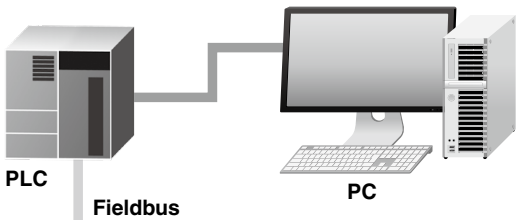
# IO-Link Compatible

# 3-Color Display Digital Flow Switch for Water

## Supports the IO-Link communication protocol

IP65




**Configuration File (IODD File*1)**
• Manufacturer • Product part no. • Set value

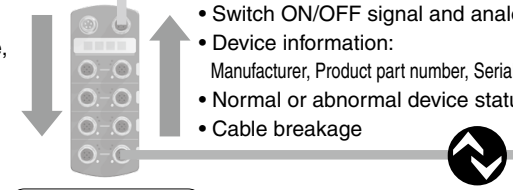
*1 **IODD File:**
IODD is an abbreviation of IO Device Description. This file is necessary for setting the device and connecting it to a master. Save the IODD file on the PC to be used to set the device prior to use.

**IO-Link**

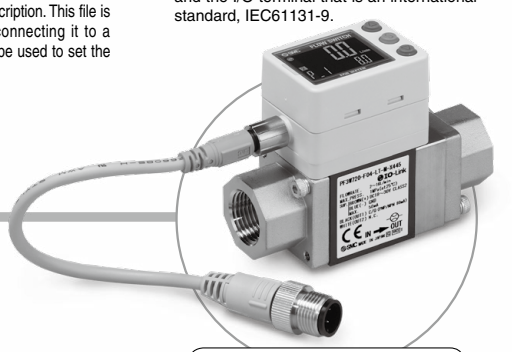
IO-Link is an open communication interface technology between the sensor/actuator and the I/O terminal that is an international standard, IEC61131-9.

Device settings can be set by the master.
• Threshold value
• Operation mode, etc.

**Read the device data.**
• Switch ON/OFF signal and analog value
• Device information:
Manufacturer, Product part number, Serial number, etc.
• Normal or abnormal device status
• Cable breakage



**IO-Link Master**



**IO-Link Compatible Device: Digital Flow Switch for Water**

### Implement diagnostic bits in the process data.

The diagnostic bit in the cyclic process data makes it easy to find problems with the equipment.
It is possible to find problems with the equipment in real time using the cyclic (cycle) data and to monitor such problems in detail with the noncyclic (aperiodic) data.

**Process Data**

| Bit offset | Item | Note |
|---|---|---|
| 0 | OUT1 output | 0: OFF 1: ON |
| 1 | OUT2 output | 0: OFF 1: ON |
| 8 | Diagnosis (error) | 0: OFF 1: ON |
| 9 | Diagnosis (flow rate) | 0: OFF 1: ON |
| 10 | Diagnosis (temperature) | 0: OFF 1: ON |
| 16 to 31 | Measured temperature value | Signed 16 bit |
| 32 to 47 | Measured flow rate value | Signed 16 bit |

| Diagnosis items |
|---|
| • Over current error |
| • Above the rated flow range |
| • Accumulated flow error |
| • Above the rated temperature range |
| • Below the rated temperature range |
| • Internal product malfunction |
| • Temperature sensor failure |

| Bit offset | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Measured flow rate value (PD) | | | | | | | | | | | | | | | |

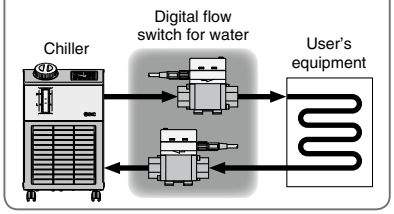
| Bit offset | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Measured temperature value (PD) | | | | | | | | | | | | | | | |

| Bit offset | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Reservation | | | | | Temperature | Flow rate | Error | Reservation | | | | | | OUT2 | OUT1 |
| | | | | | | Diagnosis | | | | | | | | | Switch output | |

### Application Examples

**For the predictive maintenance of cooling water problems**

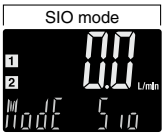
Monitors flow rate and temperature's "switch ON/OFF signals" and "analog values" to determine the cooling status
The process and cooling status can be compared.



