

# TACMINA

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**Compact Flow Meter    Flow Checker**

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## **FC-1**

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### **User's Manual**

**Before beginning operation, read this manual carefully!  
Ignoring the descriptions in this User's Manual and mishandling the unit  
may result in death or injury, or cause physical damage.**

- Thank you for purchasing this TACMINA product. Please read this manual carefully in order to ensure that you use the unit safely and correctly.
- Be sure to keep this manual in a place where it will be easily available for reference.
- If the FC-1 you bought conforms to special specifications not described in this User's Manual, handle the Flow Checker according to details of separate meetings and drawings.
- Additional information on this product and manuals in other languages may be found on our website.

[www.tacmina.com](http://www.tacmina.com)

## For the Safe Use of This Product

This manual is intended to help the operator to handle the product safely and correctly. In support of this aim, important safety-related instructions are classified as explained below.

Be sure to follow them at all times.



### Warning

- If the product is operated incorrectly in contravention of this instruction, it is possible that an accident resulting in death or serious injury will occur.



### Caution

- This indicates that improper operation can result in an injury or physical damage to the product.

### Important

- This indicates information that should always be followed to maximize the product's performance and service life.

### Note

- This is used to indicate supplementary information.

## Checking the Product

When unpacking, please confirm the following items:

- Is the enclosed product the same model you ordered?
- Do the details on the Flow Checker nameplate match your order?
- Are all the accessories present and correct?
- Please refer to the accessory list below.
- Can you detect any damage due to vibration or shock during transportation?
- Are there any loose or disconnected screws?

All TACMINA products are carefully checked prior to shipment. If, however, you find a defect, please contact your supplying agent.

### ■ Accessory list

| Accessory                      | Model                     |                  |                  |                   |                   |
|--------------------------------|---------------------------|------------------|------------------|-------------------|-------------------|
|                                | FC-1-□□-□P/□□-E□          | FC-1-□□-□B/□□-E□ | FC-1-□□-□C/□□-E□ | FC-1-□□-□CPW□□-E□ | FC-1-□□-□4H/□□-E□ |
| Air release hose (I. D x O. D) | 4 x 6 (soft PVC hose) 1 m |                  |                  |                   |                   |
| Hose/Tube (I. D x O. D)        | —                         | 4 x 9            | 6 x 11           | 1/4" x 3/8"       | 6 x 8             |
|                                |                           | PVC braided hose | PVC braided hose | PE                | PE                |
| User's Manual                  | 1                         |                  |                  |                   |                   |

## Contents

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## Explanation of Product

The FC-1 Flow Checker is used connected to a TACMINA metering pump to monitor abnormal discharge from the pump. On this volumetric flow meter, the flow of liquid in the pump causes the oval gear with built-in magnet to rotate, and a pulse is generated taking this rotation as the magnetic pulse.

### ■ Model code

The model code cannot be arranged freely. See the model columns of ■Connected pump and ■Liquid end materials.

**FC-1 -** V E **-** 4 H **/** 4 H **-** E **-** 6 x 8

①
②
③
④
⑤
⑥
⑦

#### ① Sensor main materials

V: PVC (Polyvinyl chloride)

O: PPO (Noril)

#### ② O-ring materials

E: EPDM

F: Fluro rubber

#### ③ Connection aperture on suction-side\*1

4:  $\phi 4$  ( $\phi 4 \times \phi 9$ )

6:  $\phi 6$  ( $\phi 6 \times \phi 11$ )

#### ④ Connection type on suction-side

H: Hose connection type

P: Pump direct coupling type

B: Direct coupling type for boiler

C: Sodium hypochlorite injection type

CPW: Direct connection type dedicated for use with the DCLPW/CLPW/DCLV/CLV

#### ⑤ Connection aperture on discharge-side\*1

4:  $\phi 4 \times \phi 9$

6:  $\phi 6 \times \phi 11$

#### ⑥ Connection type on discharge-side

H: Hose connection type

B: Hose connection type for boiler

#### ⑦ Connection\*2

none:

-1/4: 1/4" x 3/8"

-1/8: 1/8" x 1/4"

-6x8:  $\phi 6 \times \phi 8$

\*1 When a hose is used to make the connection, the other aperture diameters can be selected from the connection aperture diameters listed under ⑦.

