Digital Flow Switches

Series PF2A

Series PF2W

Series PF2D

For Air

For Water

For Deionized Water and Chemicals

4-channel Flow Monitor

Series PF2D200

New PFA Tube

Super PFA
Flow rate setting and monitoring are possible with the digital display.

Two types are available:
- Integrated
- Remote

Three types of output:
- Switch
- Accumulated pulse
- Analog

Switching from real-time flow rate to accumulated flow is possible.

Two independent flow rate settings are possible.

Water resistant construction conforming to IP65

A single controller can monitor the flow rate of 4 different sensors.

4 independent flow rate ranges can be monitored by a single controller.

Features 1

4-channel Flow Monitor
Series PF2□200

Connection
- Copy function
  Possible to copy information from one channel to one or more other channels.
  Copying CH1 setting to CH2, 3 and 4.

Function
- Channel scan function
  Allows constant monitoring of the displayed pressure value for each channel.

- Key lock function
- Unit switching function
- Peak value and lowest value holding

76% reduced installation space
(Compared with a PF2A□3□□ and PF2□□□□□, when panel mounted.)

Reduced panel fitting labor

Sensor connector

No tools required!

CH1
CH2
CH3
CH4

copy

Power supply/Output connector

Sensor connector

CONNECTOR
### Features

**MULTI COUNTER**: CEU5

- **A COM**
  - COM
  - S.STOP
  - OUT1
  - OUT2
  - OUT3
  - OUT4
  - OUT5
  - AC 100~240V

- **COUNT PRESET**
  - UP
  - DOWN
  - SEL.
  - SET MODE

- **M/C**
  - M/C
  - M/C
  - M/C

**The accumulated pulse output function enables remote monitoring of accumulated flow.**

<table>
<thead>
<tr>
<th>Flow rate measurement range l/min</th>
<th>Integrated type</th>
<th>Remote type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 10</td>
<td>PF2A710</td>
<td>PF2A510</td>
</tr>
<tr>
<td>5 to 50</td>
<td>PF2A750</td>
<td>PF2A550</td>
</tr>
<tr>
<td>10 to 100</td>
<td>PF2A711</td>
<td>PF2A511</td>
</tr>
<tr>
<td>20 to 200</td>
<td>PF2A721</td>
<td>PF2A521</td>
</tr>
<tr>
<td>50 to 500</td>
<td>PF2A751</td>
<td>PF2A551</td>
</tr>
<tr>
<td>150 to 3000</td>
<td>PF2A703H</td>
<td></td>
</tr>
<tr>
<td>300 to 6000</td>
<td>PF2A706H</td>
<td></td>
</tr>
<tr>
<td>600 to 12000</td>
<td>PF2A712H</td>
<td></td>
</tr>
</tbody>
</table>

**For Air**

**Flow control of N₂ gas** to prevent detection camera shimming and lead frame oxidation.

**Flow control of cooling water** for wafer temperature regulation and high frequency power supply.

**Flow control of pressurized cooling water** for welding gun.

**Application Examples**

- **Clean gas filter**
  - Set the clean gas filter on the outlet side piping of the flow switch.

- **Main line flow control**
  - Makes it possible to monitor the air flow from the main line to each branch line.

- **Flow control for each branch line**
  - Pulse counter

(Refer to page 36.)

**For Water**

**Flow rate measurement range l/min**

<table>
<thead>
<tr>
<th>Sensor unit</th>
<th>Display unit</th>
<th>Display unit (4ch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2W704(T)</td>
<td>PF2W30</td>
<td>PF2W20</td>
</tr>
<tr>
<td>PF2W720(T)</td>
<td>PF2W31</td>
<td></td>
</tr>
<tr>
<td>PF2W740(T)</td>
<td>PF2W32</td>
<td></td>
</tr>
<tr>
<td>PF2W711</td>
<td>PF2W33</td>
<td></td>
</tr>
</tbody>
</table>

**For Deionized Water and Chemicals**

**Flow rate measurement range l/min**

<table>
<thead>
<tr>
<th>Sensor unit</th>
<th>Display unit</th>
<th>Display unit (4ch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2D504</td>
<td>PF2D30</td>
<td>PF2D20</td>
</tr>
<tr>
<td>PF2D520</td>
<td>PF2D31</td>
<td></td>
</tr>
<tr>
<td>PF2D540</td>
<td>PF2D32</td>
<td></td>
</tr>
</tbody>
</table>

**For Water**

**Flow rate measurement range l/min**

<table>
<thead>
<tr>
<th>Sensor unit</th>
<th>Display unit</th>
<th>Display unit (4ch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2D504</td>
<td>PF2D30</td>
<td>PF2D20</td>
</tr>
<tr>
<td>PF2D520</td>
<td>PF2D31</td>
<td></td>
</tr>
<tr>
<td>PF2D540</td>
<td>PF2D32</td>
<td></td>
</tr>
</tbody>
</table>
### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2A710</th>
<th>PF2A750</th>
<th>PF2A711</th>
<th>PF2A721</th>
<th>PF2A751</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured fluid (Air, Nitrogen)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Flow rate measurement range (10 to 100 l/min)</td>
<td>0.5 to 10.5 l/min</td>
<td>2.5 to 53.5 l/min</td>
<td>5 to 105 l/min</td>
<td>10 to 210 l/min</td>
<td>25 to 525 l/min</td>
</tr>
<tr>
<td>Set window comparator mode</td>
<td>0.5 to 10.5 l/min</td>
<td>2.5 to 53.5 l/min</td>
<td>5 to 105 l/min</td>
<td>10 to 210 l/min</td>
<td>25 to 525 l/min</td>
</tr>
<tr>
<td>Rated flow range</td>
<td>10 to 100 l/min</td>
<td>5 to 50 l/min</td>
<td>10 to 100 l/min</td>
<td>20 to 200 l/min</td>
<td>50 to 500 l/min</td>
</tr>
<tr>
<td>Minimum set unit</td>
<td>0.1 l/min</td>
<td>0.5 l/min</td>
<td>1 l/min</td>
<td>2 l/min</td>
<td>5 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate (Exchange value: Pulse width: 50 ms)</td>
<td>0.1 l/pulse</td>
<td>0.5 l/pulse</td>
<td>1 l/pulse</td>
<td>2 l/pulse</td>
<td>5 l/pulse</td>
</tr>
<tr>
<td>Display units</td>
<td>Real-time flow rate</td>
<td>Accumulated flow</td>
<td>Operating fluid temperature</td>
<td>±1% F.S. or less</td>
<td>±2% F.S. or less</td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>–50 kPa to 0.5 MPa</td>
<td>–50 kPa to 0.75 MPa</td>
<td>±5% F.S. or less</td>
<td>–50 kPa to 0.5 MPa</td>
<td>–50 kPa to 0.75 MPa</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
<td>±10% or less</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Accumulated flow range</td>
<td>0 to 999999 l</td>
<td>0 to 999999 l</td>
<td>±10% or less</td>
<td>0 to 999999 l</td>
<td>±10% or less</td>
</tr>
<tr>
<td>Switch output</td>
<td>NPN open collector</td>
<td>Maximum load current: 80 mA, Internal voltage drop: 1 V or less (with load current of 80 mA)</td>
<td>Maximum applied voltage: 30 V, 2 outputs</td>
<td>NPN or PNP open collector (same as switch output)</td>
<td>Maximum load current: 80 mA, Internal voltage drop: 1.5 V or less (with load current of 80 mA), 2 outputs</td>
</tr>
<tr>
<td>Accumulated pulse output</td>
<td>NPN or PNP open collector</td>
<td>Maximum load current: 80 mA, Internal voltage drop: 1.5 V or less (with load current of 80 mA), 2 outputs</td>
<td>NPN or PNP open collector (same as switch output)</td>
<td>Maximum load current: 80 mA, Internal voltage drop: 1.5 V or less (with load current of 80 mA), 2 outputs</td>
<td></td>
</tr>
<tr>
<td>Status LED’s</td>
<td>Illuminates up when output is ON</td>
<td>OUT1: Green; OUT2: Red</td>
<td>3-digit, 7-segment LED</td>
<td>3-digit, 7-segment LED</td>
<td>3-digit, 7-segment LED</td>
</tr>
<tr>
<td>Response time</td>
<td>1 sec. or less</td>
<td>1 sec. or less</td>
<td>3-digit, 7-segment LED</td>
<td>3-digit, 7-segment LED</td>
<td>3-digit, 7-segment LED</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed</td>
<td>Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed</td>
<td>Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed</td>
<td>Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed</td>
<td>Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP65</td>
<td>IP65</td>
<td>IP65</td>
<td>IP65</td>
<td>IP65</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)</td>
<td>Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)</td>
<td>Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)</td>
<td>Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)</td>
<td>Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>50MΩ or more</td>
<td>50MΩ or more</td>
<td>50MΩ or more</td>
<td>50MΩ or more</td>
<td>50MΩ or more</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
</tr>
</tbody>
</table>

Note 1: For digital flow switch with unit switching function, (Fixed SI unit [l/min, or l/m² or m³ x 10³]) will be set for switch type without the unit switching function.

Note 2: Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.

Note 3: Without lead wire.

Note 4: Accumulated flow rate is reset when the power supply turns OFF.

Note 5: Switch output and accumulated pulse output can be selected during initial setting.

Note 6: Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)

Note 7: The flow switch conforms to the CE mark.
For Air
Digital Flow Switch Series PF2A

Specifications

How to Order

Remote Type Sensor Unit

PF2A5

Flow rate range

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Port size</th>
<th>Flow rate (l/min)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1/8, 1/4</td>
<td>10, 50, 100, 200, 500</td>
<td>PF2A510/550</td>
</tr>
<tr>
<td>02</td>
<td>1/2</td>
<td>3/8</td>
<td>PF2A511/521</td>
</tr>
<tr>
<td>04</td>
<td>1/2</td>
<td>Nil</td>
<td>PF2A551</td>
</tr>
</tbody>
</table>

Thread type

- Nil
- Rc
- N
- NPT
- F
- G

Flow rate range

- 10: 1 to 10 l/min
- 50: 5 to 50 l/min
- 11: 10 to 100 l/min
- 51: 50 to 500 l/min

Thread type

- Nil
- Rc
- N
- NPT
- F
- G

Output specification

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Specification</th>
<th>Applicable display unit (monitor) model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Output for display unit</td>
<td>Series PF2A300</td>
</tr>
<tr>
<td>1</td>
<td>Output for display unit + analog output (1 to 5 V)</td>
<td>Series PF2A200/300</td>
</tr>
<tr>
<td>2</td>
<td>Output for display unit + analog output (4 to 20 mA)</td>
<td>Series PF2A300</td>
</tr>
</tbody>
</table>

Model | PF2A510 | PF2A550 | PF2A511 | PF2A521 | PF2A551

Measured fluid

- Air, Nitrogen

Detection type

- Heater type

Rated flow range

- PF2A510: 1 to 10 l/min
- PF2A550: 5 to 50 l/min
- PF2A511: 10 to 100 l/min
- PF2A521: 20 to 200 l/min
- PF2A551: 50 to 500 l/min

Operating pressure range

- PF2A510: –50 kPa to 0.5 MPa
- PF2A550: 5 to 50 l/min
- PF2A511: 10 to 100 l/min
- PF2A521: 20 to 200 l/min
- PF2A551: 50 to 500 l/min

Power supply voltage

- 12 to 24 VDC (ripple ±10% or less)

Current consumption (No load)

- 100 mA or less
- 110 mA or less

Enclosure

- IP65

Operating temperature range

- Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)

Withstand voltage

- 1000 VAC for 1 min. between external terminal and case

Insulation resistance

- 50M Ω or more (500 VDC Mega) between external terminal and case

Vibration resistance

- 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, whichever is smaller

Impact resistance

- 490 m/s² in X, Y, Z directions 3 times each

Noise resistance

- 1000 Vp-p, Pulse width 1 µs, Rise time 1 ns

Weight (Note 3)

- 200 g
- 240 g

Port size (Rc, NPT, G)

- 1/8, 1/4
- 3/8
- 1/2

Note 1) The system accuracy when combined with PF2A2/L52408/L52408/L52408

Note 2) Output system can be selected during initial setting.

Note 3) Without lead wire. (Add 20 g for the types of analog output whether voltage or current output selected.)

Note 4) Flow rate unit measured under the following conditions: 0°C and 101.3 kPa.

