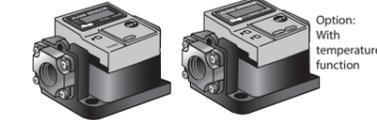


# Impeller type Flow meter unit

## FS-SC Operation Manual

FS-3C/10SC/30SC

(Option: With temperature function)



The latest version is available on our website (URL <http://www.rgl.co.jp/>).

### Before use

Before using this product, be sure to read the Operation Manual and understand the instructions in it. Be sure to observe the method of use, use conditions, and precautions specified in the Operation Manual.

### Safety precautions

The symbols used in this Operation Manual and their meanings are as follows:

	This symbol indicates that misuse of the unit could lead to death or serious injury.		This symbol indicates a prohibited action.
	This symbol indicates that misuse of the unit could lead to injury or damage to buildings, other equipment, and the like.		This symbol indicates a compulsory action.

### WARNING

#### Occurrence of abnormalities and malfunctions

Continuing to use the unit in abnormal or defective conditions such as when smoke, strange smells, or unstable behavior is present may lead to fire or accident. In this case, stop the power supply immediately and notify the dealer of the issue. Under no circumstances should you try to disassemble and repair the product yourself.

#### Use environment

- Do not use this product in places where moisture or condensation is present. Doing so may cause the product to collect moisture in it, resulting in an accident or malfunction.
- Do not use the product in places subject to vibration, shock, or pulsation. Doing so may cause an incorrect operation, accident, or malfunction.

- This product does not have an explosion proof structure. Do not use it in a hazardous location where a flammable, explosive, or corrosive gas atmosphere is present.
- This product is designed to be installed indoors. Do not use it outdoors.
- Do not use this product in a location subject to high temperatures such as near a heater. Doing so may increase the temperature inside the product, resulting in an accident or malfunction. Use this product under the use condition.

### CAUTION

#### Handling of cables

- Do not place heavy objects on cables or pull a cable from the meter unit. Doing so may cause an accident or malfunction.
- If cables not in use come in contact with each other or a cable comes in contact with external equipment, an accident or malfunction may occur. Be sure to insulate each cable before use.
- If the load conditions of output or the tolerance of the power supply voltage is out of the range described in this manual, an accident or malfunction may occur. Be sure to observe the instructions described in the "Wiring method," "Output signals," and "Specifications" sections.

#### Use environment

- Do not use the product in a place that is exposed to electromagnetic waves, radiation, or ultraviolet rays. Doing so may cause an accident or malfunction.
- Do not use the product in a place that is affected by electrolytic corrosion or subject to static electricity build up. Doing so may cause an accident or malfunction.
- Do not use the product in a place that is affected by electrical noise such as the vicinity of a high-frequency power source. Doing so may cause an accident or malfunction.

- If there is a possibility that foreign substances such as metal pieces or seal tape are mixed into the fluid, be sure to install a filter on the upstream side.
- If air bubbles are mixed in the fluid, correct measurement cannot be performed. Remove air bubbles completely before using the product.

#### Unpacking and carrying

- When unpacking or carrying the product, be careful not to drop it. If the meter unit drops, an accident or malfunction may occur.

#### Installation

- Be careful not to pinch your fingers in the meter unit during piping, etc. Doing so may cause injury.

### Other

- If you detect damage or deformation of the product in the package when unpacking it, contact your dealer and explain the situation without using it.

### Maintenance

#### Maintenance and inspection

- The display cover is incorporated with an electronic substrate. Touching the substrate could result in an accident or malfunction. Entrust inspection, adjustment, and repair of the product to your dealer.
- Piping and wiring work, maintenance, and inspection should only be carried out by personnel with expertise and experience.
- For safety reasons, stop the supply of water and power and ensure that the inside of the pipe is in a non-pressurized state before starting maintenance and inspection.

#### Storage method

- When storing our product, store it in a place that meets the following conditions.
  - A place that is not subject to rain or water. - A place without direct sunlight.
  - A place without dust. - A place without vibration and impact. - A static-free area.
  - A place air-conditioned to an ambient temperature between 0 and 40°C (without condensation or freezing).
- \* Store the product in the original packing state.

