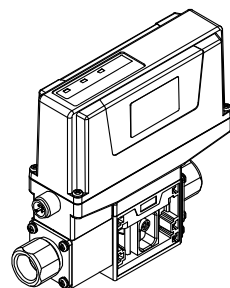




ORIGINAL INSTRUCTIONS

Instruction Manual
Flow Controller for Water
FC3W5## series



The intended use of the flow controller for water is to monitor and display flow information and provide an output signal.

1 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.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more safety instructions.

2 Specifications

2.1 General specifications

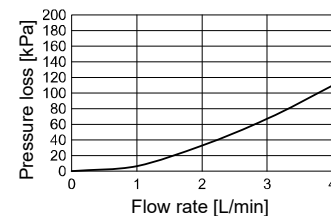
Model	FC3W504	FC3W520	
Fluid	Applicable fluid	Water	
	Fluid temperature range	0 to 50 °C (no condensation or freezing)	
Flow rate	Flow rate detection method	Karman vortex	
	Rated controlled flow rate range *1	0.5 to 4.0 L/min 2.0 to 16.0 L/min	
	Leakage when fully closed *2	0.4 L/min or less 1.0 L/min or less	
Control	Control accuracy *3	±5%F.S.	
	Control dead zone *4	Reach in the range of ±2%F.S. of the commanded flow rate	
	Repeatability	±3%F.S.	
	Temperature characteristics	±5%F.S. (0 to 50 °C, Reference 25 °C)	
	Setting time *5	Within the range of ±5%F.S. of the commanded flow rate within 10 seconds	
Pressure	Operation when power supply is not connected *6	Hold valve state	
	Operating pressure range *7	0.2 to 0.4 MPa	
	Minimum operating differential pressure	0.2 MPa	
Analogue input (Flow rate command) *8	Withstand pressure	0.6 MPa	
	Voltage	Input type: 1 to 5 VDC/0 to 10 VDC Input impedance: Approx. 1 MΩ	
	Current	Input type: 4 to 20 mADC Input impedance: 250 Ω or less	
Analogue output (Flow rate output)	Output type	1 to 5 VDC/0 to 10 VDC	
	Output impedance	Approx. 1 kΩ	
	Current	Output type: 4 to 20 mADC Output impedance: 50 to 600 Ω	
External input (Control stop)	Input type	Dry contact relay input (0.4 V or less), input time: 30 ms or more	
	Operation	Flow rate control operation stop (Hold valve state)	
Electrical	Power supply voltage	24 VDC ±10%	
	Current consumption *9	0.1 A or less (at control stop and setting) 0.5 A or less (during control operation)	
Operation LED	PWR (Green): Power supply status ERR (Red): Error status CTRL (Green): Control status		
Environmental	Enclosure rating	IP65 (IEC 60529)	
	Operating temperature range	0 to 50 °C (No condensation)	
	Operating humidity range	Operation and storage: 35 to 85%R.H. (No condensation)	
	Withstand voltage	1000 VAC for 1 minute between terminals and housing	
	Insulation resistance	50 MΩ or more between terminals and housing (with 500 VDC megger)	
Materials in contact with fluid	FKM, Stainless steel 303/304, PP+PE, POM, PPS		
Piping specifications	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	

2 Specifications (continued)

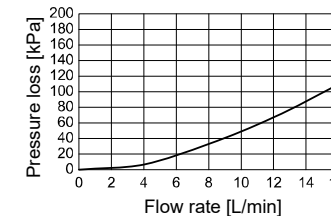
- *1: Operation may become unstable when it is outside the rated controlled flow rate range.
- *2: This product is not suitable for applications to completely cut (stop) the flow rate. If it is necessary to completely cut the flow rate, install a stop valve, etc. separately.
- *3: Includes a control dead zone of ±2%F.S.
- *4: When the controlled flow rate falls within the range of the commanded flow rate ±2%F.S. (control dead zone), the control operation halts.
- *5: The condition is the step change of the commanded flow rate in the range from 0% to 100% at an operating pressure of 0.3 MPa. The settling time may be delayed in other conditions.
- *6: This product stops control valve operation and holds valve state when power is turned OFF.
- *7: Normal control operation may not be available when it is outside the operating pressure range.
- *8: The product will perform a fully closed operation when the analogue input terminal is in open status (signal is not input).
- *9: Current consumption higher than the actual use may be present when abnormalities of control operation such as no supply pressure occurs.
- *10: Any products with tiny scratches, smears, or variations in the display colour or brightness, which does not affect the performance of the product, are verified as conforming products.