Note 5) The sensor unit conforms to the CE mark.
### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2A300/301</th>
<th>PF2A310/311</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate measurement range [Note 1]</td>
<td>0.5 to 10.5 l/min</td>
<td>5 to 105 l/min</td>
</tr>
<tr>
<td>Set flow rate range [Note 1]</td>
<td>0.5 to 10.5 l/min</td>
<td>5 to 105 l/min</td>
</tr>
<tr>
<td>Minimum set unit [Note 1]</td>
<td>0.1 l/min</td>
<td>0.5 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50 ms) [Note 1]</td>
<td>0.1 l/pulse</td>
<td>0.5 l/pulse</td>
</tr>
<tr>
<td>Display units [Note 2, 3]</td>
<td>( \epsilon, \text{ ft}^3 \times 10^{-1} )</td>
<td>( \epsilon, \text{ ft}^3 \times 10^{-1} )</td>
</tr>
<tr>
<td>Accumulated flow range [Note 4]</td>
<td>0 to 999999 l</td>
<td>0 to 999999 l</td>
</tr>
<tr>
<td>Linearity [Note 5]</td>
<td>( \pm5% ) F.S. or less</td>
<td>( \pm5% ) F.S. or less</td>
</tr>
<tr>
<td>Repeatability [Note 5]</td>
<td>( \pm1% ) F.S. or less</td>
<td>( \pm1% ) F.S. or less</td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>( \pm1% ) F.S. or less (15 to 35°C, based on 25°C)</td>
<td>( \pm2% ) F.S. or less (0 to 50°C, based on 25°C)</td>
</tr>
<tr>
<td>Current consumption (No load)</td>
<td>50 mA or less</td>
<td>60 mA or less</td>
</tr>
<tr>
<td>Weight</td>
<td>45 g</td>
<td>45 g</td>
</tr>
</tbody>
</table>

**Switch output**

- NPN open collector (PF2A300, PF2A310)
  - Maximum load current: 80 mA
  - Internal voltage drop: 1 V or less (with load current of 80 mA)
  - Maximum applied voltage: 30 V
  - 2 outputs

- PNP open collector (PF2A301, PF2A311)
  - Maximum load current: 80 mA
  - Internal voltage drop: 1.5 V or less (with load current of 80 mA)
  - 2 outputs

**Accumulated pulse output**

- NPN or PNP open collector (same as switch output)

**Indicator light**

- 3-digit, 7-segment LED

**Status LED’s**

- Illuminates up when output is ON: OUT1: Green; OUT2: Red

**Power supply voltage**

- 12 to 24 VDC (ripple \( \pm10\% \) or less)

**Response time**

- 1 sec. or less

**Hysteresis**

- Hysteresis mode: Variable (can be set from 0), Window comparator mode [Note 7]: Fixed (3-digits)

**Enclosure**

- IP40

**Operating temperature range**

- Operating: 0 to 50°C, Stored: -25 to 85°C (with no freezing and condensation)

**Withstand voltage**

- 1000 VAC for 1 min. between external terminal and case

**Insulation resistance**

- 50 MΩ or more (500 VDC Mega) between external terminal and case

**Vibration resistance**

- 10 to 500 Hz with a 1.5 mm amplitude or 98 ms\(^2\) acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.

**Impact resistance**

- 490 ms\(^2\) in X, Y, Z directions 3 times each

**Noise resistance**

- 1000 Vp-p, Pulse width 1 μs, Rise time 1 ns

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**Note 1:** The flow rate measurement range can be modified depending on the setting.

**Note 2:** For digital flow switch with unit switching function, (Fixed SI unit [l/min] or [ft\(^3\)] will be set for switch types without the unit switching function.)

**Note 3:** Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 66% RH.

**Note 4:** Accumulated flow rate is reset when the power supply turns OFF.

**Note 5:** The system accuracy when combined with PF2A5/L52408/L52408.

**Note 6:** Switch output and accumulated pulse output can be selected during initial setting.

**Note 7:** Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)

**Note 8:** The display unit conforms to the CE mark.
## How to Order

**PF2A20**

<table>
<thead>
<tr>
<th>0</th>
<th>M</th>
<th>Option 2 (Refer to page 35.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>None</td>
<td>4C Sensor connector (4 pc.)</td>
</tr>
</tbody>
</table>

| Option 1 (Refer to page 35.) |
| Nil | None |

### Connectable remote type sensor part is PF2A5(□□□□□-1 (with analog output 1 to 5 V)).

### Specifications

**Digital Flow Switch Series PF2A For Air**

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2A200/201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable flow rate sensor</td>
<td>PF2A510□□-1</td>
</tr>
<tr>
<td>Flow rate measurement range (Note 1)</td>
<td>0.5 to 10.5 l/min</td>
</tr>
<tr>
<td>Set flow rate Range</td>
<td>2.5 to 52.5 l/min</td>
</tr>
<tr>
<td>Minimum set unit (Note 1)</td>
<td>0.1 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50 ms) (Note 1)</td>
<td>0.1 l/pulse</td>
</tr>
<tr>
<td>Display units</td>
<td>Real-time flow rate (l/min, CFM x 10^-2)</td>
</tr>
<tr>
<td>Accumulated flow (l, ft^3 x 10^-2)</td>
<td>0 to 999999 l, 0 to 999999 ft^3 x 10^-1</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>24 VDC (ripple ±10% or less) (With power supply polarity protection)</td>
</tr>
<tr>
<td>Current consumption</td>
<td>55 mA or less (Not including the current consumption of the sensor)</td>
</tr>
<tr>
<td>Power supply voltage for sensor</td>
<td>Same as [Power supply voltage]</td>
</tr>
<tr>
<td>Power supply current for sensor (Note 2)</td>
<td>Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)</td>
</tr>
<tr>
<td>Sensor input</td>
<td>1 to 5 VDC (Input impedance: Approx. 800kΩ)</td>
</tr>
<tr>
<td>No. of inputs</td>
<td>4 inputs</td>
</tr>
<tr>
<td>Excess voltage protection</td>
<td>NPN open collector (PF2A200)</td>
</tr>
<tr>
<td>Maximum load current: 80 mA</td>
<td></td>
</tr>
<tr>
<td>Internal voltage drop: 1 V or less with load current of 80 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum applied voltage: 30 V</td>
<td></td>
</tr>
<tr>
<td>PNP open collector (PF2A201)</td>
<td></td>
</tr>
<tr>
<td>Maximum load current: 80 mA</td>
<td></td>
</tr>
<tr>
<td>Internal voltage drop: 1 V or less with load current of 80 mA</td>
<td></td>
</tr>
<tr>
<td>No. of outputs</td>
<td>4 inputs</td>
</tr>
<tr>
<td>Accumulated pulse output</td>
<td>NPN open collector or PNP open collector (same as switch output)</td>
</tr>
<tr>
<td>No. of outputs</td>
<td>4 outputs (1 output per 1 sensor input)</td>
</tr>
<tr>
<td>With short circuit protection</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Hysteresis mode: Variable (can be set from 0). Window comparator mode: Fixed (3-digits)</td>
</tr>
<tr>
<td>Response time (Note 5)</td>
<td>1s or less</td>
</tr>
<tr>
<td>Linearity (Note 5)</td>
<td>±5% F.S. or less</td>
</tr>
<tr>
<td>Repeatability (Note 5)</td>
<td>±3% F.S. or less</td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±2% F.S. or less (0 to 50°C, based on 25°C)</td>
</tr>
<tr>
<td>Display method</td>
<td>For measured value display: 4-digits, 7-segment LED (Orange)</td>
</tr>
<tr>
<td>For channel display: 1-digit, 7-segment LED (Red)</td>
<td></td>
</tr>
<tr>
<td>Status LED's</td>
<td>Illuminates when output is ON: OUT1: Red</td>
</tr>
<tr>
<td>Resistors</td>
<td>IP65 for the front face only, and IP40 for the remaining parts.</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Operating: 0 to 50°C; Stored: ~10 to 60°C (with no freezing and condensation)</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energized)</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>980 m/s^2 in X, Y, Z directions 3 times each (de-energized)</td>
</tr>
<tr>
<td>Noise resistance</td>
<td>500 Vp-p, Pulse width 1 μs, Rise time 1 ns</td>
</tr>
<tr>
<td>Connection</td>
<td>Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)</td>
</tr>
<tr>
<td>Material</td>
<td>Housing: PBT, Display: PET, Backside rubber: CR</td>
</tr>
<tr>
<td>Weight</td>
<td>60 g (Except for any accessories that are shipped together)</td>
</tr>
</tbody>
</table>

**Note 1** Fixed SI unit [l/min or l] will be set for switch types without the unit switching function. "-M" is suffixed at the end of part number. Accumulated flow is reset when the power supply turns OFF.

**Note 2** Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.

**Note 3** If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.

**Note 4** Switch output and accumulated pulse output can be selected during initial setting.

**Note 5** The system accuracy when combined with an applicable flow sensor.

**Note 6** This product conforms to the CE mark.
Series PF2A

Flow Characteristics (Pressure Loss)

PF2A710, 510

PF2A750, 550

PF2A711, 511

PF2A721, 521

PF2A751, 551

Sensor Unit Construction

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attachment</td>
<td>ADC</td>
</tr>
<tr>
<td>2</td>
<td>Seal</td>
<td>NBR</td>
</tr>
<tr>
<td>3</td>
<td>Mesh</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>4</td>
<td>Body</td>
<td>PBT</td>
</tr>
<tr>
<td>5</td>
<td>Sensor</td>
<td>PBT</td>
</tr>
</tbody>
</table>

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attachment</td>
<td>ADC</td>
</tr>
<tr>
<td>2</td>
<td>Seal</td>
<td>NBR</td>
</tr>
<tr>
<td>3</td>
<td>Spacer</td>
<td>PBT</td>
</tr>
<tr>
<td>4</td>
<td>Mesh</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>5</td>
<td>Body</td>
<td>PBT</td>
</tr>
<tr>
<td>6</td>
<td>Sensor</td>
<td>PBT</td>
</tr>
</tbody>
</table>
Digital Flow Switch Series PF2A

Dimensions: Integrated Display Type for Air

PF2A710, 750

Internal circuits and wiring examples
1) to 4) are the terminal numbers.

PF2A711, 721, 751

Connector pin numbers

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Pin description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC(+)</td>
</tr>
<tr>
<td>2</td>
<td>OUT2</td>
</tr>
<tr>
<td>3</td>
<td>DC(–)</td>
</tr>
<tr>
<td>4</td>
<td>OUT1</td>
</tr>
</tbody>
</table>

Flow direction
### Internal circuits and wiring examples

Load is an analog input equipment such as a voltmeter. PF2A5/L52408/L52408-

Load is an analog input equipment such as a voltmeter. PF2A5/L52408/L52408-

Load is an analog input equipment such as a voltmeter. PF2A5/L52408/L52408-

Load is an analog input equipment such as a voltmeter. PF2A5/L52408/L52408-2

### Connector pin numbers

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Pin description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC(+)</td>
</tr>
<tr>
<td>2</td>
<td>NC/Analog output</td>
</tr>
<tr>
<td>3</td>
<td>DC(–)</td>
</tr>
<tr>
<td>4</td>
<td>OUT</td>
</tr>
</tbody>
</table>

---

**Output specification**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>62</td>
</tr>
<tr>
<td>58</td>
<td>72</td>
</tr>
</tbody>
</table>

**Flow direction**

Flow direction
**For Air**

**Digital Flow Switch Series PF2A**

### Dimensions: Remote Type Display Unit for Air

**PF2A3□□□-A**

**Panel mounting type**

![Panel mounting diagram]

**Panel fitting dimensions**

![Panel fitting diagram]

View A

- The applicable panel thickness is 1 to 3.2 mm.

**Internal circuits and wiring examples**

**PF2A3□□□-A**

- Do not connect the white wire of the sensor to terminal 1.

**Terminal block numbers**

**Analog output**

1 to 5 VDC

4 to 20 mA

**Min. measured flow rate value**

**Max. measured flow rate value**

**Real-time flow rate [l/min]**

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Normal condition</th>
<th>Standard condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2A510-□-1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>PF2A550-□-1</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>PF2A511-□-1</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>PF2A521-□-1</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>PF2A551-□-1</td>
<td>50</td>
<td>500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Normal condition</th>
<th>Standard condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2A510-□-2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>PF2A550-□-2</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>PF2A511-□-2</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>PF2A521-□-2</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>PF2A551-□-2</td>
<td>50</td>
<td>500</td>
</tr>
</tbody>
</table>
Series PF2A

Dimensions: Remote Type Display Unit for Air (4-channel Flow Monitor)

PF2A200, 201

Front protective cover + Panel mounting

Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm
Dimensions: Remote Type Display Unit for Air (4-channel Flow Monitor)

Sensor connector port

Power supply / Output connector port

Sensor connector (4P x 4)

Connector (option)

Power supply / Output connector (8P)

Internal circuits and wiring examples

PF2A200

PF2A201
For Air
Digital Flow Switch/High Flow Rate Type
Series PF2A

Specifications

Model | PF2A703H | PF2A706H | PF2A712H
---|---|---|---
Measured fluid | Dry air, Nitrogen | Dry air, Nitrogen | Dry air, Nitrogen
Detection type | Heater type | Heater type | Heater type
Rated flow range | 150 to 3000 ℓ/min | 300 to 6000 ℓ/min | 600 to 12000 ℓ/min
Minimum set unit | 5 ℓ/min | 10 ℓ/min | 10 ℓ/min
Display units | Real-time flow rate: ℓ/min, CFM | | |
Operating pressure range | 0.1 to 1.5 MPa | | |
Hysteresis | ±1.5% F.S. or less (0.7 MPa, at 20 °C) | | |
Repeatability | ±1.0% F.S. or less (0.7 MPa, at 20 °C), ±3.0% of F.S. or less in case of analog output | | |
Pressure characteristics | ±1.5% F.S. or less (0.1 to 1.5 MPa, based on 0.7 MPa) | | |
Temperatures characteristics | ±2.0% F.S. or less (0 to 50 °C, based on 25 °C) | | |
Switch output | NPN open collector 1 output + Analog output (1 to 5 V) | NPN open collector 1 output + Analog output (4 to 20 mA) + Analog output (1 to 5 V) | NPN open collector 1 output + Analog output (4 to 20 mA) + Analog output (1 to 5 V)
Accumulated pulse output | NPN open collector 1 output + Analog output (1 to 5 V) | NPN open collector 1 output + Analog output (4 to 20 mA) + Analog output (1 to 5 V) | NPN open collector 1 output + Analog output (4 to 20 mA) + Analog output (1 to 5 V)
Analog output | Output voltage: 1 to 5 V; Load impedance: 100 kΩ or more | Output voltage: 1 to 5 V; Load impedance: 100 kΩ or more | Output voltage: 1 to 5 V; Load impedance: 100 kΩ or more
Response time | 1 sec. or less | 1 sec. or less | 1 sec. or less
Hysteresis | Hysteresis mode: Variable (can be set from 0); Window comparator mode: (can be set from 0 to 3% F.S.) | Hysteresis mode: Variable (can be set from 0); Window comparator mode: (can be set from 0 to 3% F.S.) | Hysteresis mode: Variable (can be set from 0); Window comparator mode: (can be set from 0 to 3% F.S.)
Power supply voltage | 24 VDC (ripple ±10% or less) | 24 VDC (ripple ±10% or less) | 24 VDC (ripple ±10% or less)
Current consumption | 150 mA or less | 150 mA or less | 150 mA or less
Enclosure | IP65 | IP65 | IP65
Operating temperature range | 0 to 50 °C (with no freezing and condensation) | 0 to 50 °C (with no freezing and condensation) | 0 to 50 °C (with no freezing and condensation)
Withstand voltage | 1000 VAC for 1 min. between external terminal and case | 1000 VAC for 1 min. between external terminal and case | 1000 VAC for 1 min. between external terminal and case
Vibration resistance | 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s²; acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. | 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s²; acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. | 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s²; acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.
Weight | 1.1 kg (without lead wire) | 1.3 kg (without lead wire) | 2.0 kg (without lead wire)
Port size (Rc, NPT, G) | 1 | 1⅛ | 2

Note 1) Flow rate display can be switched between the basic condition of 0 ℓ/min, 101.3 kPa and the standard condition (ANR) of 20 ℓ/min, 101.3 kPa, and 65% RH.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [ℓ/min, ℓ, m³ or m³ x 10³]) will be set for switch type without the unit switching function.
Note 3) The high flow rate type is CE marked; however, the linearity with applied noise is ±5% F.S. or less.
Note 4) Switch output and accumulated pulse output selections are made using the button controls.
Note 5) The analog output operates only for real-time flow rate, and does not operate for accumulated flow.