#### Warranty and disclaimer

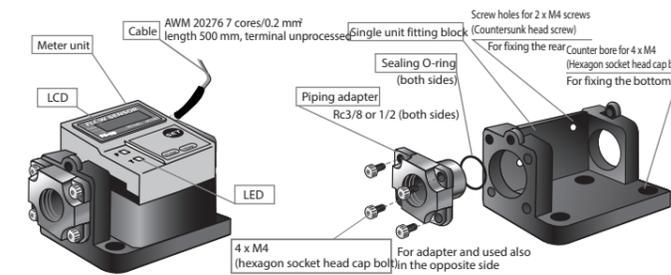
- Regal Joint is not responsible for any accident that is caused by incorrect or improper use of the product.
- The warranty period of Regal Joint's products is one year after the date of delivery.
- For defect of performance or materials within the warranty period, Regal Joint will supply an alternative product when Regal Joint permits in writing that Regal Joint is responsible for the defect.
- The range of warranty here is limited to our products alone. Any damages including loss, damage, and injury that may occur directly or indirectly due to the malfunction of the product will be excluded from the warranty.
- If the alternative product is supplied in advance upon request of the user and subsequent investigation of the defect has revealed that Regal Joint was not responsible for the defect, the cost of the alternative product will be charged.
- \* Though the alternative product is generally the same product, there are cases where an equivalent product will be supplied because of manufacturing reasons.
- \* Examples of defects for which Regal Joint is not responsible include:
  - Use of the product outside the range of the description in the Operation Manual (latest version)
  - Carelessness in use.
  - Disassembly and remodeling of the product.

#### About the Operation Manual

- It is not permitted to reprint and/or reproduce a part or all of this manual without prior permission from Regal Joint Co., Ltd.
- The descriptions in this manual are subject to change without prior notice for performance improvement or other reasons. When using the Operation Manual, reference the latest version. The latest version is available on our website (URL <http://www.rgl.co.jp/>).
- The operation overview and specifications described in this manual are intended to explain the standard operation and characteristics of the product. Therefore, when using this product, perform appropriate physical design under the optimal conditions while considering external conditions.
- All efforts have been made to ensure the accuracy of all information in this manual. However, in the event you notice any unclear, incorrect, or insufficient part in this manual, please contact us.
- \* The shape and specifications are subject to change without prior notice to improve performance.

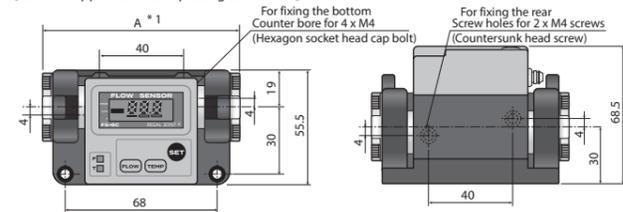
### Configuration and Dimensional Drawing

Figure below is optional: With temperature function  
A magnet is installed on the impeller that rotates according to the flow of liquid, the magnetic field of which is detected. Flow rate is calculated based on change of the magnetic field, which allows displaying the flow rate as well as outputting various signals.



For the single unit fitting block, it is possible to fix its bottom (by using two M4 hexagon socket head cap bolts), to fix its rear (by using two M4 countersunk head screws), or to fix with a pipe, depending on the mounting dimensions.

[External appearance and placing dimension] (unit: mm)



\* 1 The size differs depending on the type of the adapter. The diameter of the adapter is selected when placing an order.