2.2 Pressure loss

FC3W504-#



FC3W520-#

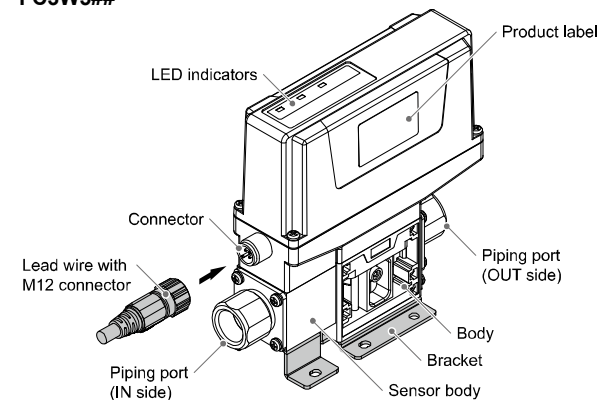


Warning

- Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Names and function of parts

3.1 FC3W5##



Name	Description
Lead wire with M12 connector	Lead wire to supply power supply, input and output signal.
Connector	Connector for lead wire with M12 connector.
Piping port	Piping connections. IN represents inlet and OUT represents outlet.
LED indicators	LED to indicate power supply status, abnormalities, and flow rate control status.
Body	Part of the product comprising the flow path.
Product label	A product label to indicate the model number and flow direction.
Bracket	Mounting bracket for installing the product.

4 Installation

4.1 Installation

Warning

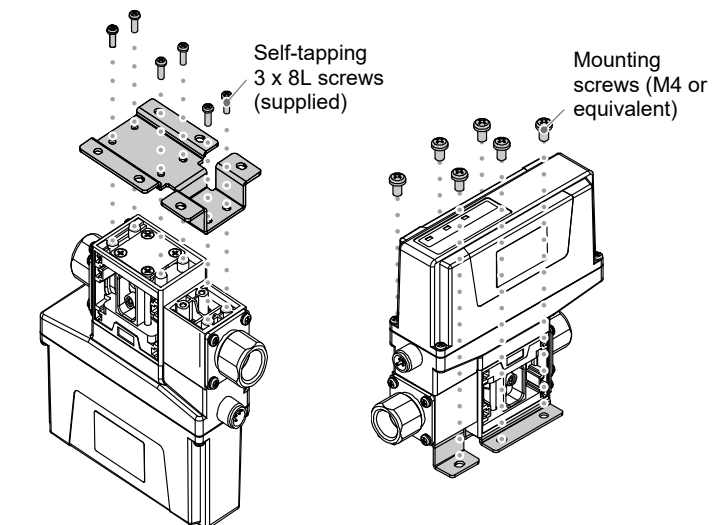
- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified operating pressure and temperature range.

4.2 Mounting

- Never mount the product in a location where it will be used as a mechanical support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- Install the product to keep the internal passage filled with fluid.
- Do not mount the product with the display facing downward.
- When mounting vertically, fluid must flow from the bottom to the top.

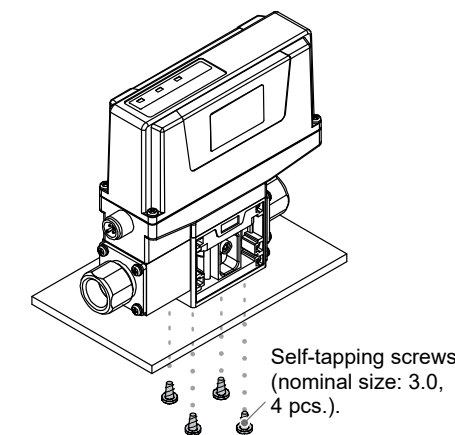
4.3 Mounting with Bracket

- Mount the bracket to the product using the self-tapping screws supplied (3 × 8L, 6 pcs.).
- The recommended tightening torque is 1.0 to 1.2 N·m.
- Mount on a panel using the product mounting screws (equivalent to M4: 6 pcs.). Use screws with sufficient length for the bracket thickness (1.5 mm).



4.4 Direct mounting

- For direct mounting, use self-tapping screws (nominal size: 3.0).

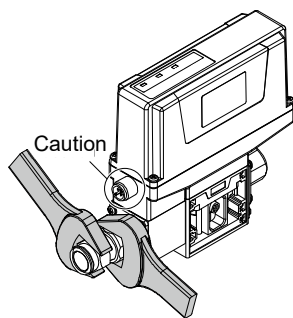


4 Installation (continued)

4.5 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port.
- Ensure there is no leakage after piping.
- When piping the product, hold the piping with a spanner on the metal part of the product (metal piping attachment on the piping side). Using a spanner on other parts may damage the product. Make sure that the spanner does not impact the connector. Otherwise, it may damage the connector.