How to Order

Flow rate range

<table>
<thead>
<tr>
<th>Port size</th>
<th>Flow rate (ℓ/min)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3000</td>
<td>PF2A703H</td>
</tr>
<tr>
<td>14</td>
<td>6000</td>
<td>PF2A706H</td>
</tr>
<tr>
<td>20</td>
<td>12000</td>
<td>PF2A712H</td>
</tr>
</tbody>
</table>

Output specification

- NPN open collector 1 output + Analog output (1 to 5 V)
- NPN open collector 1 output + Analog output (4 to 20 mA) + Analog output (1 to 5 V)
- PNP open collector 1 output + Analog output (4 to 20 mA)

Switching of switch output and accumulated pulse output is possible with NPN or PNP open collector outputs.

Refer to www.smcworld.com for details of products compatible with overseas standards.
### Flow Characteristics (Pressure Loss)

#### PF2A703H

<table>
<thead>
<tr>
<th>Flow rate (l/min)</th>
<th>Pressure loss (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.150</td>
<td>0</td>
</tr>
<tr>
<td>0.300</td>
<td>10</td>
</tr>
<tr>
<td>0.600</td>
<td>20</td>
</tr>
<tr>
<td>1.200</td>
<td>30</td>
</tr>
<tr>
<td>1.800</td>
<td>40</td>
</tr>
<tr>
<td>2.400</td>
<td>50</td>
</tr>
<tr>
<td>3.000</td>
<td>60</td>
</tr>
</tbody>
</table>

#### PF2A706H

<table>
<thead>
<tr>
<th>Flow rate (l/min)</th>
<th>Pressure loss (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.150</td>
<td>0</td>
</tr>
<tr>
<td>0.300</td>
<td>10</td>
</tr>
<tr>
<td>0.600</td>
<td>20</td>
</tr>
<tr>
<td>1.200</td>
<td>30</td>
</tr>
<tr>
<td>1.800</td>
<td>40</td>
</tr>
<tr>
<td>2.400</td>
<td>50</td>
</tr>
<tr>
<td>3.000</td>
<td>60</td>
</tr>
</tbody>
</table>

#### PF2A712H

<table>
<thead>
<tr>
<th>Flow rate (l/min)</th>
<th>Pressure loss (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.150</td>
<td>0</td>
</tr>
<tr>
<td>0.300</td>
<td>10</td>
</tr>
<tr>
<td>0.600</td>
<td>20</td>
</tr>
<tr>
<td>1.200</td>
<td>30</td>
</tr>
<tr>
<td>1.800</td>
<td>40</td>
</tr>
<tr>
<td>2.400</td>
<td>50</td>
</tr>
<tr>
<td>3.000</td>
<td>60</td>
</tr>
</tbody>
</table>

### Construction

![Construction Diagram](attachment:image.png)

### Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attachment</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>2</td>
<td>Seal</td>
<td>HNBR</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>Mesh</td>
<td>Stainless steel</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>Body</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>5</td>
<td>Sensor</td>
<td>PPS</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>Spacer</td>
<td>PBT</td>
<td>—</td>
</tr>
</tbody>
</table>
**Dimensions**

**PFA703H, 706H, 712H**

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K1</th>
<th>K2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2A703H</td>
<td>55</td>
<td>160</td>
<td>40</td>
<td>92</td>
<td>67</td>
<td>55</td>
<td>Rc1, NPT1, G1</td>
<td>36</td>
<td>50</td>
<td>0.8</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>PF2A706H</td>
<td>65</td>
<td>180</td>
<td>45</td>
<td>104</td>
<td>79</td>
<td>65</td>
<td>Rc1 1/2, NPT1 1/2, G1 1/2</td>
<td>46</td>
<td>58</td>
<td>1</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>PF2A712H</td>
<td>75</td>
<td>220</td>
<td>55</td>
<td>114</td>
<td>89</td>
<td>75</td>
<td>Rc2, NPT2, G2</td>
<td>56</td>
<td>62</td>
<td>1</td>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

**Accumulated pulse output wiring examples**

- **Model**: PF2A703H
  - DC(+) – 1
  - Analog output – 2
  - DC(–) – 3
  - OUT1 – 4

**Accumulated pulse output wiring examples**

- **Model**: PF2A706H
  - DC(+) – 1
  - Analog output – 2
  - DC(–) – 3
  - OUT1 – 4

**Accumulated pulse output wiring examples**

- **Model**: PF2A712H
  - DC(+) – 1
  - Analog output – 2
  - DC(–) – 3
  - OUT1 – 4

**Analog output**

1 to 5 VDC

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Min. measured flow rate value [l/min]</th>
<th>Max. measured flow rate value [l/min]</th>
<th>Real-time flow rate [l/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2A703H-28</td>
<td>150</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>PF2A703H-68</td>
<td>300</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>PF2A706H-28</td>
<td>300</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>PF2A706H-68</td>
<td>600</td>
<td>12000</td>
<td></td>
</tr>
</tbody>
</table>

**4 to 20 mA DC**

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Min. measured flow rate value [l/min]</th>
<th>Max. measured flow rate value [l/min]</th>
<th>Real-time flow rate [l/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF2A703H-29</td>
<td>150</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>PF2A703H-69</td>
<td>300</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>PF2A706H-29</td>
<td>300</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>PF2A706H-69</td>
<td>600</td>
<td>12000</td>
<td></td>
</tr>
</tbody>
</table>
For Water
Digital Flow Switch
Series PF2W

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2W704</th>
<th>PF2W720</th>
<th>PF2W740</th>
<th>PF2W711</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured fluid</td>
<td>Water</td>
<td>Water</td>
<td>Water</td>
<td>Water</td>
</tr>
<tr>
<td>Flow rate measurement range</td>
<td>0.35 to 4.5 l/min</td>
<td>1.7 to 17.0 l/min</td>
<td>3.5 to 45 l/min</td>
<td>7 to 110 l/min</td>
</tr>
<tr>
<td>Set flow rate range</td>
<td>0.35 to 4.5 l/min</td>
<td>1.7 to 17.0 l/min</td>
<td>3.5 to 45 l/min</td>
<td>7 to 110 l/min</td>
</tr>
<tr>
<td>Rated flow range</td>
<td>0.5 to 4 l/min</td>
<td>2 to 16 l/min</td>
<td>5 to 40 l/min</td>
<td>10 to 100 l/min</td>
</tr>
<tr>
<td>Minimum set unit</td>
<td>0.05 l/min</td>
<td>0.1 l/min</td>
<td>0.5 l/min</td>
<td>1 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50 ms)</td>
<td>0.05 l/pulse</td>
<td>0.1 l/pulse</td>
<td>0.5 l/pulse</td>
<td>1 l/pulse</td>
</tr>
<tr>
<td>Operating fluid temperature</td>
<td>0 to 50°C</td>
<td>±5% F.S. or less</td>
<td>±3% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±3% F.S. or less</td>
<td>±3% F.S. or less</td>
<td>±3% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±5% F.S. or less</td>
<td>±2% F.S. or less</td>
<td>±2% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics (Note 1)</td>
<td>±5% F.S. or less (0 to 50°C, based on 25°C)</td>
<td>±2% F.S. or less</td>
<td>±2% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Current consumption (No load)</td>
<td>70 mA or less</td>
<td>80 mA or less</td>
<td>80 mA or less</td>
<td></td>
</tr>
<tr>
<td>Weight (Note 2)</td>
<td>460 g</td>
<td>520 g</td>
<td>700 g</td>
<td>1150 g</td>
</tr>
<tr>
<td>Port size (Rc, NPT, G)</td>
<td>3/8</td>
<td>3/8</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>Port size</td>
<td>4/6</td>
<td>16</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>Symbol</td>
<td>03</td>
<td>04</td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td>Port size</td>
<td>3/8</td>
<td>1/2</td>
<td>3/4</td>
<td>1</td>
</tr>
<tr>
<td>Flow rate range</td>
<td>0.5 to 4 l/min</td>
<td>2 to 16 l/min</td>
<td>5 to 40 l/min</td>
<td>10 to 100 l/min</td>
</tr>
<tr>
<td>Thread type</td>
<td>Nil</td>
<td>Rc</td>
<td>N</td>
<td>NPT</td>
</tr>
</tbody>
</table>

How to Order

Integrated Display Type

PF2W7 [20] [03] [27] [M]

How to Order

Lead wire (Refer to page 35.)

Lead wire: Nil (Without unit switching function)

Lead wire: M12 3 m lead wire with connector (With unit switching function)

Output specification

27 NPN open collector 2 outputs

67 PNP open collector 2 outputs

Note 1) In the case of PF2W711, ±3% of F.S. or less (15°C to 35°C, based on 25°C). Note 2) Without lead wire.

Note 3) For digital flow switch with unit switching function. (Fixed SI unit: l/min or l will be set for switch type without the unit switching function.)

Note 4) Accumulated flow rate is reset when the power supply turns OFF. Note 5) Switch output and accumulated pulse output can be selected during initial setting.

Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more.

Note 7) This product conforms to the CE mark.

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How to Order

Remote Type Sensor Unit

- **PF2W5**
  - 20
  - 03
  - 03

Flow rate range:
- 04: 0.5 to 4 l/min
- 20: 2 to 16 l/min
- 40: 5 to 40 l/min
- 11: 10 to 100 l/min

Thread type:
- Nil
- Rp
- N
- G

Port size:
- 03: 3/8
- 04: 1/2
- 06: 3/4
- 10: 1

Flow rate (l/min):
- PF2W504, PF2W520: 0.5 to 4
- PF2W520, PF2W540: 2 to 16
- PF2W540, PF2W511: 5 to 40
- PF2W511: 10 to 100

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2W504</th>
<th>PF2W520</th>
<th>PF2W540</th>
<th>PF2W511</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured fluid</td>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detection type</td>
<td>Karman vortex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated flow range</td>
<td>0.5 to 4 l/min</td>
<td>2 to 16 l/min</td>
<td>5 to 40 l/min</td>
<td>10 to 100 l/min</td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>0 to 1 MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withstand pressure</td>
<td>1.5 MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating fluid temperature</td>
<td>0 to 50°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity Note 1)</td>
<td>±5% F.S. or less</td>
<td>±3% F.S. or less</td>
<td>±3% F.S. or less</td>
<td>±1% F.S. or less</td>
</tr>
<tr>
<td>Repeatability Note 1)</td>
<td>±3% F.S. or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±2% F.S. or less (15 to 35°C based on 25°C), ±3% F.S. or less (0 to 50°C, based on 25°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output for display unit</td>
<td>Pulse output, N channel, open drain, output for display unit PF2W33/L52408/L52408. (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>Voltage output 1 to 5 V Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current output 4 to 20 mA Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (No load)</td>
<td>20 mA or less</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) The system accuracy when combined with PF2W2/L52408/L52408.

Note 2) Output system can be selected during initial setting.

Note 3) Without lead wire. (Add 20 g for the types of analog output whether voltage or current output selected.)

Note 4) The sensor unit conforms to the CE mark.
**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2W300/301</th>
<th>PF2W330/331</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate measurement range (Note 1)</td>
<td>0.35 to 4.5 ( \text{ℓ/min} )</td>
<td>1.7 to 17.0 ( \text{ℓ/min} )</td>
</tr>
<tr>
<td>Set flow rate range (Note 1)</td>
<td>0.35 to 4.5 ( \text{ℓ/min} )</td>
<td>1.7 to 17.0 ( \text{ℓ/min} )</td>
</tr>
<tr>
<td>Minimum set unit (Note 1)</td>
<td>0.05 ( \text{ℓ/min} )</td>
<td>0.1 ( \text{ℓ/min} )</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50 ms) (Note 1)</td>
<td>0.05 ( \text{ℓ/pulse} )</td>
<td>0.1 ( \text{ℓ/pulse} )</td>
</tr>
<tr>
<td>Display units</td>
<td>NPN or PNP open collector 2 outputs</td>
<td>NPN or PNP open collector 2 outputs</td>
</tr>
<tr>
<td>Flow rate range Type for sensor unit</td>
<td>0.5 to 4 ( \text{ℓ/min} )</td>
<td>2 to 16 ( \text{ℓ/min} )</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP40</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>1 sec. or less</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Hysteresis mode: Variable (can be set from 0) Window comparator mode: 3-digit fixed (Note 6)</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1)** Values vary depending on each set flow rate range.