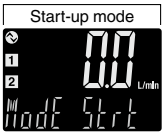

### Display function

Displays the output communication status and indicates the presence of communication data

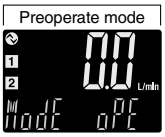
SIO mode



Start-up mode



Preoperate mode



Operate mode

**Operation and Display**

| Communication with master | IO-Link status indicator light | Status | | | Screen display | Description |
|---|---|---|---|---|---|---|
| Yes | *1 | IO-Link mode | Normal | Operate | mode oPE | Normal communication status (readout of measured value) |
| | | | | Start up | mode Strt | At the start of communication |
| | | | | Preoperate | mode PrE | |
| | *1 (Flashing) | | Abnormal | Version does not match | Er 15 V1.0 | The IO-Link version does not match that of the master. The master uses version 1.0. |
| | | | | Lock | mode LoC | Backup and restore required due to data storage lock |
| No | | | | Communication disconnection | mode oPE / mode Strt / mode PrE | Normal communication was not received for 1 second or longer. |
| | OFF | SIO mode | | | mode SIO | General switch output |

*1 In IO-Link mode, the IO-Link indicator will be ON or flashing.

# PF3W7□-X445

SMC

# IO-Link Compatible
## 3-Color Display
# Digital Flow Switch for Water
# PF3W7□-X445

## How to Order

**PF3W 7 20 – □ 04 – LT Q – M □ □ – X445**

**Integrated display type**

**Rated flow range (Flow range)**

| | |
|---|---|
| **04** | 0.5 to 4 L/min |
| **20** | 2 to 16 L/min |
| **40** | 5 to 40 L/min |

**Thread type**

| | |
|---|---|
| **Nil** | Rc |
| **N** | NPT |
| **F** | G*1 |

*1 ISO 228 compliant

**Piping port size**

| Symbol | Port size | Applicable flow range | | |
|---|---|---|---|---|
| | | 04 | 20 | 40 |
| **03** | 3/8 | ● | ● | — |
| **04** | 1/2 | — | ● | ● |
| **06** | 3/4 | — | — | ● |

**Output specification/Temperature sensor**

| Symbol | Output specification | | Temperature sensor |
|---|---|---|---|
| | OUT1 | OUT2 | |
| **LT** | IO-Link: Switch output (N/P) | — | With temperature sensor |

**Lead wire/Option**

| | |
|---|---|
| **Nil** | With lead wire with M8 connector (3 m) |
| **N** | Without lead wire with M8 connector (3 m) |
| **Q** | With M12-M8 conversion lead wire (0.1 m)*2 |

*2 A cable (3 m) with an M12 connector is also available separately. Refer to the **Web Catalog** for details.

**Unit specification**

| Symbol | Instantaneous flow rate | Accumulated flow | Temperature |
|---|---|---|---|
| **Nil** | gal/min | gal | °C |
| **M** | L/min | L | °C |

* Under the New Measurement Act, units other than SI (symbol "M") cannot be used in Japan.
* Reference: 1 [L/min] = 0.2642 [gal/min]
  1 [gal/min] = 3.785 [L/min]

**Bracket/Option**

| | |
|---|---|
| **Nil** | None |
| **R** | With bracket |

**Calibration certificate (Only for flow rate)**

| | |
|---|---|
| **Nil** | None |
| **A** | With calibration certificate |

* The certificate is written in both Japanese and English.
  The integrated display type with temperature sensor can only display the flow rate.
  The temperature sensor is not calibrated.

**IO-Link compatible**

## Options/Part Nos.

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

| Option | Part no. | Qty. | Note | |
|---|---|---|---|---|
| Bracket | **ZS-40-K** | 1 | For PF3W704/720 | With 4 tapping screws (3 x 8) |
| | **ZS-40-L** | 1 | For PF3W740 | With 4 tapping screws (3 x 8) |
| Lead wire with M8 connector | **ZS-40-A** | 1 | Lead wire length 3 m | |
| M12-M8 conversion lead wire | **ZS-40-M12M8-A** | 1 | Lead wire length 0.1 m*1 | |

*1 A cable (3 m) with an M12 connector is also available separately. Refer to the **Web Catalog** for details.