Attachment details

Thread size	Width across flats
Rc3/8	20.9 mm
NPT3/8	
G3/8	23.9 mm
Rc1/2	23.9 mm
NPT1/2	
G1/2	26.9 mm

After hand tightening, apply a spanner to the spanner flats on the product, and tighten it for 2 to 3 rotations. The recommended tightening torque is shown in the table below.

Thread size	Tightening torque
Rc3/8, NPT3/8	15 to 20 N·m
Rc1/2, NPT1/2	20 to 25 N·m

If the tightening torque is exceeded, the product can be damaged. If the correct tightening torque is not applied, the fittings may become loose and cause leakage.

4.6 Environment

Warning

- Do not use in an environment where corrosive gases, oil, chemicals, salt water or steam are present.
- Do not use the product in an environment where the product is constantly exposed to water splashes.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product specifications.

5 Wiring

5.1 Wiring

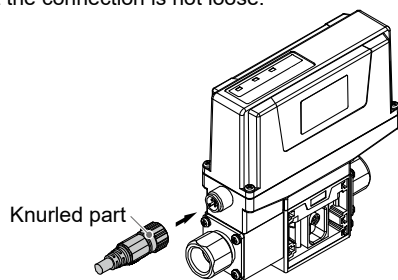
Caution

- Do not perform wiring while the power is on.
- Confirm proper insulation of wiring.
- Avoid repetitive bending, stretching or applying a heavy object or force to the lead wire.
- 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.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge. Do not use a cable longer than 30 m.
- When an analogue output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and the product.

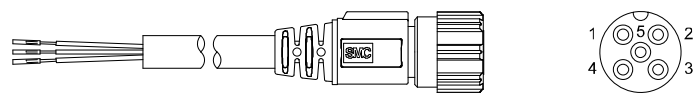
5 Wiring (continued)

5.2 Connection method

- Align the cable connector key groove with the product connector key to insert and rotate the knurled part of the cable connector.
- Check that the connection is not loose.



5.3 Lead wire and connector

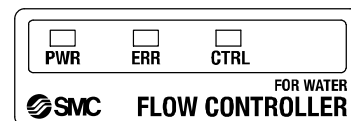


*: Wire colours are for the lead wire included with the FC3W5## series.

Pin number	Wire colour	Name	Explanation
1	Brown	DC(+)	24 VDC
2	White	IN1	Analogue input (Flow rate command input)
3	Blue	DC(-)	0 VDC
4	Black	OUT1	Analogue output (Flow rate output)
5	Grey	IN2	External input (Control stop input) *: Control stops with a Lo input at 0.4 V or less and 30 ms or more *: Hold valve state at signal input

6 Troubleshooting

6.1 Error indication

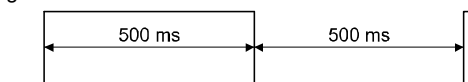


LED	Colour	Status	Description
PWR	Green LED ON	Power supply status	Power supply voltage is supplied to the product.
ERR	Red LED ON	System error	Abnormality of internal data.
	Red LED flashing1	Over-current error	Excessive current is applied to the product.
	Red LED flashing2	Insufficient flow rate	The controlled flow rate does not reach the commanded flow rate.
CTRL	Red LED flashing3	Abnormal power supply voltage	The power supply voltage is lower than approx. 18 V.
	Green LED ON	Control completed	The controlled flow rate is set at within ±5%F.S. of the commanded flow rate.
	Green LED flashing2	Fully closed completed	The control valve is fully closed.
	Green LED flashing1	During control	The flow rate control is operating aiming for the commanded flow rate.
	Green LED OFF	Control stop	The control operation of the control valve is stopped due to the generation of an error or by an external input signal (control stop signal).

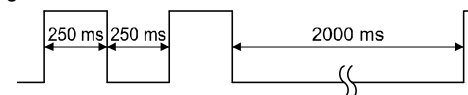
6 Troubleshooting (continued)

6.2 LED Indication method

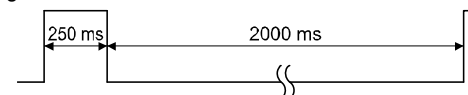
- Flashing1



- Flashing2



- Flashing3



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

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more detailed information about troubleshooting.

7 How to Order

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

8 Outline Dimensions (mm)

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for Outline Dimensions.

9 Maintenance

9.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

How to reset the product after a power cut or when the power has been unexpectedly removed

The settings of the product are retained from before the power cut or de-energizing. 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.

10 Limitations of Use

10.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

11 Product disposal

This product should not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

12 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL: <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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