**Note 2)** For digital flow switch with unit switching function. (Fixed SI unit [\( \text{ℓ/min} \) or \( \text{ℓ} \)] will be set for switch types without the unit switching function.)

**Note 3)** Accumulated flow rate is reset when the power supply turns OFF.

**Note 4)** The system accuracy when combined with PF2W5 /L52408/L52408.

**Note 5)** Switch output and accumulated pulse output can be selected during initial setting.

**Note 6)** Window comparator mode — Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)

**Note 7)** The display unit conforms to the CE mark.
### Specifications

#### Model | PF2W200/201
---|---
**Applicable flow rate sensor** | PF2W504/504T-1 | PF2W520/520T-1 | PF2W540/540T-1 | PF2W511-1
**Flow rate measurement range** | 0.35 to 4.50 l/min | 1.7 to 17.0 l/min | 3.5 to 45.0 l/min | 7 to 110 l/min
**Set flow rate range** | 0.35 to 4.50 l/min | 1.7 to 17.0 l/min | 3.5 to 45.0 l/min | 7 to 110 l/min
**Minimum set unit** | 0.05 l/min | 0.1 l/min | 0.5 l/min | 1 l/min
**Accumulated pulse flow rate exchange value (Pulse width: 50 ms)** | 0.05 l/pulse | 0.1 l/pulse | 0.5 l/pulse | 1 l/pulse
**Display units** | Real-time flow rate  | Accumulated flow | Real-time flow rate  | Accumulated flow |
**Accumulated flow range** | 0 to 999999 l | 0 to 999999 gal(US) | 0 to 999999 l | 0 to 999999 gal(US)
**Power supply voltage** | 24 VDC (ripple ±10% or less) (With power supply polarity protection) | | | |
**Current consumption** | 55 mA or less (Note including the current consumption of the sensor) | | | |
**Power supply voltage for sensor** | Same as [Power supply voltage] | | | |
**Power supply current for sensor** | Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.) | | | |
**Sensor input** | 1 to 5 VDC (Input impedance: Approx. 800KΩ) | | | |
**No. of inputs** | 4 inputs | | | |
**Input protection** | Excess voltage protection | | | |
**Output specifications** | | | | |
**Switch output** | NPN open collector (PF2W200) | Maximum load current: 80 mA | | |
| | | Internal voltage drop: 1 V or less (with load current of 80 mA) | Maximum applied voltage: 30 V | |
| | | PNP open collector (PF2W201) | Maximum load current: 80 mA | |
| | | Internal voltage drop: 1 V or less (with load current of 80 mA) | | |
**Accumulated pulse output** | NPN open collector or PNP open collector (same as switch output) | | | |
**No. of outputs** | 4 outputs (1 output per 1 sensor input) | | | |
**Output protection** | Short circuit protection | | | |
**Hysteresis** | Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits) | | | |
**Response time** | 1s or less | | | |
**Linearity** | ±5% F.S. or less | | | |
**Repeatability** | ±2% F.S. or less (0 to 50°C, based on 25°C) | | | |
**Temperature characteristics** | ±2% F.S. or less (0 to 50°C, based on 25°C) | | | |
**Display method** | For measured value display: 4-digits, 7-segment LED (Orange) | | | |
| | For channel display: 1-digit, 7-segment LED (Red) | | | |
**Status LED’s** | Illuminates when output is ON | | | |
| | OUT1: Red | | | |
**Enclosure** | IP65 for the front face only, and IP40 for the remaining parts. | | | |
**Operating temperature range** | Operating: 0 to 50°C, Stored: −10 to 60°C (with no freezing and condensation) | | | |
**Operating humidity range** | Operating or Stored: 35 to 85%RH (with no condensation) | | | |
**Vibration resistance** | 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energized) | | | |
**Impact resistance** | 980 m/s² in X, Y, Z directions 3 times each (de-energized) | | | |
**Noise resistance** | 500 Vp-p, Pulse width 1μs, Rise time 1 ns | | | |
**Connection** | Power supply / Output connection: 6P connector, Sensor connection: 4P connector (e-con) | | | |
**Material** | Housing: PBT, Display: PET, Backside rubber: CR | | | |
**Weight** | 60 g (Except for any accessories that are shipped together) | | | |

**Note 1)** Fixed SI unit [l/min or l] will be set for switch types without the unit switching function. ("M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.

**Note 2)** If Vcc side on sensor input connector part is short-circuited with 0V side, the flow monitor inside will be damaged.

**Note 3)** Switch output and accumulated pulse output can be selected during initial setting.

**Note 4)** The system accuracy when combined with applicable flow sensor.

**Note 5)** This product conforms to the CE mark.

Connectable remote type sensor part is PF2WS□□□-1 (with analog output 1 to 5 V).
Series PF2W

Flow Characteristics (Pressure Loss)

PF2W704, 504

PF2W720, 520

PF2W740, 540

PF2W711, 511

Sensor Unit Construction

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attachment</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>2</td>
<td>Seal</td>
<td>NBR</td>
</tr>
<tr>
<td>3</td>
<td>Body</td>
<td>PPS</td>
</tr>
<tr>
<td>4</td>
<td>Sensor</td>
<td>PPS</td>
</tr>
</tbody>
</table>
Series PF2W

Dimensions: Integrated Display Type for Water

PF2W711

Flow direction
Dimensions: Remote Type Sensor Unit for Water

PF2W504, 520-[N]-

PF2W540-[N]-

Internal circuits and wiring examples

Load is an analog input equipment such as a voltmeter.

PF2W504/L52408/L52408-1 (With voltage output type)

PF2W504/L52408/L52408-2 (With voltage output type)

Output specification

<table>
<thead>
<tr>
<th>Output for display unit only</th>
<th>Output for display unit + Analog output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>42</td>
<td>62</td>
</tr>
<tr>
<td>52</td>
<td>72</td>
</tr>
</tbody>
</table>

Wiring

- Use this sensor by connecting it to a SMC remote type display unit Series PF2W504/L52408.

Connector pin numbers

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Pin description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC(+)</td>
</tr>
<tr>
<td>2</td>
<td>NC/Analog output</td>
</tr>
<tr>
<td>3</td>
<td>DC(–)</td>
</tr>
<tr>
<td>4</td>
<td>OUT</td>
</tr>
</tbody>
</table>
Series PF2W

Dimensions: Remote Type Sensor Unit for Water

PF2W511-(N)-

Output specification

Output for display unit only

Output for display unit + Analog output

Part no. Min. measured flow rate value [l/min] Max. measured flow rate value [l/min] Real-time flow rate [l/min]

PF2W504-1 0.5 4
PF2W520-1 2 16
PF2W540-1 5 40
PF2W511-1 10 100

Part no. Min. measured flow rate value [l/min] Max. measured flow rate value [l/min] Real-time flow rate [l/min]

PF2W504-2 0.5 4
PF2W520-2 2 16
PF2W540-2 5 40
PF2W511-2 10 100
**PF2W3□□-A**  
Panel mounting type

* The applicable panel thickness is 1 to 3.2 mm.

**Internal circuits and wiring examples**

1 to 8 are the terminal numbers.

Do not connect the white wire of the sensor to 3.

**View A**

**Terminal block numbers**
Series PF2W

Dimensions: Remote Type Display Unit for Water (4-channel Flow Monitor)

PF2W200, 201

Front protective cover + Panel mounting

Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm
Sensor connector (4P x 4)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Terminal</th>
<th>Connector no.</th>
<th>Cable wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC+</td>
<td>1</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>N.C.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>DC–</td>
<td>3</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>N: 1 to 5 V</td>
<td>4</td>
<td>White</td>
</tr>
</tbody>
</table>

Power supply / Output connector (accessory)

Pin No.
1 Brown DC(+)
2 Blue DC(–)
3 Black CH1_OUT1
4 White N.C.
5 Gray CH2_OUT1
6 Red CH3_OUT1
7 Green CH4_OUT1
8 Yellow N.C.

Internal circuits and wiring examples

**PF2W200**

**PF2W201**
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2W704T</th>
<th>PF2W720T</th>
<th>PF2W740T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured fluid</td>
<td>Water, Mixture of water (50%) and ethylene glycol (50%)</td>
<td>Water, Mixture of water (50%) and ethylene glycol (50%)</td>
<td>Water, Mixture of water (50%) and ethylene glycol (50%)</td>
</tr>
<tr>
<td>Flow rate measurement range</td>
<td>0.35 to 4.5 l/min</td>
<td>1.2 to 17.0 l/min</td>
<td>3.5 to 45 l/min</td>
</tr>
<tr>
<td>Flow rate range</td>
<td>0.35 to 4.5 l/min</td>
<td>1.7 to 17.0 l/min</td>
<td>3.5 to 45 l/min</td>
</tr>
<tr>
<td>Rated flow range</td>
<td>0.5 to 4 l/min</td>
<td>2 to 16 l/min</td>
<td>5 to 40 l/min</td>
</tr>
<tr>
<td>Minimum set unit</td>
<td>0.05 l/min</td>
<td>0.1 l/min</td>
<td>0.5 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow range value (Pulse width: 50 ms)</td>
<td>0.05 l/pulse</td>
<td>0.1 l/pulse</td>
<td>0.5 l/pulse</td>
</tr>
<tr>
<td>Operating fluid temperature</td>
<td>0 to 90°C (with no cavitation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.5% F.S. or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±3% F.S. or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±3% F.S. or less (0 to 90°C, based on 25°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (No load)</td>
<td>70 mA or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>710 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size (N, Rc, NPT, G)</td>
<td>3/8, 3/8, 1/2, 1/2</td>
<td>1/2, 3/4</td>
<td></td>
</tr>
<tr>
<td>Detection type</td>
<td>Karman vortex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator light</td>
<td>3-digit, 7-segment LED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display units</td>
<td>Note 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real-time flow rate</td>
<td>l/min, gal(US)/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accumulated flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>0 to 1 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withstand pressure</td>
<td>1.5 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accumulated flow range</td>
<td>0 to 999999 l</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output specification</td>
<td>NPN open collector 2 outputs</td>
<td>PNP open collector 2 outputs</td>
<td></td>
</tr>
<tr>
<td>Switch output</td>
<td>NPN open collector</td>
<td>Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA); Maximum applied voltage: 30 V; 2 outputs</td>
<td>PNP open collector</td>
</tr>
<tr>
<td>Status LED’s</td>
<td>Illuminates when output is ON: OUT1: Green; OUT2: Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>1 sec. or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Hysteresis mode: Variable (can be set from 0); Window comparator mode (Note 6); 3-digit fixed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>Operating: 0 to 50°C, Stored: -25 to 85°C (with no freezing and condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1000 VAC for 1 min. between external terminal and case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>50 MΩ and more (500 VDC Mega) between external terminal and case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 50 Hz with a 1.5 mm amplitude or 98 m/s² acceleration in each X, Y, Z directions for 2 hrs, whichever is smaller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact resistance</td>
<td>490 m/s² in X, Y, Z directions 3 times each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise resistance</td>
<td>1000 Vp-p, Pulse width 1 μs, Rise time 1 ns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** ±5% F.S. or less (0 to 50°C, based on 25°C), ±3% F.S. or less (15 to 35°C, based on 25°C)

**Note 2:** Without lead wire.

**Note 3:** For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch type without the unit switching function.)

**Note 4:** Accumulated flow rate is reset when the power supply turns OFF.

**Note 5:** Switch output and accumulated pulse output can be selected during initial setting.

**Note 6:** Window comparator mode — Since hysteresis will reach 3 digits, keep P_1,1 and P_2,1 or n_1,1 and n_2,1 apart by 7 digits or more.

(in case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)

**Note 7:** The flow switch conforms to the CE mark.
How to Order

Remote Type Display Unit

PF2W5 [20] T [03] C

Flow rate range

Temperature range

Thread type

Nil Rc NPT F G

Port size

Applicable model

PF2W504T, 520T
PF2W520T, 540T
PF2W540T

Temperature range

0 to 90°C

Thread type

Nil Rc NPT F G

Port size

Applicable model

PF2W504T, 520T
PF2W520T, 540T
PF2W540T

Specifications

Model

PF2W504T
PF2W520T
PF2W540T

Measured fluid

Water, Mixture of water (50%) and ethylene glycol (50%)

Detection type

Karman vortex

Rated flow range

0.5 to 4 l/min
2 to 16 l/min
5 to 40 l/min

Operating pressure range

0 to 1 MPa

Withstand pressure

1.5 MPa

Operating fluid temperature

0 to 90°C (with no cavitation)

Linearity

±5% F.S. or less

Repeatability

±2% F.S. or less

Temperature characteristics

±2% F.S. or less (15 to 35°C, based on 25°C), ±3% F.S. or less (0 to 50°C, based on 25°C)

Output for display unit

Pulse output, N channel, open drain, output for display unit PF2W300.

Analog output

Voltage output 1 to 5 V
Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.
Current output 4 to 20 mA
Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC

Power supply voltage

12 to 24 VDC (ripple ±10% or less)

Current consumption (No load)

20 mA or less

Enclosure

IP65

Operating temperature range

Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)

Withstand voltage

1000 VAC for 1 min. between external terminal and case

Insulation resistance

50M Ω or more (500 VDC Mega) between external terminal and case

Vibration resistance

10 to 500 Hz with a 1.5 mm amplitude or 98 m/s² acceleration, whichever is smaller.

Impact resistance

490 m/s² in X, Y, Z directions 3 times each

Noise resistance

1000 Vp-p, Pulse width 1µs, Rise time 1ms

Weight

660 g

Port size (Rc, NPT, G)

3/8, 3/4, 1/2

Display units are the same as those of remote type digital flow switch for water (series PF2W300/L52408/L52408). Refer to pages 17, 18 for details.
Series PF2W

Flow Characteristics (Pressure Loss)

PF2W704T, 504T

PF2W720T, 520T

PF2W740T, 540T

Sensor Unit Construction

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attachment</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>2</td>
<td>Seal</td>
<td>FKM</td>
</tr>
<tr>
<td>3</td>
<td>Body</td>
<td>PPS</td>
</tr>
<tr>
<td>4</td>
<td>Sensor</td>
<td>PPS</td>
</tr>
</tbody>
</table>
Dimensions: Integrated Display Type for Water

PF2W704T, 720T, 740T

Internal circuits and wiring examples
1 to 4 are the terminal numbers.