## Specifications

| Model | | | PF3W704 | PF3W720 | PF3W740 |
|---|---|---|---|---|---|
| **Applicable fluid** | | | Water and ethylene glycol aqueous solution (Viscosity: 3 mPa·s (3 cP) or less)*1 | | |
| **Detection method** | | | Karman vortex | | |
| **Rated flow range** | | | 0.5 to 4 L/min | 2 to 16 L/min | 5 to 40 L/min |
| **Display flow range** | | | 0.35 to 5.50 L/min (Flow of under 0.35 L/min is displayed as "0.00") | 1.7 to 22.0 L/min (Flow of under 1.7 L/min is displayed as "0.0") | 3.5 to 55.0 L/min (Flow of under 3.5 L/min is displayed as "0.0") |
| **Set flow range** | | | 0.35 to 5.50 L/min | 1.7 to 22.0 L/min | 3.5 to 55.0 L/min |
| **Smallest settable increment** | | | 0.01 L/min | 0.1 L/min | |
| **Conversion of accumulated pulse (Pulse width: 50 ms)** | | | 0.05 L/pulse | 0.1 L/pulse | 0.5 L/pulse |
| **Fluid temperature** | | | 0 to 90°C (No freezing or condensation) | | |
| **Display unit** | | | Instantaneous flow rate: L/min, Accumulated flow: L | | |
| **Accuracy** | | | ±3% F.S. | | |
| **Repeatability** | | | ±2% F.S.*2 | | |
| **Temperature characteristics** | | | ±5% F.S. (25°C standard) | | |
| **Operating pressure range***3 | | | Refer to the graph of operating pressure and proof pressure. (Refer to the **Web Catalog**.) | | |
| **Proof pressure***3 | | | Refer to the graph of operating pressure and proof pressure. (Refer to the **Web Catalog**.) | | |
| **Pressure loss** | | | Refer to the graph of pressure loss. (Refer to the **Web Catalog**.) | | |
| **Accumulated flow range***4 | | | 999999999.9 L | | 9999999999 L |
| | | | By 0.1 L | | By 1 L |
| **Switch output** | | | Select from NPN or PNP open collector output. | | |
| | **Maximum load current** | | 80 mA | | |
| | **Maximum applied voltage** | | 30 V (NPN output) | | |
| | **Internal voltage drop** | | 1.5 V or less (at load current of 80 mA) | | |
| | **Delay time***5 | | 3.5 ms or less, variable from 0 to 60 s/0.01 s increments | | |
| | **Hysteresis** | **Hysteresis mode** | Variable from 0 | | |
| | | **Window comparator mode** | | | |
| | **Output protection** | | Short-circuit protection | | |
| | **Output mode** | **Flow rate** | Select from Hysteresis, Window comparator, Accumulated output, Accumulated pulse output, Error output, or Switch output OFF modes. | | |
| | | **Temperature** | Select from Hysteresis mode or Window comparator mode. | | |
| **Display method** | | | 2-screen (Main screen, Sub screen) Main screen: 4-digit, 7-segment, 2-color, Red/Green; Sub screen: 9-digit, 11-segment, (Only the 5th digit is a 7-segment LED.) White Display values updated 5 times per second | | |
| **Indicator light** | | | Output 1, Output 2: Orange | | |
| **Power supply voltage** | **When used as a switch output device** | | 12 to 24 VDC, including ripple (p-p) 10% | | |
| | **When used as an IO-Link device** | | 18 to 30 VDC, including ripple (p-p) 10% | | |
| **Current consumption** | | | 50 mA or less | | |
| **Digital filter***6 | | | Select from 0.5 s, 1.0 s, 2.0 s, 5.0 s, 10.0 s, 15.0 s, 20.0 s, or 30.0 s. | | |
| **Environment** | **Enclosure** | | IP65 | | |
| | **Operating temperature range** | | 0 to 50°C (No freezing or condensation) | | |
| | **Operating humidity range** | | Operating/Stored: 35 to 85% RH (No condensation) | | |
| | **Withstand voltage** | | 250 VAC for 1 minute between external terminals and case | | |
| | **Insulation resistance** | | 50 MΩ or more (500 VDC measured via megohmmeter) between external terminals and case | | |
| **Standards and regulations** | | | CE marking, RoHS | | |
| **Main materials of parts in contact with fluid** | | | PPS, Stainless steel 304, FKM, SCS13 | | |
| | | | Non-grease | | |
| **Piping port size***7 | | | 3/8 | 3/8, 1/2 | 1/2, 3/4 |
| **Weight** | **With temperature sensor** | | 285 g | 335 g | 530 g |
| | **With lead wire** | | +85 g | | |

*1 Please refer to the graph of measurable range for ethylene glycol aqueous solution on the **Web Catalog**. Measurement is possible as long as the fluid does not corrode the wetted parts and viscosity is 3 mPa·s (3 cP) or less. Be aware that water leakage may occur due to internal seal shrinkage or swelling depending on the type of fluid.