When the connection type on the suction side ④ is "B," only -1/8 can be selected.

\*2 This cannot be selected when the connection aperture on the suction side ③ is "6" and the connection type on the suction side ④ is "H."

## Specifications

### ■ Performance Specifications

|                             |                                                                                             |
|-----------------------------|---------------------------------------------------------------------------------------------|
| Flow rate range             | 0.2 to 1.8 L/min (in case of continuous flow)                                               |
| Pulse constant              | 1 mL/pulse                                                                                  |
| Accuracy                    | ±10%                                                                                        |
| Constant operating pressure | 1.0 MPa                                                                                     |
| Liquid temperature          | -10 to 50°C (No freezing allowed)                                                           |
| Ambient temperature         | 0 to 40°C                                                                                   |
| Liquid viscosity            | 1 to 50 mPa • s                                                                             |
| Environmental protection    | IEC standard: IP65 or equivalent                                                            |
| Output                      | Open collector (collector capacity: 30 V, 30 mA) When pulse output is Hi, green LED lights. |
| Power supply                | 4.5 to 25 V DC (20 mA max.) When power is ON, red LED lights.                               |
| Connection                  | φ4 x φ9 φ6 x φ11 1/4" x 3/8" 1/8" x 1/4" φ6 x φ8                                            |
| Air release aperture        | 4 mm dia. x 6 mm dia. hose                                                                  |

Note 1 Do not exceed the maximum operating pressure and operating temperature range of the applicable pump.

2 Install the Flow Checker so that it is horizontal and the display is vertical.

3 Do not use the Flow Checker for liquids containing fine particles.

4 The pressure loss is 0.05 MPa (in case of water at maximum flow rate).

5 The standard code length is 1.3 m. Limit the transfer distance to 50 m.



#### Caution

- Check the applicable metering pump, pressure and temperature indicated on the nameplate, and use the flow meter within the appropriate range.
- Be sure to use the flow meter within the operating temperature range of the pump.

## Specifications

### ■ Connected pump (for pump direct coupling type only)

| Model                                     | Applicable pump           | Model                                     | Applicable pump        |
|-------------------------------------------|---------------------------|-------------------------------------------|------------------------|
| FC-1-VE-4B/4B-E<br>(none / -1/8)          | PW-30-VTCET               | FC-1-VE-6P/6H-E<br>(none / -1/4 / -6x8)   | PW-60/100-VTCE         |
|                                           | PZ-30-VTCET               |                                           | PZ-60/100-VTCE         |
|                                           | V-10/40-VTCET             |                                           | SXDA1/SXWA1-22/32-VEC  |
|                                           | CS2-10N/30N-VTCET         |                                           | FXD1/FXW1-02/03-VECE   |
| FC-1-VE-4P/4H-E<br>(none / -1/4 / -6x8)   | PW-30-VTCE                |                                           | V-70/100/300-VTCE      |
|                                           | PZ-30-VTCE                |                                           | CS2-60N/100N/300N-VTCE |
|                                           | SXDA1/SXWA1-31/61/12-VEC  | FC-1-OF-6P/6H-E<br>(none / -1/4 / -6x8)   | PW-60/100-VTCF         |
|                                           | FXD1/FXW1-003/006/01-VECE |                                           | PZ-60/100-VTCF         |
|                                           | V-10/40-VTCE              |                                           | SXDA1/SXWA1-22/32-VTC  |
| FC-1-OF-4P/4H-E<br>(none / -1/4 / -6x8)   | CS2-10N/30N-VTCE          |                                           | FXD1/FXW1-02/03-VTCF   |
|                                           | PW-30-VTCF                |                                           | V-70/100/300-VTCF      |
|                                           | PZ-30-VTCF                |                                           | CS2-60N/100N/300N-VTCF |
|                                           | SXDA1/SXWA1-31/61/12-VTC  | FC-1-OF-6C/6H-E<br>(none / -1/4 / -6x8)   | CLPZ-60/100-ATCF       |
|                                           | FXD1/FXW1-003/006/01-VTCF |                                           | CLCS2-60N/100N         |
| FC-1-OF-4C/4H-E<br>(none / -1/4 / -6x8)   | V-10/40-VTCF              | FC-1-OF-6CPW/6H-E<br>(none / -1/4 / -6x8) | DCLPW-60/100-ATCF      |
|                                           | CS2-10N/30N-VTCF          |                                           | CLPW-60/100-ATCF       |
|                                           | CLPZ-30-ATCF              |                                           | CLV-70/100-ATCF        |
|                                           | CLCS2-10N/30N             |                                           | DCLV-70/100-ATCF       |
| FC-1-OF-6CPW/4H-E<br>(none / -1/4 / -6x8) | DCLPW-30-ATCF             |                                           |                        |
|                                           | CLPW-30-ATCF              |                                           |                        |
|                                           | CLV-10/40-ATCF            |                                           |                        |
|                                           | DCLV-10/40-ATCF           |                                           |                        |