Flow direction

Connector pin numbers

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Pin description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC(+)</td>
</tr>
<tr>
<td>2</td>
<td>OUT2</td>
</tr>
<tr>
<td>3</td>
<td>DC(–)</td>
</tr>
<tr>
<td>4</td>
<td>OUT1</td>
</tr>
</tbody>
</table>
### Series PF2W

#### Output specification

**Output for display unit only**

- Analog output

- **Part no.**
  - PF2W504T-□-1
  - PF2W520T-□-1
  - PF2W540T-□-1

- **Min. measured flow rate value**
  - 0.5
  - 2
  - 5

- **Max. measured flow rate value**
  - 4
  - 16
  - 40

**Output for display unit + Analog output**

- **Part no.**
  - PF2W504T-□-2
  - PF2W520T-□-2
  - PF2W540T-□-2

- **Min. measured flow rate value**
  - 0.5
  - 2
  - 5

- **Max. measured flow rate value**
  - 4
  - 16
  - 40

---

#### Internal circuits and wiring examples

- **Sample 1:** A to B are the terminal numbers.

- **Sample 2:**
  - Load
  - is an analog input equipment such as a voltmeter.
  - Use this sensor by connecting it to a SMC remote type display unit Series PF2W3□/L52408/L52408.

#### Connector pin numbers

- **Pin description**
  - 1: DC(+) (Brown)
  - 2: NC/Analog output (White)
  - 3: DC(–) (Blue)
  - 4: OUT (Black)

---

#### Dimensions: Remote Type Sensor Unit for Water

- **PF2W504T, 520T, 540T-□(N)**

- **Flow direction**

- **Dimensions:**
  - Remote Type Sensor Unit for Water

- **Wiring:**
  - Use this sensor by connecting it to a SMC remote type display unit Series PF2W3□/L52408/L52408.
For Air/Water Digital Flow Switch Series PF2A/PF2W

Description

Integrated Display Type
PF2A710, 750, 711, 721, 751
PF2W704(T), 720(T), 740(T), 11

Remote Type/Display Unit
PF2A300, 301, 310, 311
PF2W300, 301, 330, 331

Integrated Display Type
PF2A703H, 706H, 712H

4-channel Flow Monitor (Remote type/Display unit)
PF2A200, 201
PF2W200, 201

LED display/Red
Displays the measured flow rate, each setting condition, and error code.

Indicator
(PF2A703, PF2A300 for air only)
Illuminates when the normal condition (nor) is selected.

Output (OUT1) display/Green
Displays the output condition of OUT1. Illuminates when turned ON.

Output (OUT2) display/Red
Displays the output condition of OUT2. Illuminates when turned ON.

UP button ( button)
Use to change the mode or to increase the set value.

SET button ( button)
Use to select the function.

DOWN button ( button)
Use to change the mode or decrease the set value.

RESET button ( + button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate.
In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

REMOTE button
If the UP and DOWN buttons are pressed simultaneously, the REMOTE button will activate.
In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

LCD display/Orange
Displays the measured flow rate, each setting condition, and error code.

Output (OUT1) display/Orange
Displays the output condition of OUT1. Illuminates when turned ON.

Unit display/Orange
Displays the selected unit. Type without unit switching function is fixed SI units (l/min, l, m3, m3 x 103).

Flow rate confirmation display/Orange
The blinking intervals change depending on the flow rate value.

UP button ( button)
Use to change the mode or to increase the set value.

DOWN button ( button)
Use to change the mode or decrease the set value.

MODE button ( button)
Use for changing the function.

Switch output display/Red
Displays the output condition of OUT1 (CH1 to 4). CH1 to 4 will illuminate when the normal condition (nor) is selected.

Unit display/Orange
Illuminates the selected unit. Use after putting the unit label other than l/min, l.

Channel display/Red
Displays the selected channel.

UP button ( button)
Use to change the mode or to increase the set value.

SET button
Use this button to set the value or the set mode.

DOWN button ( button)
Use to change the mode or decrease the set value.
Functions

Refer to the “Instruction Manual” for information on setting and operating.

### Flow rate measurement selection
Real-time flow rate and accumulated flow rate can be selected. A flow rate of up to 999999 can be accumulated. The accumulated flow rate is reset when the power supply turns OFF. (PF2A7□□H maintains the values.)

### Unit switching

#### For Air

<table>
<thead>
<tr>
<th>Display</th>
<th>Real-time flow rate</th>
<th>Accumulated flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.1</td>
<td>l/min</td>
<td>t, m³, m³ x 10³</td>
</tr>
<tr>
<td>U.2</td>
<td>CFM = ft³/min</td>
<td>ft³ x 10³</td>
</tr>
</tbody>
</table>

#### High Flow Rate Type (For Air)

<table>
<thead>
<tr>
<th>Display</th>
<th>Real-time flow rate</th>
<th>Accumulated flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.1</td>
<td>l/min</td>
<td>t, m³, m³ x 10³</td>
</tr>
<tr>
<td>U.2</td>
<td>CFM</td>
<td>ft³ x 10³</td>
</tr>
</tbody>
</table>

#### For Water / High Temperature Fluid Type (For Water)

<table>
<thead>
<tr>
<th>Display</th>
<th>Real-time flow rate</th>
<th>Accumulated flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.1</td>
<td>l/min</td>
<td>t, m³, m³ x 10³</td>
</tr>
<tr>
<td>U.2</td>
<td>GPM</td>
<td>gal (US)</td>
</tr>
</tbody>
</table>

Note) Fixed SI unit (l/min, or t, m³, m³ x 10³) will be set for the type without the unit switching function.

### Flow rate conversion

Normal condition: 0°C, 101.3 kPa, dry air
Standard condition: 20°C, 101.3 kPa, 65%RH (ANR) Switchable between these conditions.

### Flow rate measuring unit confirmation

This function allows for the confirmation of the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

### Key lock

This function prevents accidental operations such as changing the set value.

### Accumulation clearance

This function clears the accumulated value.

### Initialization of setting (only for Series PF2A7□□H)

This function restores the setting to the original state, just as it had been shipped from the factory.

### Output types

Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

#### Real-time switch output

```
ON
P.1 ≥ P.2
```

#### Accumulated switch output

```
ON
Accumulated flow →
```

#### Accumulated pulse output

```
ON
```

Note 1) For a digital flow switch with an unit switching function.  (Fixed SI unit (l/min, or t, m³ or m³ x 10³) will be set for switch types without an unit switching function.) Refer to the specifications of the display unit for the flow rate value per pulse.
Functions

Copy function (PF2□200, 201 only)
Information to be copied is:
① Flow rate range
② Display mode
③ Display unit (Only available when the unit specification is nil.)
④ Output method
⑤ Output mode
⑥ Flow rate display unit (available with PF2A20□ only)
⑦ Flow rate value

Channel select function (PF2□200, 201 only)
Every pushing the △ button, channel selection “1→2→3→4→1...” is available. The flow rate measurement of each selected channel is shown in the display unit.

Channel scan function (PF2□200, 201 only)
Changes displaying the channel shown every about 2 seconds and its detected flow rate.

Error correction

<table>
<thead>
<tr>
<th>LED display</th>
<th>Contents</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err1</td>
<td>A current of more than 80 mA is flowing to OUT1.</td>
<td>Check the load and the wiring for OUT1.</td>
</tr>
<tr>
<td>Err2</td>
<td>A current of more than 80 mA is flowing to OUT2.</td>
<td>Check the load and the wiring for OUT2.</td>
</tr>
<tr>
<td>Err3</td>
<td>The set data has changed for some reason.</td>
<td>Perform the RESET operation, and reset all the data again.</td>
</tr>
<tr>
<td>Err4</td>
<td>The flow rate is over the flow rate measurement range.</td>
<td>Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.</td>
</tr>
</tbody>
</table>

Note 1) Applicable to display integrated type and remote type except PF2A□□□□□□ series.
Note 2) Applicable to PF2A□□□□□□ series only.

For PF2A/W200, 201

LED display | Contents | Solution |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1</td>
<td>Over current is flowing to the load of a switch output.</td>
<td>Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.</td>
</tr>
<tr>
<td>Er0</td>
<td>Internal data error.</td>
<td></td>
</tr>
<tr>
<td>Er9</td>
<td>Internal data error.</td>
<td>Contact SMC.</td>
</tr>
<tr>
<td>Er10</td>
<td>Internal data error.</td>
<td></td>
</tr>
<tr>
<td>Er5</td>
<td>Internal data error.</td>
<td>Shut off the power supply and then reset the switch.</td>
</tr>
<tr>
<td>Er6</td>
<td>Internal data error.</td>
<td>Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.</td>
</tr>
<tr>
<td>---</td>
<td>The flow rate is over the flow rate measurement range.</td>
<td>Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.</td>
</tr>
</tbody>
</table>
Series PF2A/PF2W

Option

When only optional parts are required, order with the part numbers listed below.

M12 lead wire with connector

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Qty.</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-29-A</td>
<td>1</td>
<td>3 m</td>
</tr>
</tbody>
</table>

In addition to the lead wire assembly shown above, those listed below (female contact) can be connected.

- Correns Corp.: VA-4D
- OMRON Corp.: X52
- Yamatake Co., Ltd.: PA5-4I
- Hirose Electric Co., Ltd.: HR24
- DKK Ltd.: CM01-8DP4S

Panel mounting

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-22-E</td>
<td>Panel mounting adapter A, B</td>
<td>With mounting bracket</td>
</tr>
</tbody>
</table>

In addition to the connectors shown above, those listed below (e-con) can be connected.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-28-CA-4</td>
<td>1</td>
</tr>
</tbody>
</table>

In addition to the connectors shown above, those listed below (e-con) can be connected.

- Sumitomo 3M Limited: 37104-3122-000FL
- Tyco Electronics AMP K.K.: 2-1473562-4
- OMRON Corp.: XN2A-1430

Panel mounting adapter A

| Panel mounting adapter B |
| Mounting bracket (accessory) |

Front protective cover + Panel mounting adapter

| Mounting screw (M3 x 8 L) (accessory) |

Panel mounting adapter

Waterproof seal (accessory)
### Related Product

**Multi Counter**

**Series CEU5**

---

#### How to Order

- **CEU5**
- **Output transistor mode**
  - Nil: NPN open collector output
  - P: PNP open collector output
- **Power supply voltage**
  - Nil: 100 to 240 VAC
  - D: 24 VDC
- **External output**
  - Nil: RS-232C
  - B: RS-232C + BCD

---

#### Connection Method

**Connection with the Digital Flow Switch (Series PF2)**

- **Possible to measure accumulated pulse output of a Digital Flow Switch by an unit of 100 l (litter) and 10 ft³ (cube foot) using the pre-scaling function* of the multi counter (When inputting to the multi counter, Up or Down is selected as input method.)**
- **Possible to take advantage of all CEU5 functions using preset mode and function mode.**

* The set value is calculated by selecting manual mode. By multiplication by 4, then, per pulse value is set.

---

**<Connection with other manufacturers’ encoders>**

- **Possible to switch multi counter side input method to 2-phase or Up/Down.**
- **Possible to connect to an encoder if the output method is Open Collector.**
- **When selecting UP or DOWN, phase A to COM input is counted toward addition direction, phase B to COM input is counted toward subtraction direction.**

---

**Caution**

When connecting the CEU5 with an encoder from another manufacturer, please thoroughly confirm the specification beforehand. Please note that the CEU5 may not count normally depending on the output method, output frequency and connecting cable length, etc. of the encoders.

Regarding connection with scale cylinder, refer to “Stroke reading cylinders & Counters CE series” in the Best Pneumatics Vol. 10.
Series PF2A/PF2W
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by all safety practices, including labels of "Caution", "Warning" or "Danger". To ensure safety, please observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠️ Caution : Operator error could result in injury or equipment damage.
⚠️ Warning : Operator error could result in serious injury or loss of life.
⚠️ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

---

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
   Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information and taking into consideration the possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.
   Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of the pneumatic system should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
   1. Inspection and maintenance of machinery/equipment should only be performed after confirming the control positions are safely locked-out.
   2. When equipment is to be removed, confirm the safety processes mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
   3. Before the machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc. (Bleed air into the system gradually, to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:
   1. Conditions and environments beyond the given specifications, or if product is used outdoors.
   2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
   3. An application which has the possibility of having a negative effects on people, property, or animals, and therefore requires special safety analysis.
**Warning**

1. Operate the switch only within the specified voltage.
   Use of the switch outside of the specified voltage range can cause not only a malfunction and damage to the switch, but it can also cause electrical shock and fire.

2. Do not exceed the maximum allowable load specification.
   A load exceeding the maximum load specification can cause damage to the switch.

3. Do not use a load that generates a surge voltage.
   Although the circuit at the output side of the switch is surge-protected, damage may still occur if a voltage surge is applied repeated. When a load which generates a surge, such as from a relay or solenoid valve, is directly driven, use a switch with a built-in surge absorbing element.

4. Since the type of fluid varies depending on the product, be sure to verify the specifications.
   The switches do not have an explosion proof rating. To prevent a possible fire hazard, do not use with inflammable gases or fluids.

5. Monitor the internal voltage drop of the switch.
   When operating below the specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

   \[
   \text{Supply voltage} - \text{Internal voltage drop of switch} < \text{Minimum operating voltage of load}
   \]

6. Use the switch within the specified flow rate measurement and operating pressure.
   Operating beyond the specified flow rate and operating pressure can damage the switch.