*2 If 0.5 s is selected by setting the digital filter, the repeatability will be ±3% F.S.

*3 The operating pressure range and proof pressure may change according to the fluid temperature. Refer to the **Web Catalog**.

*4 Cleared when the power supply is turned off The hold function can be selected. (Intervals of 2 or 5 minutes can be selected.)
If the 5-minute interval is selected, the life of the memory element (electronic parts) is limited to 3.7 million times. (If energized for 24 hours, life is calculated as 5 minutes x access times (3.7 million) = 18.5 million minutes = about 35 years.) Therefore, if using the hold function, calculate the memory life for your operating conditions, and use within this life.

*5 Does not include the value of the digital filter

*6 The response time until the set value reaches 90% in relation to the step input
(The response time is 7 s when it is output by the temperature sensor.)

*7 When the piping diameter or piping passage is restricted, the specifications may not be satisfied.
- The form of the G thread (including the major and minor diameter and pitch of the internal thread) is based on JIS B 0202 (ISO 228-1).
- Products indicated as ISO 1179-1 (G thread for hydraulics/pneumatics) or ISO 16030 (G thread for pneumatics) are based on JIS B 0202 (ISO 228-1) for effective depth of thread, seat surface area, surface roughness, and squareness.
- For ISO 1179-1 (G thread for hydraulics/pneumatics), the withstand pressure is specified for each product. SMC does not guarantee the withstand pressure specified in ISO 1179-1, ISO 1179-2, ISO 1179-3, or ISO 1179-4.
- For ISO 16030 (G thread for pneumatics), the withstand pressure is specified for each product. SMC does not guarantee the withstand pressure specified in ISO 16030.

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

### Communication Specifications (IO-Link mode)

| | |
|---|---|
| **IO-Link type** | Device |
| **IO-Link version** | V1.1 |
| **Communication speed** | COM2 (38.4 kbps) |
| **Minimum cycle time** | 3.5 ms |
| **Process data length** | Input data: 6 bytes, Output data: 0 byte |
| **On request data communication** | Yes |
| **Data storage function** | Yes |
| **Event function** | Yes |
| **Vendor ID** | 131 (0x0083) |
| **Device ID***1 | PF3W704-□-LT□-M-X445: 330 (0x014A)<br>PF3W720-□-LT□-M-X445: 310 (0x0136)<br>PF3W740-□-LT□-M-X445: 317 (0x013D) |

*1 The device ID differs according to each product type (flow range, whether or not a temperature sensor is provided, etc.).

### Temperature Sensor Specifications

| Items | Specifications |
|---|---|
| Rated temperature range | 0 to 100°C*1 |
| Set/Display temperature range | –10 to 110°C |
| Smallest settable increment/Minimum display unit | 1°C |
| Display unit | °C |
| Display accuracy | ±2°C |
| Response time | 7 s*2 |
| Ambient temperature characteristics | ±5% F.S. |

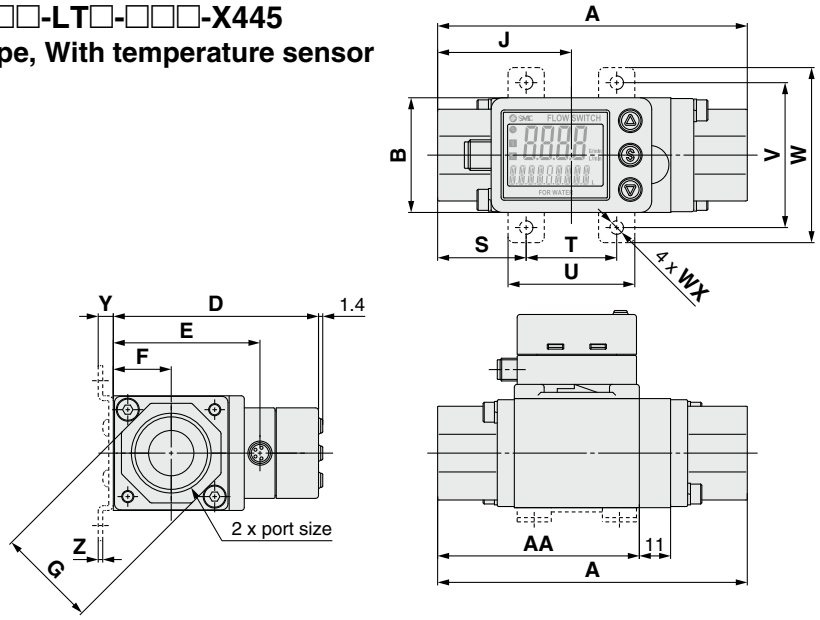
*1 The rated temperature range refers solely to that of the temperature sensor. The fluid temperature range specification of the flow switch as a whole is 0 to 90°C.

