation</b>	Full stroke opening and closing operations (one-way operation x 1)
<b>Operating pressure</b>	0.3 [MPa] Constant (within product specification range)
<b>Ambient temperature</b>	20 to 25 [°C]
<b>Fluid temperature</b>	20 to 25 [°C]
<b>Water quality</b>	Clear water

## Caution

In the state where the flow rate is insufficient for the control flow rate (such as when the valve is shut or the pump is stopped), the control valve in the product fully opens.


As a result, the flow rate settling time at the time of control restart may be longer, or the operating life may be shortened if such an operation is performed repeatedly. This may be caused by the valve shutting, the pump stopping, etc.


We recommend turning OFF the power to the product prior to stopping the water flow or fixing (maintaining) the opening position of the control valve using the external input function (control stop input).


When starting flow control, supply water before turning ON the power or releasing the external input (control start) so that the product can start flow control.

## 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.

 **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.

\*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.

### 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.

### 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.

## Safety Instructions

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

## SMC Corporation

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

D-G