7. Use the switch within the specified flow rate measurement and operating pressure.
   Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

8. Design the system, so that the fluid always fills the detection passage.
   Especially for vertical mounting, introduce the fluid from the bottom to the top.

9. Operate within the flow rate measurement range.
   If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

10. Sudden increase in flow rate may destroy the flow sensor. Ensure to open/close the flow control valve not to exceed the maximum flow rate measurement values.

---

**Design and Selection**

---

**Caution**

1. Data from the flow switch is stored even after the power supply is turned off.
   The input data is stored in EEPROM so that the data will not be lost after the flow switch is turned off. (The data can be rewritten for up to one million times, and stored for up to 20 years.)

2. Accumulated flow rate is reset when it is turned OFF.
   Only the PF2A7□H series (for air) will maintain, its accumulated flow rate value, even though the power supply is cut.

---

**Mounting**

---

**Warning**

1. Mount the switch using the proper tightening torque.
   When the switch is tightened beyond the specified tightening torque, it may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to loosen during operation.

<table>
<thead>
<tr>
<th>Thread</th>
<th>Tightening torque N·m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rc 1/8</td>
<td>7 to 9</td>
</tr>
<tr>
<td>Rc 1/4</td>
<td>12 to 14</td>
</tr>
<tr>
<td>Rc 1/2</td>
<td>22 to 24</td>
</tr>
</tbody>
</table>

---

2. Apply a wrench only to the metal part of the piping when installing the flow switch onto the system piping.
   Do not apply the wrench to any part other than the piping attachment or the switch may be damaged.

3. Monitor the flow direction of the fluid.
   Install and connect piping so that fluid flows in the direction of the arrow indicated on the body.

4. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

5. Do not drop or bump.
   Do not drop, bump, or apply excessive impacts (490 m/s²) while handling. Although the external body of the switch (switch case) may not be damaged, the switch inside could be damaged and cause a malfunction.

6. Hold the body of the switch when handling.
   The tensile strength of the cord is 40N and applying a greater pulling force than this can cause a malfunction. When handling, hold the body of the switch.

7. Do not use until you can verify that equipment can operate properly.
   Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

8. Avoid the mounting orientation with the bottom of the body facing up.
   The switch can be mounted in any way such as vertically or horizontally, however, avoid the mounting orientation with the bracket on the bottom of the body facing upward.
### Operating Environment

#### Usage

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

#### Warning

1. Never use in the presence of explosive gases.
   The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

2. Mount the switch in a location where there is no vibration greater than 98 m/s² or impact greater than 490 m/s².

3. Do not use in an area where surges are generated.
   When there are units that generate a large amount of surge in the area around a pressure switch, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the switch’s internal circuitry. Avoid sources of surge generation and crossed lines.

4. Switches are not equipped with surge protection against lightning.
   The flow switches are CE compliant, however they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to the system components as necessary.

5. Avoid using the switch in an environment where the likelihood of splashing or spraying of liquids exists.
   The switches are dustproof and splashproof, however avoid using in an environment where the likelihood of heavy splashing or spraying of liquids exists. Since the display unit of the remote type switches featured here is not dust or splashproof, the use in an environment where liquid splashing or spraying exists must be avoided.

[For air]

6. Use the switch within the specified fluid and ambient temperature range.
   The fluid and ambient temperature range is 0° to 50°C. Take measures to prevent the fluid from freezing when it is below 5°C, since this may damage the switch and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensation and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are within the specification.

[For water]

7. Use the switch within the specified fluid and ambient temperature range.
   The fluid and ambient temperatures range for the switch is 0 to 50°C (and 0 to 90°C for high temperature fluid). Take measures to prevent the fluid from freezing when it is below 5°C, since this may cause damage to the switch and lead to a malfunction. Never use the switch in an environment where there are drastic temperature changes even when these temperatures fall within the specified temperature range.

### Mounting

#### Warning

1. Verify the color and the terminal number when wiring.
   Incorrect wiring can cause the switch to be damaged and malfunction. Verify the color and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching of the lead wire.
   Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.
   Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.
   Wire separately from power lines and high voltage lines, and avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these lines.

5. Do not allow a load to short circuit.
   Although a switch indicates excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

[For air]

1. Never mount a switch in a place that will be used as a step stool during piping.
   Damage may occur if an excessive load is applied to the switch.

10. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.
   When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.

[For water]

11. Never mount a switch in a place that will be used as a step stool during piping.
   Damage may occur if an excessive load is applied to the switch. Especially when the switch supports the piping, do not apply a load of 15N or more to the metal part of the switch.

12. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.
   When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.
   When used with the downstream side open, be careful of the cavitation that is prone to occur.

### Wiring

#### Warning

1. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.
   When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.

2. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.
   When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.
Series PF2A/PF2W
Specific Product Precautions 3

Be sure to read before handling. Refer to page 37 for safety instructions.

## Maintenance

### Warning
1. Perform periodical inspections to ensure proper operation of the switch.
   Unexpected malfunctions may cause a possible danger.
2. Take precautions when using the switch for an interlock circuit.
   When a pressure switch is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction, and verify the operation of the switch and interlock function on a regular basis.
3. Do not disassemble or perform any conversion work on flow switches.

### Warning
1. Check regulators and flow adjustment valves before introducing the fluid.
   If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.
2. The fluids that the switch can measure accurately are nitrogen and dry air.
   Please note that accuracy cannot be guaranteed when other fluids are used.
3. Never use inflammable fluids.
   The flow velocity sensor heats up to approximately 150°C.
4. Install a filter or mist separator on the upstream side when there is a possibility of condensate and foreign matter being mixed in with the fluid.
   The rectifying device built into the switch will be clogged up and accurate measurement will no longer be possible.

### Warning
1. After the power is turned on, the switch’s output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.
2. Perform settings after stopping control systems.
   When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings.
3. Do not apply excessive rotational force to the display unit.
   The integrated type display unit can rotate 360°. Rotation is controlled by the stopper; however, the stopper may be damaged if the display unit is turned with excessive force.

### Others

### Warning
6. Never use inflammable fluids.
7. Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.
   If foreign matter adheres to the switch’s vortex generator or vortex detector, accurate measurement will no longer be possible.

### Measured Fluid

<table>
<thead>
<tr>
<th>Measured Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
</tr>
<tr>
<td>Water</td>
</tr>
</tbody>
</table>

### Detection principle of digital flow switch for air

A heated thermistor is installed in the passage, and fluid absorbs heat from the thermistor as it is introduced to the passage. The thermistor’s resistance value increases as it loses heat. Since the resistance value increase ratio has a uniform relationship to the fluid velocity, the fluid velocity can be detected by measuring the resistance value. To further compensate the fluid and ambient temperature, the temperature sensor is also built into the switch to allow stable measurement within the operating temperature range.

### Detection principle of digital flow switch for water

When an elongated object (vortex generator) is placed in the flow, reciprocal vortices are generated on the downstream side. These vortices are stable under certain conditions, and their frequency is proportional to the flow velocity, resulting the following formula.

\[ f = k x v \]

where:
- \( f \) is the frequency of vortexes
- \( v \) is the flow velocity
- \( k \) is the proportional constant (determined by the vortex generator’s dimensions and shape)

Therefore, the flow rate can be measured by detecting this frequency.

### Contact SMC regarding the specifications for clean environment.

---

40
## Caution

Set the flow rate within the rated flow range. The set flow rate range is the range of flow rate that can be set on the controller. The rated flow range is the range that satisfies the sensor’s specifications (accuracy, linearity etc.). It is possible to set a value outside of the rated flow range, however, the specification is not be guaranteed.

### <For Air/PF2A>

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Flow rate range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 l/min</td>
</tr>
<tr>
<td>PF2A510</td>
<td>0.5 l/min</td>
</tr>
<tr>
<td>PF2A511</td>
<td>2.5 l/min</td>
</tr>
<tr>
<td>PF2A521</td>
<td>5 l/min</td>
</tr>
<tr>
<td>PF2A551</td>
<td>10 l/min</td>
</tr>
</tbody>
</table>

### <For Water/PF2W>

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Flow rate range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 l/min</td>
</tr>
<tr>
<td>PF2W504</td>
<td>0.5 l/min</td>
</tr>
<tr>
<td>PF2W504T</td>
<td>0.35 l/min</td>
</tr>
<tr>
<td>PF2W520</td>
<td>2 l/min</td>
</tr>
<tr>
<td>PF2W520T</td>
<td>1.7 l/min</td>
</tr>
<tr>
<td>PF2W540</td>
<td>5 l/min</td>
</tr>
<tr>
<td>PF2W540T</td>
<td>3.5 l/min</td>
</tr>
<tr>
<td>PF2W511</td>
<td>10 l/min</td>
</tr>
</tbody>
</table>

- **Rated flow range of sensor**
- **Set flow rate range of sensor**
4-channel Flow Monitor

**Warning**

1. Do not drop, bump, or apply excessive impacts (980 m/s²) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.

2. The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.

**Caution**

1. Connecting sensor cable and connector (ZS-28-CA-□)
   - Cut the sensor cable as shown below.
   - Insert each lead wire into the corresponding connector number by following the chart provided below.

   ![Sensor connector chart]

   - Make sure that the numbers on the connector and the wire colors match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
   - Using pliers, press the center of A straight down.
   - Note that the connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

   2. Inserting/Detaching of sensor connector, power supply/output connector
   - Insert each connector straightforwardly until it clicks and locks onto the body.
   - To remove the connector, pull it straight out while pushing the lever with your thumb.

**Connection**

**Warning**

1. Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.

2. Do not attempt to insert or pull the flow rate sensor or its connector when the power is on. Switch output may malfunction.

3. Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.

4. If a commercial switching power supply is used, make sure that the F.G. terminal is grounded.

**Operating Environment**

**Warning**

1. Our 4-channel flow monitor is CE marked, however, it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.

2. Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.

3. Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.

**Mounting**

**Caution**

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

- Front protective cover + Panel mounting
  - Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.
Digital Flow Switch for Deionized Water and Chemicals

Series PF2D

A single controller can monitor the flow rate of 4 different sensors.

Body and Sensor
New PFA

Three types of flow range
- 0.4 to 4 l/min (PF2D504)
- 1.8 to 20 l/min (PF2D520)
- 4.0 to 40 l/min (PF2D540)

Super PFA

Dust generation of 3 particles/cc or less (average number)
Karman vortex eliminates moving parts and allows low dust generation.

Particle characteristics (reference)

Fill the flow path with sulfuric acid and leave it for 30 minutes.
After disposing the sulfuric acid, flush the flow path out with deionized water and measure the resistance rate of the fluid that is discharged from the downstream side.
A quick recovery time indicates little liquid pool.

Swept flow characteristics
Tapered side seal minimizes dead volume to reduce accumulation of liquid pool.

Swept flow characteristics (reference)

Processing chart for Series PF2D

Remote type sensor unit

Supersonic cleaning
Double-packing
Drying
Clean room class 1000

Assembly
Common environment

Vibration reducing seals
Malfunctions (output errors) that would otherwise be caused by vibration are prevented.

Tube
Sensor
Body

The data was obtained by performing an actual 10 minutes’ supersonic cleaning using an average 16 MΩ cm of deionized water at class 10000 clean room (1 l/min flow rate).
The diameter of the measured particles ranges from 0.1 to 0.5 µm. The flow rate used during measuring is 100 cc/min.
## Specifications for Sensor Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2D504</th>
<th>PF2D520</th>
<th>PF2D540</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured fluid</td>
<td>Liquid not to corrode nor erode deionized water and/or Teflon®. Viscosity: 3 mPa·s (3 cP) or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detection style</td>
<td>Karman vortex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated flow range Note 2)</td>
<td>0.4 to 4 l/min</td>
<td>1.8 to 20 l/min Note 1)</td>
<td>4 to 40 l/min</td>
</tr>
<tr>
<td>Operating pressure range Note 2)</td>
<td>0 to 1 MPa</td>
<td>0 to 0.6 MPa</td>
<td></td>
</tr>
<tr>
<td>Proof pressure Note 3)</td>
<td>1.5 MPa</td>
<td></td>
<td>0.9 MPa</td>
</tr>
<tr>
<td>Operating fluid temperature</td>
<td>0 to 90 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity Note 4)</td>
<td>±2.5% F.S. or less (at 25 °C water)</td>
<td>±2% F.S. or less, allowable load resistance: 100 kΩ or more</td>
<td>±2% F.S.or less, allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±1% F.S. or less (at 25 °C water)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>±5% F.S. or less (0 to 50 °C, based on 25 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output specifications</td>
<td>Pulse output, N channel, open drain, output for display unit PF2D 300/301 (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)</td>
<td>Voltage output Note 5) 1 to 5 V</td>
<td>Linearity: ±2% F.S. or less, allowable load resistance: 100 kΩ or more</td>
</tr>
<tr>
<td>Analog output</td>
<td>Linearity: ±2% F.S.or less, allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC (ripple ±10% or less)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>20 mA or less (without load)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Environmental specifications

- **Enclosure**: IP65
- **Operating temperature range**: Operating: 0 to 50 °C, Stored: −25 to 85 °C in stock (with no condensation and freezing)
- **Voltage resistance**: 1000 VAC for 1 min. between external terminals and case
- **Insulation resistance**: 50 MΩ or more (500 VDC Mega) between external terminals and case
- **Vibration resistance**: 4.9 m/s²
- **Impact resistance**: 490 m/s² to X, Y, Z directions 3 times for each
- **Noise resistance**: 1000 Vp-p, Pulse width: 1 μs, Rise time: 1 ns

### Weight

- 140 g (without lead wire)
- 225 g (without lead wire)