Adapter size	A width
Rc3/8	92
Rc1/2	115

### Specifications

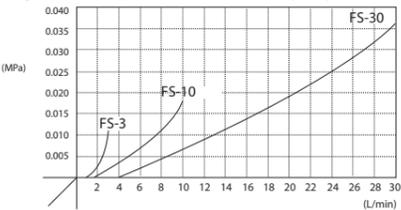
Model	FS-3C	FS-10SC	FS-30SC
Rated flow rate range	0.5 - 3.0 L/min	1.5 - 10.0 L/min	5.0 - 30.0 L/min
Applicable fluid	Industrial water, Water *7 Various liquids		
Detecting method	Impeller type		
Fluid temperature	0~60°C, *7 0~90°C (No freezing, no dewing)		
Ambient temperature	0~50°C, *7 0~40°C (No freezing, no dewing)		
Accuracy <sup>2</sup>	±2.5% F.S.		
Max. operating pressure	1.0 MPa *7 0.5MPa		
Power supply voltage <sup>3</sup>	12 VDC±5% or 24 VDC±10%		
Current consumption	At voltage output: Max. 30 mA		
	At current output: Max. 50 mA <sup>4</sup> Max. 70 mA		
Cable AWM 20276 (7 cores 0.2 mm <sup>2</sup> length 500 mm)			
Flow rate display and temperature display <sup>5</sup> Numerical value LCD display 0.1 step			
Flow rate analog output <sup>5</sup> Temperature analog output <sup>5</sup> (Select voltage and current when placing an order)	Voltage output	0 - 10 V (load 3 kΩ or more) *4	
	Current output	4 - 20 mA (load 300 Ω or less) at 0 - 100°C	
Flow rate alarm output <sup>6</sup> Temperature alarm output	Maximum load current	Below 100 mA	
	Maximum applied voltage	Below 40 V	
Alarm display	Output mode	MOSFET	
	Alarm display	Lights up in one of 2 colored LED (red or green)	
Power down display	Power down LCD blinks at 75% of power supply voltage		
Certification, standard, etc.	RoHS Directive (SUS adapter specification only)		
Material of liquid contacting part	POM-PA-SUS *7 Fluororesin, Ceramic		
Material of connecting part	SUS or BsBM (Ni-plated) *7 Fluororesin		
Sealing O-ring	Fluorine rubber		
Orifice diameter	ø5	ø7	ø10
Pipe diameter	Rc3/8 or Rc1/2 *8 φ10×12mm		
Weight	Approx. 380 g		
Mounting posture	Free		
Direction of flow	Both directions		
Protective structure	Reverse connection protection (available only for 24 VDC specification)		

\* 2 There are errors of maximum ±0.75 L/min, ±0.25 L/min, and ±0.075 L/min, respectively since F.S. (full scale) is 30 L/min, 10 L/min, and 3 L/min, 100°C

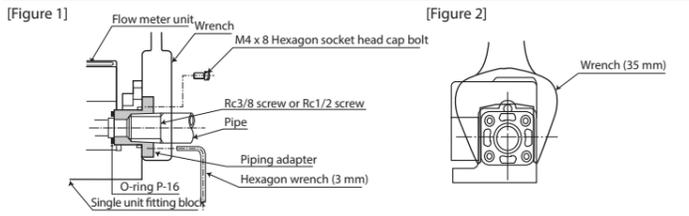
- \* 3 For the power supply voltage, either 12 VDC or 24 VDC may be selected when placing an order.
- \* 4 Option: With temperature function
- \* 5 For the analog output, either voltage output or current output may be selected when placing an order.
- \* 6 Alarm setting value at factory shipping is set to 3SC = 2.0 L/min, 10SC = 6.0 L/min, 30SC = 20.0 L/min.
- \* 7 In case of fluorine resin body.
- \* 8 Fluororesin body When the aperture is optional.

### Flow Rate Characteristics

[Pressure loss diagram]  
The figure below shows pressure difference between the primary and secondary pressures with source pressure of 0.29 Mpa.



### Piping



- Piping must be performed by screwing the pipe into the piping adapter or by using the Kantouch joint made by Regal Joint.
- Caution on installing piping material  
When applying a wrench (35 mm), be sure to put it on the outer circumference of the piping adapter.

**CAUTION** Putting the wrench directly on the fitting block may cause a breakage of the fitting block. (See Figure 2)

- The inner diameter of the piping adapter is that of an Rc3/8 screw or Rc1/2 screw.
- The piping adapter is fixed on the fitting block by using four hexagon socket head cap M4 × 8 bolts. Use a 3 mm hexagonal screw driver or L-type wrench to mount and detach the adapter.

**CAUTION** An O-Ring (Type P-16) is inserted into the sealing surface between the flow meter unit and the piping adapter.

**Take care not to forget to insert it, not to twist it, and not to allow dust to enter inside.**

### WARNING

- Note that if the unit is installed without inserting an O-ring, water will leak.
- If the water/industrial water is very dirty/  
When measuring water, attach a filter to the pipe. Otherwise, sludge will accumulate in the fluid sensor, resulting in malfunction of the sensor. (We offer filters upon request.)
- Do not use air to remove water from the piping. It may cause malfunction of sensors.

### Wiring Method (interface)

Connect the cables to the relay terminal, connector, or the like by soldering or crimping. For connectors, core wire sizes of #24 to #28 are recommended.