- \* The motor installation direction (vertical or horizontal) has no effect on the pump selection.  
(Example: If the FXD1 is listed in the applicable models, the FYD1 is also applicable.)
- \* The number of pump heads has no effect on the pump selection.  
(Example: If the FXD1 is listed in the applicable models, the FXD2 is also applicable.)
- \* The presence/absence of a relief mechanism has no effect on the pump selection.  
(Example: If the PW-30 is listed in the applicable models, the PW-30R is also applicable.)
- \* The control function has no effect on the pump selection.  
(Example: If the PW is listed in the applicable models, the PWM and PWT are also applicable.)

#### Note

- When this product is used with the CLPW series and DCLPW series, signals are output in the following situations as well.  
When air-mixed liquid is discharged but the prescribed amount is not discharged  
When only air is discharged and no liquid is discharged such as when the tank is empty

## Specifications

### ■ Liquid end materials

| Model              | Connection type      | Materials   |       |            |       |               |
|--------------------|----------------------|-------------|-------|------------|-------|---------------|
|                    |                      | Flow sensor |       |            |       |               |
|                    |                      | Lower case  | Plate | Inner case | Rotor | O-ring        |
| FC-1-VE-4H/4H-E□   | Hose connection      | PVC         | PVC   | PPS*1      | PPS   | EPDM          |
| FC-1-OF-4H/4H-E□   |                      | PPO*2       | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-VE-6H/6H-E    |                      | PVC         | PVC   | PPS        | PPS   | EPDM          |
| FC-1-OF-6H/6H-E    |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-VE-4B/4B-E□   | Pump direct coupling | PVC         | PVC   | PPS        | PPS   | EPDM          |
| FC-1-VE-4P/4H-E□   |                      | PVC         | PVC   | PPS        | PPS   | EPDM          |
| FC-1-OF-4P/4H-E□   |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-OF-4C/4H-E□   |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-OF-6CPW/4H-E□ |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-VE-6P/6H-E□   |                      | PVC         | PVC   | PPS        | PPS   | EPDM          |
| FC-1-OF-6P/6H-E□   |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-OF-6C/6H-E□   |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |
| FC-1-OF-6CPW/6H-E□ |                      | PPO         | PPO   | PPO        | PPO   | Fluoro rubber |

| Model              | Materials |            |               |                       |              |                   |
|--------------------|-----------|------------|---------------|-----------------------|--------------|-------------------|
|                    | joint     | Check ball | O-ring        | Valve seat            | Ball stopper | Air release valve |
| FC-1-VE-4H/4H-E□   | PVC       | Ceramic    | EPDM          | EPDM                  | PVC          | PE                |
| FC-1-OF-4H/4H-E□   |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-VE-6H/6H-E    |           |            | EPDM          | EPDM                  |              |                   |
| FC-1-OF-6H/6H-E    |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-VE-4B/4B-E□   |           |            | EPDM          | PTFE                  |              |                   |
| FC-1-VE-4P/4H-E□   |           |            | EPDM          | EPDM                  |              |                   |
| FC-1-OF-4P/4H-E□   |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-OF-4C/4H-E□   |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-OF-6CPW/4H-E□ |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-VE-6P/6H-E□   |           |            | EPDM          | EPDM                  |              |                   |
| FC-1-OF-6P/6H-E□   |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-OF-6C/6H-E□   |           |            | Fluoro rubber | Special fluoro rubber |              |                   |
| FC-1-OF-6CPW/6H-E□ |           |            | Fluoro rubber | Special fluoro rubber |              |                   |

\*1 PPS: Polyphenylene sulfide resin (Ryton)

\*2 PPO: Polyphenylene oxide resin (Noril)