### Port size

- 3/8 inch tube
- 1/2 inch tube
- 3/4 inch tube

### Wetted material


---

**Note 1)** 1.6 to 20 l/min (0.1 MPa) with viscosity of 1 mPa·s (1 cP) or less

**Note 2)** The operating pressure range drops according to the fluid temperature. See attached graph.

**Note 3)** 1.5 times of the maximum operating pressure and varying with fluid temperature.

**Note 4)** The system accuracy when combined with PF2D30/L52408.

**Note 5)** When the voltage output is selected.

**Note 6)** When the current output is selected.

**Note 7)** The sensor unit conforms to the CE mark.
For Deionized Water and Chemicals

Digital Flow Switch  Series PF2D

How to Order

Remote Type Display Unit

PF2D30  0  A  M

Output specification

Unit specification

Nil With unit switching function
M Fixed SI unit

Panel mounting

Output 1  Switch output
Output 2  Switch output

Specifications for Display Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2D300/301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate measurement range (Note 1)</td>
<td>0.25 to 4.5 l/min 1.3 to 21.0 l/min 2.5 to 45 l/min</td>
</tr>
<tr>
<td>Set flow rate range (Note 1)</td>
<td>0.25 to 4.5 l/min 1.3 to 21.0 l/min 2.5 to 45 l/min</td>
</tr>
<tr>
<td>Minimum set unit (Note 1)</td>
<td>0.1 l/min 0.1 l/min 0.5 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50ms) (Note 1)</td>
<td>0.05 l/pulse 0.1 l/pulse 0.5 l/pulse</td>
</tr>
</tbody>
</table>

Display units

- Real-time flow rate: l/min, gal (US)/min
- Accumulated flow: l, gal (US)

Accumulated flow range (Note)

- 0 to 999999 l

Linearity (Note 3)

- ±2.5% F.S. or less

Repeatability

- ±0.5% F.S. or less

Temperature characteristics

- ±1% F.S. or less (15 to 35°C, based on 25°C)
- ±2% F.S. or less (0 to 50°C, based on 25°C)

Current consumption (No load)

- 60 mA or less

Weight

- 45 g

Switch output

- NPN open collector (PF2D300)
- Maximum load current: 80 mA
- Internal voltage drop: 1 V or less (with load current of 80 mA)
- Maximum applied voltage: 30 V
- 2 outputs

- PNP open collector (PF2D301)
- Maximum load current: 80 mA
- Internal voltage drop: 1.5 V or less (with load current of 80 mA)
- 2 outputs

Enclosure

- IP40

Operating temperature range

- Operating: 0 to 50°C. Stored: −25 to 85°C (with no condensation and freezing)
- 1000 VAC for 1 min. between external terminal and case

Insulation resistance

- 50M Ω or more (500 VDC Mega) between external terminal and case

Vibration resistance

- 10 to 500 Hz with a 1.5 mm amplitude or 98 m/s² acceleration in each X, Y, Z direction for 2 hrs., whichever is smaller.

Impact resistance

- 490 m/s² to X, Y, Z directions 3 times for each

Noise resistance

- 1000 Vp-p, Pulse width: 1 µs, Rise time: 1 ns

Indicator light

- 3-digits 7-segment LED

Status LED’s

- ON: when light is on, OUT1: Green; OUT2: Red

Power supply voltage

- 12 to 24 VDC (ripple ±10% or less)

Response time

- 1 sec. or less

Hysteresis

- Hysteresis mode: adjustable (can be set from 0) Window comparator mode (Note 5): fixed (3 digits)

Note 1) The value varies depending on set flow range

Note 2) For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch types without the unit switching function.)

Note 3) The system accuracy when combined with PF2DS/L52408/L52408.

Note 4) Switch output and accumulated pulse output can be selected using the control button operation during initial setting.

Note 5) Window comparator mode: Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)

Note 6) The display unit conforms to the CE mark.

Note) Accumulated flow rate is reset when the power supply turns OFF.

Output 1  Switch output  Switch output  Accumulated pulse output  Accumulated pulse output
Output 2  Switch output  Accumulated pulse output  Switch output  Accumulated pulse output

1  2  3  4
**How to Order**

4-channel Flow Monitor
Remote Type Display Unit

**PF2D20**

- **Output specification**: M
  - 0 NPN4 outputs
  - 1 PNP4 outputs

**Option 2 (Refer to page 55.)**
- Nil
- Sensor connector (4 pc.) 4C

**Option 1 (Refer to page 55.)**
- Nil
- Panel mounting A
- Front protective cover + Panel mounting B

---

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>PF2D200/201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable flow rate sensor</td>
<td>PF2D504-0-1</td>
</tr>
<tr>
<td>Flow rate measurement range</td>
<td>0.25 to 4.50 l/min</td>
</tr>
<tr>
<td>Flow rate range</td>
<td>1.3 to 21.0 l/min</td>
</tr>
<tr>
<td>Minimum set unit</td>
<td>0.05 l/min</td>
</tr>
<tr>
<td>Accumulated pulse flow rate exchange value (Pulse width: 50ms)</td>
<td>0.05 l/pulse</td>
</tr>
<tr>
<td>Real-time flow rate</td>
<td>l/min, gal(US)/min</td>
</tr>
<tr>
<td>Display units</td>
<td>Real-time flow rate</td>
</tr>
<tr>
<td>Accumulated flow range</td>
<td>0 to 999999 l, 0 to 999999 gal(US)</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>24 VDC (ripple ±10% or less)</td>
</tr>
<tr>
<td>Current consumption</td>
<td>55 mA or less (Not including the current consumption of the sensor)</td>
</tr>
<tr>
<td>Power supply voltage for sensor</td>
<td>Same as [Power supply voltage]</td>
</tr>
<tr>
<td>Power supply current for sensor</td>
<td>Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)</td>
</tr>
</tbody>
</table>

**Sensor input**
- No. of inputs: 4 inputs
- Switch output (Real-time switch output, Accumulated switch output): NPN open collector (PF2D200)
  - Maximum load current: 80 mA
  - Internal voltage drop: 1 V or less (with load current of 80 mA)
  - Maximum applied voltage: 30 V
- PNP open collector (PF2D201)
  - Maximum load current: 80 mA
  - Internal voltage drop: 1 V or less (with load current of 80 mA)

**Accumulated pulse output**
- NPN open collector or PNP open collector (same as switch output)

**Hysteresis**
- Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)

**Response time**
- 1s or less

**Linearity**
- ±3% F.S. or less

**Repeatability**
- ±2% F.S. or less

**Temperature characteristics**
- ±2% F.S. or less (0 to 50°C, based on 25°C)

**Display method**
- For measured value display: 4-digits, 7-segment LED (Orange)
- For channel display: 1-digit, 7-segment LED (Red)

**Status LED’s**
- Illuminates when output is ON

**Resistance**
- Real-time flow rate: 1 to 5 VDC (Input impedance: Approx. 800kΩ)

**Connection**
- Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)

**Material**
- Housing: PBT, Display: PET, Backside rubber: CR

**Weight**
- 60 g (Except for any accessories that are shipped together.)

---

**Note 1) Fixed SI unit [l/min or l] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.

**Note 2) If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.

**Note 3) Switch output and accumulated pulse output can be selected during initial setting.

**Note 4) The system accuracy when combined with an applicable flow sensor.

**Note 5) This product conforms to the CE mark.

---

Connectable remote type sensor part is PF2D504-0-1 (with analog output 1 to 5 V).
Flow Characteristics (Pressure Characteristics)

<table>
<thead>
<tr>
<th>Pressure loss [MPa]</th>
<th>Flow rate (l/min)</th>
<th>PF2D504</th>
<th>PF2D520</th>
<th>PF2D540</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>0.010</td>
<td>0.010</td>
<td>0.010</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
<td>0.015</td>
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</tr>
<tr>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
</tr>
<tr>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
</tr>
<tr>
<td>0.030</td>
<td>0.030</td>
<td>0.030</td>
<td>0.030</td>
<td>0.030</td>
</tr>
<tr>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
</tr>
<tr>
<td>0.040</td>
<td>0.040</td>
<td>0.040</td>
<td>0.040</td>
<td>0.040</td>
</tr>
</tbody>
</table>

Construction

PF2D504/520

Parts list

<table>
<thead>
<tr>
<th>Number</th>
<th>Parts</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td>New PFA</td>
</tr>
<tr>
<td>2</td>
<td>Sensor</td>
<td>New PFA</td>
</tr>
<tr>
<td>3</td>
<td>Tube</td>
<td>Super PFA</td>
</tr>
<tr>
<td>4</td>
<td>Housing A</td>
<td>PPS</td>
</tr>
<tr>
<td>5</td>
<td>Housing B</td>
<td>PPS</td>
</tr>
<tr>
<td>6</td>
<td>Housing C</td>
<td>PPS</td>
</tr>
<tr>
<td>7</td>
<td>Bushing</td>
<td>POM</td>
</tr>
<tr>
<td>8</td>
<td>Cap</td>
<td>PPS</td>
</tr>
<tr>
<td>9</td>
<td>Gasket</td>
<td>FKM</td>
</tr>
<tr>
<td>10</td>
<td>O-ring</td>
<td>FKM</td>
</tr>
<tr>
<td>11</td>
<td>Thread</td>
<td>Stainless steel 304</td>
</tr>
<tr>
<td>12</td>
<td>Lead wire</td>
<td>PVC</td>
</tr>
</tbody>
</table>

PF2D540
Series PF2D

Dimensions: Remote Type Sensor Unit

PF2D504-11/520-13

PF2D540-19

Internal circuits and wiring examples

Load is an analog input equipment such as a voltmeter.
PF2D5[___]1 (With voltage output type)
PF2D5[___]2 (With voltage output type)

Wiring

* Use this sensor by connecting it to a SMC remote type display unit Series PF2D[___].

Analog output

Current [mA]

Voltage [V]

Flow rate [l/min]

Flow direction
**Digital Flow Switch Series PF2D**

For Deionized Water and Chemicals

**Dimensions: Remote Type Display Unit**

**PF2D30-A**

**Panel mounting type**

Panel fitting dimensions

*The applicable panel thickness is 1 to 3.2 mm.*

- **View A**

Internal circuits and wiring examples

1 to 8 are the terminal numbers.

- **PF2D300-A(-M)**

- **PF2D301-A(-M)**

Terminal block numbers

*Do not connect the white wire of the sensor to 1 of the display unit.*
Series PF2D

Dimensions: Remote Type Display Unit for Deionized Water and Chemicals (4-channel Controller)

PF2D200/201

Front protective cover + Panel mounting

Sensor connector (option)

Front protective cover

Panel mounting adapter

Waterproof seal

Panel fitting dimensions

Applicable panel thickness: 0.5 to 8 mm
Digital Flow Switch Series PF2D

Dimensions: Remote Type Display Unit for Deionized Water and Chemicals (4-channel Controller)

Sensor connector (4P x 4)

Connector (option)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Terminal</th>
<th>Connector no.</th>
<th>Cable wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC+</td>
<td>1</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>N.C.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>DC−</td>
<td>3</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>IN: 1 to 5 V</td>
<td>4</td>
<td>White</td>
</tr>
</tbody>
</table>

Power supply / Output connector (8P)

Internal circuits and wiring examples

PF2D200

PF2D201
**Series PF2D**

### Description

**Remote Type/Display Unit**
PF2D300, 301

*RESET button (▲ ▼ button)*

- If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate.
- In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

<table>
<thead>
<tr>
<th>No.</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LED display/Red</td>
<td>Displays the measured flow rate, each setting condition, and error code.</td>
</tr>
<tr>
<td>2</td>
<td>Output (OUT1) display/Green</td>
<td>Displays the output condition of OUT1. Illuminates when turned ON.</td>
</tr>
<tr>
<td>3</td>
<td>Output (OUT2) display/Red</td>
<td>Displays the output condition of OUT2. Illuminates when turned ON.</td>
</tr>
<tr>
<td>4</td>
<td>UP button (▲ button)</td>
<td>Use to change the mode or to increase the set value.</td>
</tr>
<tr>
<td>5</td>
<td>SET button (● button)</td>
<td>Use this button to set the value or the set mode.</td>
</tr>
<tr>
<td>6</td>
<td>DOWN button (▼ button)</td>
<td>Use to change the mode or decrease the set value.</td>
</tr>
</tbody>
</table>

**4-channel Flow Monitor (Remote type/Display unit)**
PF2D200, 201

<table>
<thead>
<tr>
<th>No.</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LED display/Orange</td>
<td>Displays the measured flow rate, each setting condition, and error code.</td>
</tr>
<tr>
<td>2</td>
<td>Switch output display/Red</td>
<td>Displays the output condition of OUT1 (CH1 to 4). Lights up when turned ON.</td>
</tr>
<tr>
<td>3</td>
<td>Unit display/Orange</td>
<td>Illuminates the selected unit. Use after putting the unit label other than l/min, L.</td>
</tr>
<tr>
<td>4</td>
<td>Channel display/Red</td>
<td>Displays the selected channel.</td>
</tr>
<tr>
<td>5</td>
<td>UP button (▲ button)</td>
<td>Use to change the mode or to increase the set value.</td>
</tr>
<tr>
<td>6</td>
<td>SET button</td>
<td>Use this button to set the value or the set mode.</td>
</tr>
<tr>
<td>7</td>
<td>DOWN button (▼ button)</td>
<td>Use to change the mode or decrease the set value.</td>
</tr>
</tbody>
</table>
Functions/PF2D

Flow rate measurement selection
Real-time flow rate and accumulated flow rate can be selected. A flow rate of up to 999999 can be accumulated. The accumulated flow rate is reset when the power supply turns OFF.

Unit switching

<table>
<thead>
<tr>
<th>Display</th>
<th>Real-time flow rate</th>
<th>Accumulated flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>U₁, l</td>
<td>( \ell/\text{min} )</td>
<td>( \ell )</td>
</tr>
<tr>
<td>U₂, GPM</td>
<td>GPM</td>
<td>gal (US)</td>
</tr>
</tbody>
</table>

GPM = gal (US)/min
Note) Fixed SI unit \((l/min, l, m^3 \text{ or } m^3 \times 10)\) will be set for the type without the unit switching function.