**WARNING** Perform terminal processing for unused cables.

#### [Function of each cable]

Color	Name	Characteristics	Output*7 selection	Operation - Usage
Red	Power supply +	24 DCV ± 10% 12 DCV ± 5%	One from two choices	DC power is supplied from the equipment. FS has no power switch and current flows to the unit as soon as power is supplied.
Black	Power supply -	GND		Connects minus side of the power supply. Becomes GND (0V). Becomes the minus line of the analog output.
White	Flow rate analog output	0 - 10 V 4 - 20 mA	One from two choices	The flow rate is converted into an electric signal, which is sent to the equipment side.
Orange	Temperature <sup>4</sup> analog output	0 - 10 V 4 - 20 mA	One from two choices	The water temperature is converted into an electric signal, which is sent to the equipment side.
Yellow	Flow rate alarm output	Photo MOSFET (A) <sup>8</sup> Photo MOSFET (B)	One from two choices	An alarm is reported to the equipment side when the flow rate exceeds the setting value. (A): ON when flow rate is equal to or greater than the setting value. (B): ON when flow rate is less than the setting value.
Brown	Temperature <sup>4</sup> alarm output	Photo MOSFET (A) <sup>8</sup> Photo MOSFET (B)	One from two choices	An alarm is reported to the equipment side when the temperature exceeds the setting value. (A): ON when temperature is equal to or greater than the setting value. (B): ON when temperature is less than the setting value.
Green	Alarm common return	No grounding (COM)		Becomes return of the alarm output. Independent from GND.

\* 7 For the cable shown in "Output selection," one of these specifications is selected when placing an order.  
\* 8 Alarm output (A) = Ex- OFF output, alarm output (B) = Ex- ON output

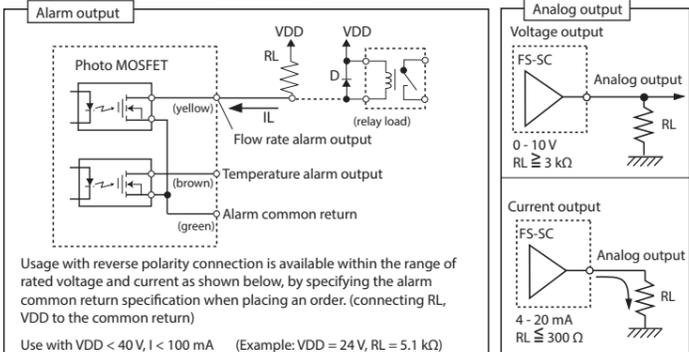
\* Connect wiring in accordance with the model

**WARNING** If cables not in use come in contact with each other or a cable comes in contact with external equipment, an accident or malfunction may occur. Be sure to insulate each cable before use.

- Power supply: (1) If a voltage exceeding the specifications is applied, the unit may be damaged.
- (2) If cables are connected in the reverse polarity, the unit may be damaged. (Reverse connection protection is available only for 24 VDC specification)

- Analog output The unit may be damaged if the output line is short-circuited to Alarm output the power supply.

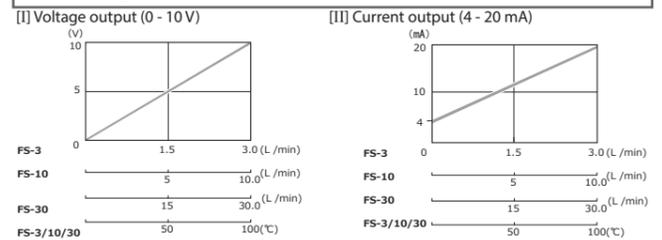
[Method of applying a load] The standard method of applying the load resistance on the equipment side (RL) is shown below.



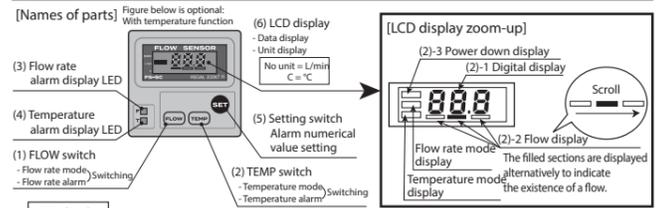
Usage with reverse polarity connection is available within the range of rated voltage and current as shown below, by specifying the alarm common return specification when placing an order. (connecting RL, VDD to the common return)  
Use with VDD < 40 V, I < 100 mA (Example: VDD = 24 V, RL = 5.1 kΩ)

**CAUTION** - When operating the unit under a relay load, use a relay with a diode (D) to prevent breakdown of the photo MOSFET due to a counter-electromotive force.  
- Because analog output is set to the selection at the time of order (either voltage or current output), check the setting before use.