## Piping

### How to Install on □PW□/□PZ□/V/CS2 pumps

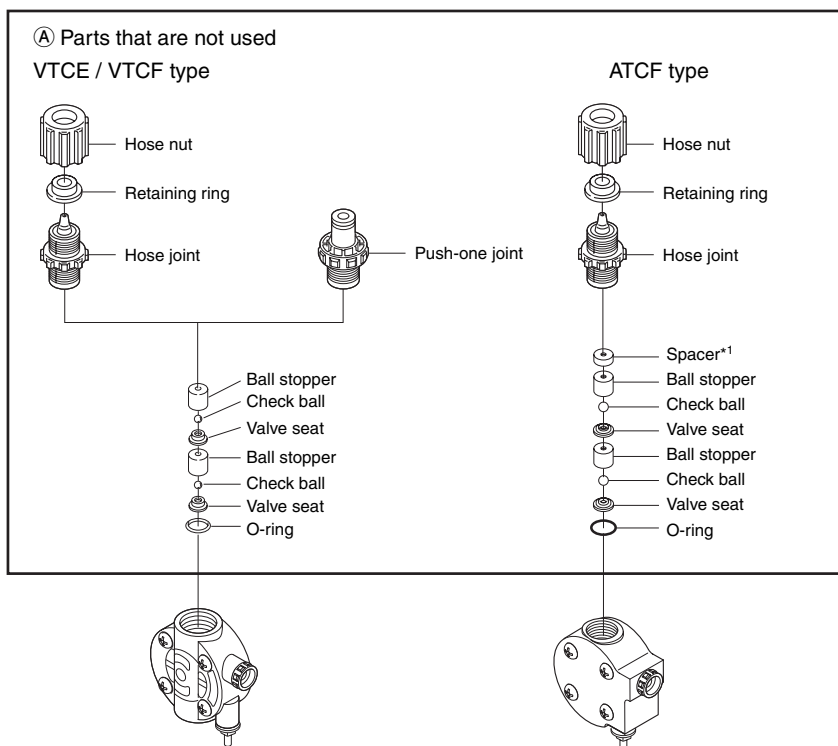
\* For pump direct coupling type only.

#### ■ Disassembling the joint section

- ① Disassemble the upper joint of the pump.
- ② Parts ① are not used when installing the Flow Checker.  
Keep these parts in a safe place.

#### Important

- When the upper joint is removed, check the O-rings and check balls for scratches and the valve seats for adhesion of dirt.