Flow rate measuring unit confirmation
This function allows to confirm the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

Error correction

For PF2D300/301

<table>
<thead>
<tr>
<th>LED display</th>
<th>Contents</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{Er} \text{ 1} )</td>
<td>A current of more than 80 mA is flowing to OUT1.</td>
<td>Check the load and the wiring for OUT1.</td>
</tr>
<tr>
<td>( \text{Er} \text{ 2} )</td>
<td>A current of more than 80 mA is flowing to OUT2.</td>
<td>Check the load and the wiring for OUT2.</td>
</tr>
<tr>
<td>( \text{Er} \text{ 4} )</td>
<td>The set data has changed for some reason.</td>
<td>Perform the RESET operation, and reset all the data again.</td>
</tr>
<tr>
<td>- - -</td>
<td>The flow rate is over the flow rate measurement range.</td>
<td>Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.</td>
</tr>
</tbody>
</table>

For PF2D200/201

<table>
<thead>
<tr>
<th>LED display</th>
<th>Contents</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{Er} \text{ 1} )</td>
<td>Over current is flowing to the load of a switch output.</td>
<td>Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.</td>
</tr>
<tr>
<td>( \text{Er} \text{ 6} )</td>
<td>Internal data error.</td>
<td>Contact SMC.</td>
</tr>
<tr>
<td>( \text{Er} \text{ 5} )</td>
<td>Internal data error.</td>
<td>Shut off the power supply and then reset the switch.</td>
</tr>
<tr>
<td>( \text{Er} \text{ 6} )</td>
<td>Internal data error.</td>
<td>Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.</td>
</tr>
<tr>
<td>- - -</td>
<td>The flow rate is over the flow rate measurement range.</td>
<td></td>
</tr>
</tbody>
</table>

Key lock
This function prevents incorrect operations such as changing the set value accidentally.

Accumulation clearance
This is to clear the accumulated value.

Output types
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output

Accumulated switch output

Accumulated pulse output

Refer to the “Instruction Manual” for information on setting and operating.
Series PF2D

Functions

<table>
<thead>
<tr>
<th>Copy function (PF2D200, 201 only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information to be copied is:</td>
</tr>
<tr>
<td>① Flow rate range</td>
</tr>
<tr>
<td>② Display mode</td>
</tr>
<tr>
<td>③ Display unit (Only available when the unit specification is nil.)</td>
</tr>
<tr>
<td>④ Output method</td>
</tr>
<tr>
<td>⑤ Output mode</td>
</tr>
<tr>
<td>⑥ Flow rate value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Channel select function (PF2D200, 201 only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every pushing the △ button, channel selection “1→2→3→4→1...” is available. The flow rate measurement of each selected channel is shown in the display unit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Channel scan function (PF2D200, 201 only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes displaying the channel shown every about 2 seconds and its detected flow rate.</td>
</tr>
</tbody>
</table>

Option

When only optional parts are required, order with the part numbers listed below.

e-con connector

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-28-CA-2</td>
<td>1</td>
</tr>
</tbody>
</table>

Panel mounting

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-22-E</td>
<td>Panel mounting adapter A, B With mounting bracket</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-26-B</td>
<td>Panel mounting adapter With waterproof seal, mounting screw</td>
<td></td>
</tr>
<tr>
<td>ZS-26-C</td>
<td>Front protective cover + Panel mounting adapter With waterproof seal, mounting screw</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the connector shown above, those listed below (female contact) can be connected.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumitomo 3M Limited</td>
<td>37104-3101-000FL</td>
</tr>
<tr>
<td>Tyco Electronics AMP K.K.</td>
<td>1-1473562-4</td>
</tr>
<tr>
<td>OMRON Corp.</td>
<td>XN2A-1430</td>
</tr>
</tbody>
</table>

In addition to the connector shown above, those listed below (female contact) can be connected.

- Panel mounting adapter
- Front protective cover + Panel mounting adapter
- Mounting bracket (accessory)
- Waterproof seal (accessory)
Applicable Fluid

Compatibility checklist: Between the digital flow switch material for deionized water and chemicals and the fluid selected.

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>○</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>○</td>
</tr>
<tr>
<td>Isobutyl alcohol</td>
<td>X</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>○</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>○</td>
</tr>
<tr>
<td>Ozone</td>
<td>X</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>○</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>○</td>
</tr>
<tr>
<td>Butyl acetate</td>
<td>○</td>
</tr>
<tr>
<td>Nitric acid (except fuming nitric acid)</td>
<td>○</td>
</tr>
<tr>
<td>Deionized water</td>
<td>○</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>X</td>
</tr>
<tr>
<td>Ultra deionized water</td>
<td>○</td>
</tr>
<tr>
<td>Toluene</td>
<td>○</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>○</td>
</tr>
<tr>
<td>Sulfuric acid (except fuming sulfuric acid)</td>
<td>○</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>○</td>
</tr>
</tbody>
</table>

Note 1) The material and fluid compatibility check list provides reference values as a guide only.  
Note 2) It is possible that some fluids are permeable depending on the type of fluid, its density and temperature. Any permeated fluid may affect the products life.  
Thus, when using these fluid types, verify the fluid in advance by testing it, prior to making a decision to use it.

· Compatibility is indicated for fluid temperatures at 90°C or less.  
· The product does not have an explosion proof construction. Be sure to take measures to prevent the area around the product from becoming filled with an explosive gas, when using an explosive fluid.

Table symbols:  
○ : Can be used  
○ : Can be used under certain conditions  
X : Cannot be used
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of “Caution”, “Warning” or “Danger”. To ensure safety, please observe all safety practices.

⚠️ Caution : Operator error could result in injury or equipment damage.

⚠️ Warning : Operator error could result in serious injury or loss of life.

⚠️ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

⚠️ Warning

1. The compatibility of equipment is the responsibility of the person who designs the system or decides its specifications.
   Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information and taking into consideration the possibility of equipment failure when configuring a system.

2. Only trained personnel should operate machinery and equipment.
   Assembly, handling or repair of systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

4. To promote safe operation, be sure to observe company standard and legal regulations, etc.
   Refer to ISO4414, JIS B 8370 (pneumatic system axiom), labor health and safety laws and other safety regulations.
Design and Selection

⚠️ Warning
1. Operate the switch only within the specified voltage.
   Use of the switch outside of the specified voltage range can cause not only a malfunction and damage to the switch, but it can also cause electrocution and fire.

2. Do not exceed the maximum allowable load specification.
   A load exceeding the maximum load specification can cause damage to the switch.

3. Do not use a load that generates a surge voltage.
   Although the circuit at the output side of the switch is surge protected, damage may still occur if a voltage surge is applied repeatedly. When a load which generates a surge, such as from a relay or solenoid valve is directly driven, use a switch with a built-in surge absorbing element.

4. Be sure to verify the applicable fluid.
   The switches do not have an explosion proof rating. To prevent possible fire hazard, do not use with flammable gases or fluids.

5. Monitor the internal voltage drop of the switch.
   When operating below the specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

\[
\text{Supply voltage} \quad \text{Internal voltage drop of switch} \quad \text{Minimum operating voltage of load}
\]

6. Use the switch within the specified flow rate measurement and operating pressure.
   Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

   <Examples of pressure reduction measures>
   a) Use a device such as a water hammer relief valve to slow the valve’s closing speed.
   b) Absorb impact pressure by using an accumulator or elastic piping material such as a rubber hose.
   c) Keep the piping length as short as possible.

7. Design the system so that the fluid always fills the detection passage.
   Especially for vertical mounting, introduce the fluid from the bottom to the top.

8. Operate within the flow rate measurement range.
   If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

9. Never use inflammable fluids and/or permeable fluids.
   They may cause a fire, an explosion or corrosion.

"Refer to the MSDA (material safety data sheet) when using chemicals.

Design and Selection

⚠️ Caution
1. Data from the flow switch is stored even after the power supply is off.
   The input data is stored in EEPROM so that the data will not be lost after the flow switch is turned off. (The data can be rewritten for up to one million times, and stored for up to 20 years.)

2. Accumulated flow rate is reset when it is turned OFF.

Mounting

⚠️ Warning
1. Monitor the flow direction of the fluid.
   Install and connect piping so that fluid flows in the direction of the arrow indicated on the body.

2. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

3. Do not drop or bump.
   Do not drop, bump, or apply excessive impacts (490 m/s²) while handling. Although the external body of a switch (switch case) may not be damaged, the switch inside could be damaged and cause a malfunction.

4. Hold the body of the switch when handling.
   The tensile strength of the cord is 49N and applying a greater pulling force than this can cause a malfunction. When handling, hold the body of the switch.

5. Do not use until you can verify that equipment can operate properly.
   Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

6. Never mount a switch in a place that will be used as a step stool during piping.

7. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.
   When abruptly reducing the size of piping or when there is a restriction such as a valve on the inlet side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the outlet side of the switch.

When used with the outlet side open, be careful of the cavitation that is prone to occur.
Warning

1. Verify the color and the terminal number when wiring.
   Incorrect wiring can cause the switch to be damaged and malfunction. Verify the color and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching of the lead wire.
   Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.
   Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.
   Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.

5. Do not allow loads to short circuit.
   Although a switch indicate excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

Usage

Warning

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

Operating Environment

Warning

1. Never use in the presence of explosive gases.
   The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

2. Mount the switch in a location where there is no vibration (Display: greater than 98 m/s², Sensor: 4.9 m/s² or less), or no impact greater than 490 m/s².

3. Do not use in an area where surges are generated.
   When there are units that generate a large amount of surge in the area around a pressure switch, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the switch’s internal circuitry. Avoid sources of surge generation and crossed lines.

4. Switches are not equipped with surge protection against lightning.
   The flow switches are CE compliant; however, they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to system components as necessary.

5. Avoid using the switch in an environment where the likelihood of splashing or spraying of liquids exists.
   The switches are dustproof and splashproof; however, avoid using in an environment where the likelihood of heavy splashing or spraying of water and/or oil exist. Since the display unit of the remote type switches featured here is not dust or splash proof, the use in an environment where water and/or oil splashing or spraying exists must be avoided.

Maintenance

Warning

1. Perform periodical inspections to ensure proper operation of the switch.
   Unexpected malfunctions may cause a possible danger.

2. Take precautions when using the switch for an interlock circuit.
   When a pressure switch is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction. Verify the operation of the switch and the interlock function on a regular basis.

3. Do not disassemble or perform any conversion work on flow switches.

4. The following should be observed during regular maintenance to avoid damage and loss due to chemicals.
   a) Do not touch the remaining chemicals in piping and/or digital flow switch.
   b) Check the name and the nature of chemicals used and treat them accordingly.
Series PF2D
Specific Product Precautions 3
Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

⚠️ Warning

1. Check regulators and flow adjustment valves before introducing the fluid.
   If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.
2. Be sure to take measures to prevent exposing the switch to inflammable and/or explosive gases when using inflammable fluid.
3. Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.
   If foreign matter adheres to the switch’s vortex generator or vortex detector, accurate measurement will no longer be possible.

⚠️ Warning

1. After the power is turned on, the switch’s output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.
2. Perform settings after stopping control systems.
   When the switch’s initial setting and flow rate setting are performed, output maintains the condition prior to the settings. Output turns OFF when the switch’s initial setting and flow rate setting are preformed.

⚠️ Caution

Set the flow rate within the rated flow range.
The set flow rate range is the range of flow rate that can be set on the controller side.
The rated flow range is the range that satisfies the sensor’s specifications (accuracy, linearity etc.).
It is possible to set a value outside of the rated flow range, however, the specification is not be guaranteed.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Flow rate range</th>
<th>40 l/min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.4 l/min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3 l/min</td>
<td>4 l/min</td>
</tr>
<tr>
<td></td>
<td>2.5 l/min</td>
<td>4.5 l/min</td>
</tr>
</tbody>
</table>

- **Measured Fluid**

- **Others**

Set Flow Rate Range and Rated Flow Range

### Warning

1. After the power is turned on, the switch’s output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.
2. Perform settings after stopping control systems.
   When the switch’s initial setting and flow rate setting are performed, output maintains the condition prior to the settings. Output turns OFF when the switch’s initial setting and flow rate setting are preformed.
Series PF2D
Specific Product Precautions 4

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

4-channel Flow Monitor

Warning

1. Do not drop, bump, or apply excessive impacts (980 m/s²) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.
2. The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.

Wiring

Caution

1. Connecting sensor cable and connector (ZS-28-CA-□)
   • Cut the sensor cable as shown below.
   • Insert each lead wire into the corresponding connector number by following the chart provided below.
   • Make sure that the numbers on the connector and the wire colors match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
   • Using pliers, press the center of A straight down.
   • Note that connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

<table>
<thead>
<tr>
<th>Connector no.</th>
<th>Cable wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown (DC+)</td>
</tr>
<tr>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>Blue (DC−)</td>
</tr>
<tr>
<td>4</td>
<td>White (IN: 1 to 5 V)</td>
</tr>
</tbody>
</table>

2. Inserting/Detaching of sensor connector, power supply/output connector
   • Insert each connector straightforwardly until it clicks and locks onto the body.
   • To remove the connector, pull it straight out while pushing the lever with your thumb.

Operating Environment

Warning

1. Our 4-channel flow monitor is CE marked, however it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.
2. Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.
3. Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.

Mounting

Caution

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

Front protective cover + Panel mounting

Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

Front protective cover
Waterproof seal (accessory)
Panel mounting adapter (ZS-26-B)
Panel
Mounting screw (M3 x 8 L) (accessory)

Pin no.
1 Brown DC (+)
2 Blue DC (−)
3 Black CH1_OUT1
4 White N.C.
5 Gray CH2_OUT1
6 Red CH3_OUT1
7 Green CH4_OUT1
8 Yellow N.C.
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