*2 The response time refers solely to that of the temperature sensor.

# PF3W7□-X445

## Dimensions

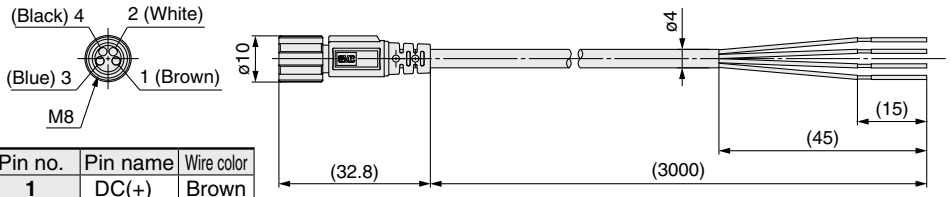
### PF3W704/720/740-□□-LT□-□□□-X445
**Integrated display type, With temperature sensor**




[mm]

| Model | Port size (Rc, NPT, G) | A | AA | B | D | E | F | G | J | Bracket dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | S | T | U | V | W | WX | Y | Z |
| **PF3W704** | 3/8 | 70 | 50 | 30 | 60 | 40.6 | 15.2 | 24 | 35 | 24 | 22 | 32 | 40 | 50 | 4.5 | 5 | 1.5 |
| **PF3W720** | 3/8, 1/2 | 78 | 54 | 30 | 60 | 40.6 | 15.2 | 27 | 39 | 28 | 22 | 32 | 40 | 50 | 4.5 | 5 | 1.5 |
| **PF3W740** | 1/2, 3/4 | 98 | 71 | 38 | 68 | 48.6 | 19.2 | 32 | 49 | 34 | 30 | 42 | 48 | 58 | 4.5 | 5 | 1.5 |

### ZS-40-A
**Lead wire with M8 connector**

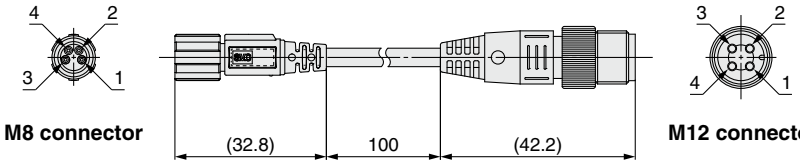



| Pin no. | Pin name | Wire color |
|---|---|---|
| **1** | DC(+) | Brown |
| **2** | N.C. | White |
| **3** | DC(–) | Blue |
| **4** | OUT1 | Black |

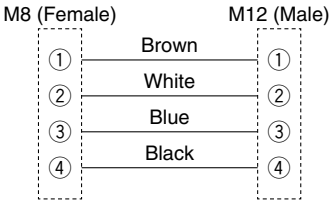
**Lead Wire Specifications**

| | | |
|---|---|---|
| **Conductor** | Nominal cross section | AWG23 |
| | **O.D.** | Approx. 0.7 mm |
| **Insulator** | **Material** | Heat resistant PVC |
| | **O.D.** | Approx. 1.1 mm |
| | **Color** | Brown, White, Black, Blue |
| **Sheath** | **Material** | Heat and oil resistant PVC |
| **Finished O.D.** | | ø4 |

### ZS-40-M12M8-A
**M12-M8 conversion lead wire**




**M8 connector** **M12 connector**




**Wiring diagram**

Refer to the Operation Manual in our website (http://www.smcworld.com) for wiring.

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