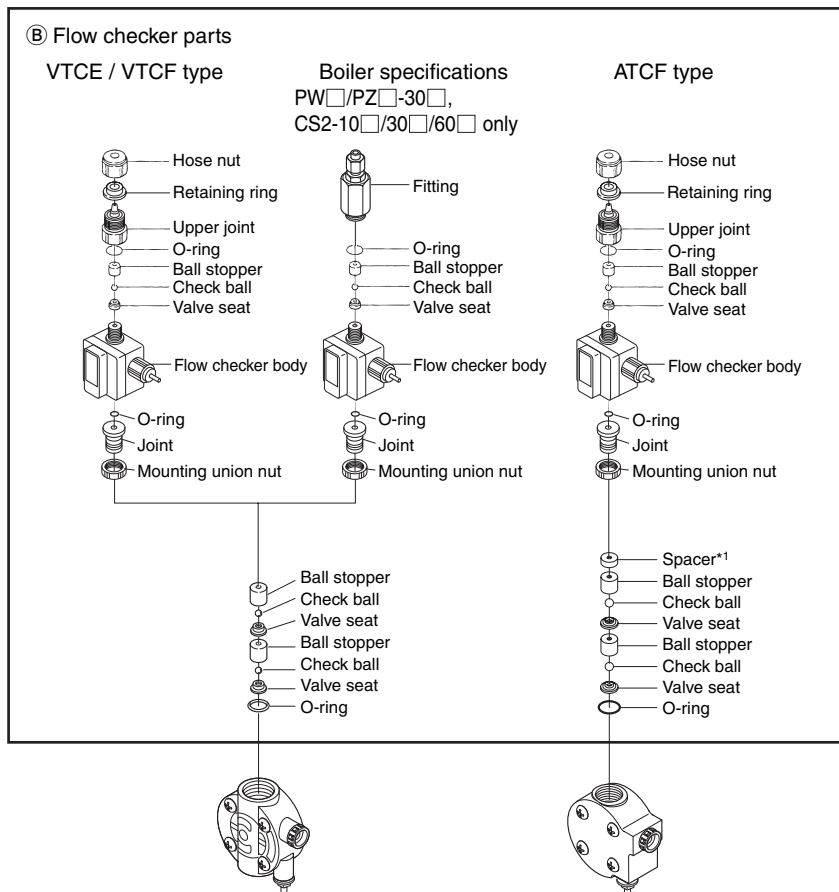


\*1 The spacer is provided only on the ATCF type.

Applicable models · · · □PW□-30□/60□/100□  
 □PZ□-30□/60□/100□  
 V-10□/40□/70□/100□/300□  
 DCLV/CLV-10□/40□/70□/100□  
 CS2-10□/30□/60□/100□/300□

## ■ Installing the Flow Checker

Install the Flow Checker and the disassembled upper joint onto the pump head.



\*1 The spacer is provided only on the ATCF type.

Applicable models . . . □PW□-30□/60□/100□

□PZ□-30□/60□/100□

V-10□/40□/70□/100□/300□

DCLV/CLV-10□/40□/70□/100□

CS2-10□/30□/60□/100□/300□

## How to Install on F□D / F□W / S□DA / S□WA pumps

\* For pump direct coupling type only.

### ■ Disassembling the joint section

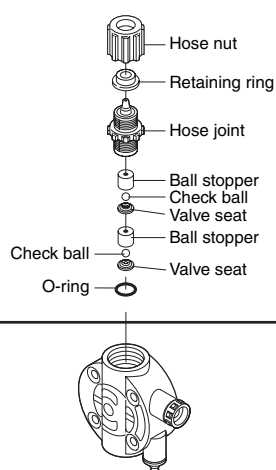
- ① Disassemble the upper joint of the pump.
- ② Parts ① are not used when installing the Flow Checker.  
Keep these parts in a safe place.

### Important

- When the upper joint is removed, check the O-rings and check balls for scratches and the valve seats for adhesion of dirt.

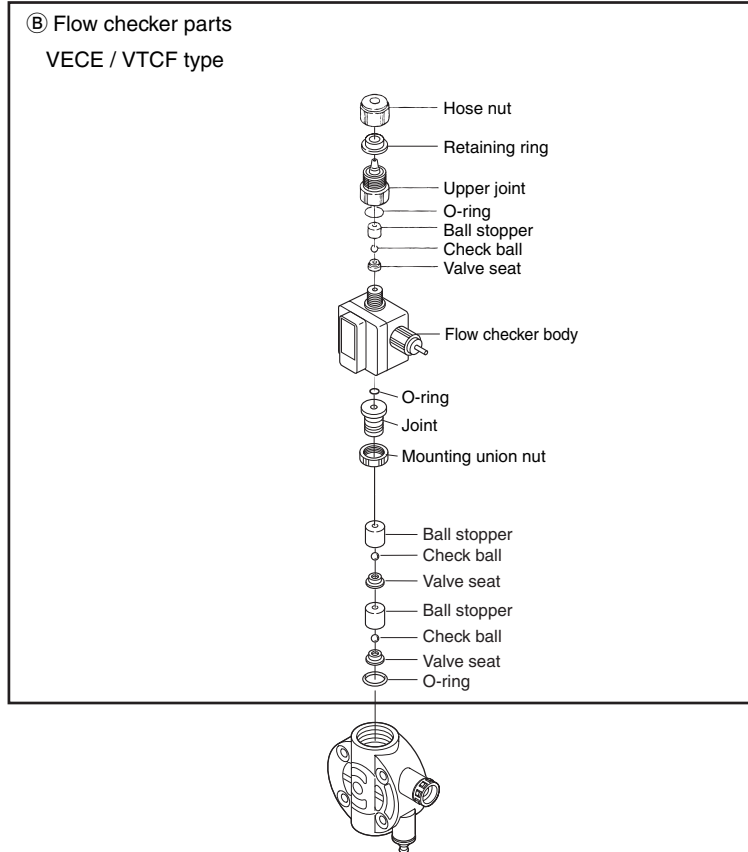
① Parts that are not used

VECE / VTCF type



### ■ Installing the Flow Checker

Install the Flow Checker and the disassembled upper joint onto the pump head.