### Output Signals



### Operation Method

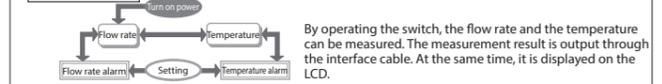


Turning ON the DC power, (2)-1 displays flow rate in digital, and simultaneously (2)-2 scrolls from left to right to indicate the existence of a flow. It scrolls at a constant speed regardless of the flow rate. (No scroll indicates no flow)

- Flow rate is,
  - FS-3C : 0.0 - 3.0 L/min
  - FS-10SC : 0.0 - 10.0 L/min
  - FS-30SC : 0.0 - 30.0 L/min
 temperature: 0-100°C
- (2)-3 Power down display  
When the DC power voltage drops (18 V or less for 24 VDC specification, and 9 V or less for 12 VDC specification), (2)-3 blinks.

\*UP\* display: Exceeds the specification flow rate range.

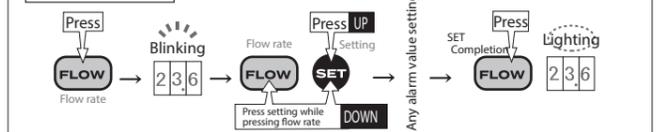
#### Operation outline



#### Flow rate setting

- When DC power is supplied to the unit after connecting the interface cables, operation starts and enters flow rate mode. (Because no power switch is provided, the unit starts when connected to 24 VDC or 12 VDC.)

#### Alarm operation flow



- When the (1) FLOW switch is pressed, the (6) LCD display blinks and the alarm setting is enabled.
  - Pressing the (5) SET switch increases the threshold value. When the target threshold value is reached, press the (1) FLOW switch again. The threshold value is determined and the flow rate is displayed again.
  - When the (5) SET switch is pressed while holding down the (1) FLOW switch, the threshold value decreases.
- Action when the actual flow rate exceeds the threshold value  
For alarm A in <Table 1>, the (3) flow rate alarm display LED changes from red to green and the alarm signal of the cable is turned on. (When placing an order, the reverse polarity can also be set.)

#### <Table 1> Definition of alarm output and display LED

Alarm	Measured value is higher than set value	Measured value is lower than set value	Definitions of the alarm output and display LED are specified in <Table 1> by Regal Joint. We ask the customer to specify the desired alarm in accordance with the application when placing an order. Photo MOSFET ON indicates conductive, and OFF indicates non-conductive. The alarms for the flow rate and the temperature can be set independently.
A (OFF)	Green lamp is ON	Red lamp is ON	
B (ON)	Red lamp is ON	Green lamp is ON	

#### Temperature setting

- Option: With temperature function
- Pressing the (2) TEMP switch shifts the unit to temperature mode. As shown in the figure on the right, three digits are displayed and the unit is indicated in
  - Pressing the (2) TEMP switch again causes the (6) LED display to blink and the temperature alarm setting is enabled.
  - Pressing the (5) SET switch increases the threshold value.
  - By pressing the (2) TEMP switch, the threshold value is determined and the temperature indication is displayed again.
  - When the (5) SET switch is pressed while holding down the (1) TEMP switch, the threshold value decreases.
- Action when the water temperature exceeds the threshold value  
For alarm A in <Table 1>, the (4) Temperature alarm display LED changes from red to green and the alarm signal of the cable is turned on. (When placing an order, the reverse polarity can also be set.)  
\* The threshold can be set in the range from 0 to 99.9°C, but has no hysteresis.

### Maintenance

#### [Removing the meter unit]

- Turn OFF the power supply. (Because a power switch is not installed in this unit, remove the power cable.)
- Loosen the four M4 screws (hexagonal socket head cap screws M4 × 8) for the adapter with a 3 mm hexagonal screw driver or a hex wrench.
- Shift the meter unit slightly toward the adapter side loosened in Step 2.
- Because a gap is generated between the adapter and the meter unit, the meter unit can be pulled towards the upper side of the unit block or toward the front. At this time, note that there is a possibility of water flowing out of the pipe. In addition, be careful not to drop the O-rings placed on both sides.
- To install the unit, follow the reverse of the procedure for removal.

**CAUTION** Do not forget to install O-rings on both sides.

\* For any questions regarding maintenance, please contact us. We are not responsible for any malfunction caused by disassembly or dismantling by the customer.