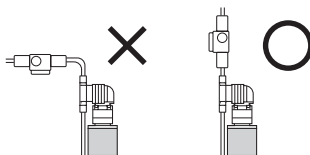
### How to Install on a pump (hose connection type)

#### ■ Installing the Flow Checker

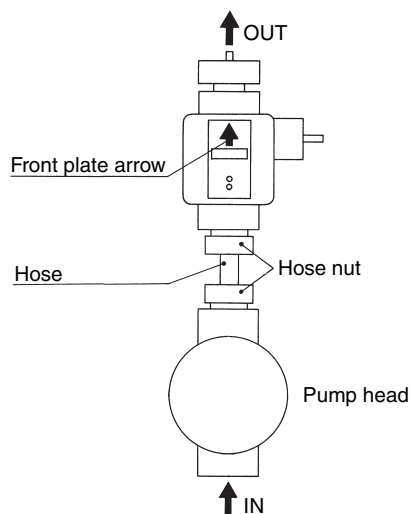
As stated in the User's manual that is included with the pump, use a hose to connect the Flow Checker to the pump head.

##### Note

- Install this product on the discharge side of the pump. If you install it on the suction side, it will not function properly.
- Align the arrow on the front plate of the Flow Checker with the flow direction of the fluid.



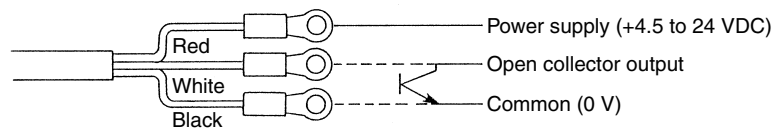
- Install the flow meter so that the display surface is vertical.
- Install the checker as close as possible to the pump head.
- When installing the pipes, make sure that foreign objects such as dirt do not get inside.
- Do not use the checker with fluid that contains slurry.



## Electrical Wiring

### Connecting the Power Supply

- Use a 4.5 to 24 VDC, 20 mA max. power supply.  
Connect the + pole to the red lead of the cable and the - pole to the black lead.



### Connecting to a Flow Monitor

| Flow Monitor terminal |                        | Flow checker lead |
|-----------------------|------------------------|-------------------|
| ①                     | —Common                | .....(black)      |
| ②                     | CELL —Signal           | .....(white)      |
| ③                     | —Power supply (12 VDC) | .....(red)        |
| ④                     | GND                    |                   |
| ⑤                     | AC 0V                  |                   |
| ⑥                     | AC100V                 |                   |
| ⑦                     | AC200V                 |                   |
| ⑧                     | C                      |                   |
| ⑨                     | A                      |                   |
| ⑩                     | B                      |                   |
| ⑪                     | IN                     |                   |
| ⑫                     |                        |                   |
| ⑬                     | GND                    |                   |

Power supply (12 VDC) is connected to terminals ⑤, ⑥, and ⑦.

Alarm contact is connected to terminals ⑧, ⑨, and ⑩.

Interlock (no-voltage contact) is connected to terminals ⑪ and ⑫.

- Limit the transfer distance to 50 m.
- \* The overall length of the discharge volume checker code is 1.3 (m).

## Corrosion Resistance

### ■ Primary compatible chemicals and recommended models for the Flow Checker.

| Chemical            | Conditions                           | Recommended Model |
|---------------------|--------------------------------------|-------------------|
| Hydrochloric acid   | 10% or less, room temperature (23°C) | FC-1-VE           |
| Sulfuric acid       | 10% or less, room temperature (23°C) |                   |
| Sodium hydroxide    | 30% or less, room temperature (23°C) |                   |
| Ammonia water       | Room temperature (23°C)              |                   |
| Methanol            | Room temperature (23°C)              |                   |
| Acetic acid         | Room temperature (23°C)              | FC-1-OF           |
| Sodium hypochlorite | 12% or less, room temperature (23°C) |                   |

\* Rust inhibitor components vary depending on the manufacturer. When using such a compound, contact the chemical manufacturer for details such as those on compatible materials.

\* The compatible fluids and conditions vary depending on the pump that is used. Refer to the specifications of each pump.

## Air Release



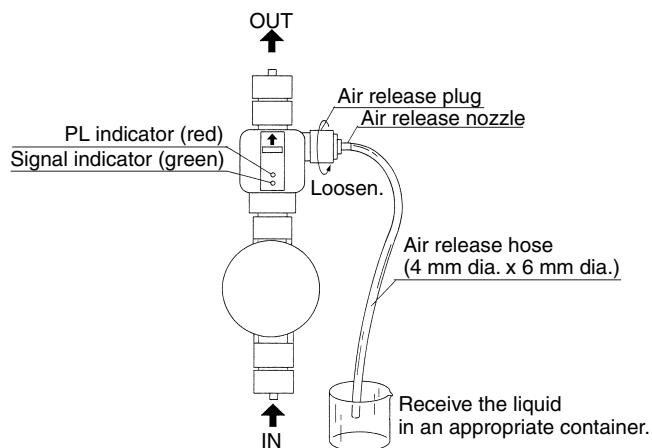
### Warning

- During air release, chemicals spray forcefully from the tip of the air release valve or piping. Either release air using water or other safe liquid, or return the tip of the air release hose or piping to the tank.

### Important

- Release air before pump operation when using the Flow Checker for the first time or when replacing the chemical container.

- ① Set the stroke length adjusting dial on the pump to the 100% position.
- ② Attach the air release hose (4 mm dia. x 6 mm dia.) (provided) to the air release nozzle, and return the hose to the chemical tank.
- ③ Turn the air release plug on the Flow Checker in the counterclockwise (to OPEN) direction to loosen slightly and then turn the pump ON.  
Take care not to loosen the plug too much. Also, when releasing air, be sure to wear protective coverings (rubber gloves, mask, protective goggles, etc.).
- ④ Completely fill the suction-side piping and pump head with the transferring liquid with the pump operating. When the pump head and Flow Checker are filled with liquid, liquid will spray from the air release nozzle. Make sure that the liquid does not splash personnel.
- ⑤ After completely removing any remaining air, tighten the air release plug.
- ⑥ Return the stroke length adjusting dial on the pump to its original position if it has been changed.



## Checking Operation

- ① When the power supply is connected, the red power indicator and green operation signal indicator light.  
(The operation signal indicator goes out depending on the position of the magnet.)
- ② When 1 mL of liquid flows, a pulse signal is emitted, and the green operation signal indicator blinks once.

## Maintenance & Inspection

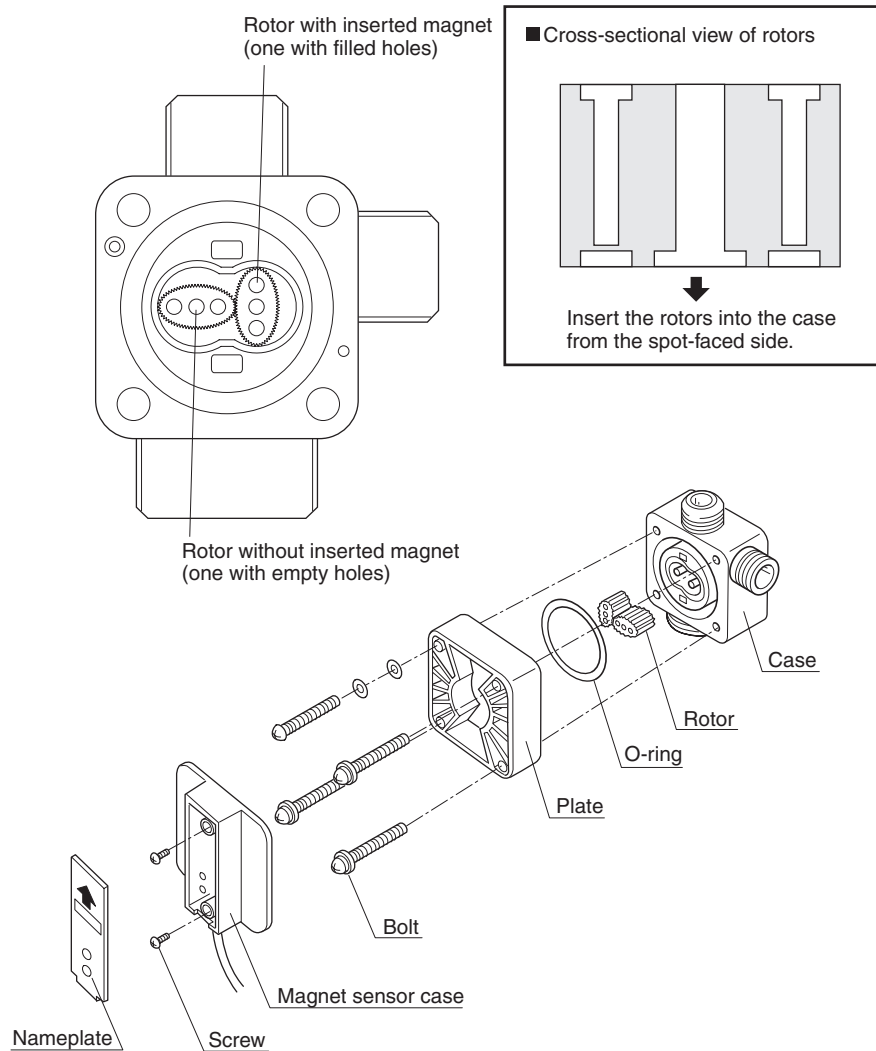
Special maintenance and inspection are not required if the Flow Checker is used within the appropriate flow rate range and under other appropriate conditions.

### ■ Joints

Disassemble and assemble joints referring to the figures in "Piping" on page 7 to 11 onwards.  
Remove the joint section, and check the ball guides and valve seats for dirt and other foreign matter.

### ■ Body

- ① Remove the nameplate.  
(The nameplate is attached to the sensor case by double-sided adhesive tape.)
- ② Unscrew the two screws in the sensor case using a screwdriver and remove the sensor case.
- ③ Remove the four bolts using a screwdriver, and remove the plate to remove the rotors.
- ④ Clean the rotors and inside the case with compressed air. During this operation, take care to prevent components from being blown out by the compressed air. (air pressure: 0.1 to 0.2 MPa)
- ⑤ The rotor without holes contains a magnet. Check this rotor for adhesion of iron powder, and clean off any adhering iron powder with compressed air.
- ⑥ Return the rotors to the case. During this operation, take care not to mistake the top and bottom, and left and right positions of the rotors as these are pre-determined. Also, do not forget to insert the O-rings.
- ⑦ Turn the rotors by hand for at least one turn to make sure that they are firmly engaged inside the case.  
During this operation, also check that rotor action is light and smooth.
- ⑧ Fit in the plate, and lightly tighten the four bolts, then tighten them firmly in order from opposing corners at a tightening torque of about 2.5 N • m. Insufficient tightening may prevent the specified accuracy from being obtained.
- ⑨ Fit in the sensor case, tighten the two screws, and attach the nameplate.



## Customer Services

If you are unsure about customer services (e.g. repair within the warranty period), please contact your supplying agent.

### Warranty

- (1) The warranty period is one (1) year from the date of purchase.
- (2) If, during the warranty period, the product sustains malfunctions or damages despite normal use and proper maintenance as a result of design or manufacturing defect, TACMINA will arrange for repair of the product at no charge to the customer.  
However, the customer will be charged for the following expenses:
  - Malfunctions or damages of the warranted product occurring after the warranty period has expired
  - Malfunctions or damages of the warranted product caused by carelessness in handling or incorrect use or storage
  - Malfunctions or damages of the warranted product resulting from the use of parts other than the ones designated by TACMINA
  - Malfunctions or damages of the warranted product resulting from the repair or remodeling undertaken by individuals other than TACMINA employees or personnel of businesses authorized by TACMINA
  - Malfunctions or damages of the warranted product stemming from changes in the specifications or remodeling of the warranted product instituted at the wishes of individuals (such as the user) other than TACMINA employees
  - Malfunctions or damages of the warranted product resulting from fires, natural disasters, geological calamities and forces majeures
  - Costs incurred by on-site service calls to remote areas
- (3) Decisions on the causes of the malfunctions or damages of the warranted product shall be made in accordance with the outcome of the discussions held between the user and TACMINA's maintenance engineers.
- (4) TACMINA accepts no liability whatsoever for any damage caused by malfunctions of the warranted product or for any damage incurred by use of the warranted product.



Product designs and specifications are subject to change without notice for product improvement.

# TACMINA CORPORATION

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