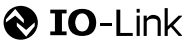




ORIGINAL INSTRUCTIONS

Instruction Manual
Digital Flow Switch – Integrated display
PF3A7##H-L series



The intended use of the digital flow switch is to monitor and display flow information while connected to the IO-Link communication protocol.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)⁽¹⁾, and other safety regulations.

⁽¹⁾ ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety. etc.

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

	Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

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

2 Specifications

Models			PF3A703H	PF3A706H	PF3A712H
Applicable fluid			Air, N ₂		
Operating fluid temperature			0 to 50 °C		
Flow	Detection method		Heating type sensor		
	Rated flow range		30 to 3000 L/min	60 to 6000 L/min	120 to 12000 L/min
	Set point range	Instantaneous flow	30 to 3150 L/min	60 to 6300 L/min	120 to 12600 L/min
		Accumulated flow	0 to 999,999,999,900 L (PF3A703H = 0 to 999,999,999,990 L)		
	Min. resolution	Instantaneous flow	2 L/min	5 L/min	10 L/min
		Accumulated flow	10 L	100 L	
	Accumulated volume per pulse (Pulse width = 50 ms)		Select from 100 L/pulse and 1000 L/pulse		
Accumulated value hold			2 or 5 minutes		
Pressure	Rated pressure range		0.1 to 1.5 MPa		
	Proof pressure		2.25 MPa		
	Pressure loss		Refer to the pressure loss graph		
	Pressure Characteristics		±2.5% F.S. (0.1 to 1.0 MPa, 0.5 MPa standard)		
Electrical	Power supply voltage	Used as switch output device	24 VDC ±10%		
		Used as IO-Link device	18 to 30 VDC ±10%		
Current consumption		150 mA or less			
Protection		Polarity protection			
Accuracy	Display accuracy		±3.0% F.S.		
	Analogue output accuracy		±3.0% F.S.		
	Repeatability		Display, switch output, analogue output: ±1.0% F.S.		
	Temperature characteristics		±5.0% F.S. (ambient temp. 0 to 50 °C, 25 °C standard)		
Switch output	Output type		NPN or PNP open collector output		
	Output mode		Select one of output (hysteresis or window comparator mode), output for accumulated flow, accumulated pulse output, error output and switch OFF.		
	Switch operation		Normal or reversed output		
	Maximum load current		80 mA		
	Maximum applied voltage (NPN output)		30 VDC		
	Internal voltage drop (Residual voltage)		1.5 V or less (Load current 80 mA)		
	Delay time		3.3 ms or less Variable at 0 to 60 s / 0.01 step		
	Hysteresis		Variable		
Analogue Output	Protection		Over current protection		
	Output type		Voltage output: 1 to 5 V (0 to 10 V can be selected), Current output: 4 to 20 mA		
	Impedance	Voltage output	Output impedance approx. 1 kΩ		
		Current output	Max. load impedance 600 Ω		
Ext. input	Response time		Output with digital filter setting		
	Input type		Input with no voltage: 0.4 V or less		
	Input mode		Select from Reset Accumulated Value, Reset Peak and Reset Bottom values		
Time for input		30 ms or more			

2 Specifications (continued)

Models		PF3A703H	PF3A706H	PF3A712H
Display	Reference condition	Normal or Standard condition		
	Display	Display method: LCD Number of displays: 2 (main display and sub display) Colour (main display): Red and green Display colour (sub display): Orange Display (main display and sub display): 9 digits (7 segment 7digits, 11 segment 2 digits)		
	Operation LED	OUT LED: Orange is ON when output is ON		
	Digital filter	Select from 1 s/2 s/5 s		
Environmental	Protection	IP65		
	Withstand voltage	1000 V AC for 1 minute between terminals and housing		
	Insulation resistance	50 MΩ between terminals and housing (with 500 VDC megger)		
	Operating temperature range	Operation: 0 to 50 °C, Storage: -10 to 60 °C (No condensation or freezing)		
Piping specification	Operating humidity range	Operation, Storage: 35 to 85%RH (No condensation)		
	Piping specification	Rc1, NPT1, G1	Rc1 1/2, NPT1 1/2, G1 1/2	Rc2, NPT2, G2
	Material in contact with fluid	Aluminium alloy, PPS, HNBR (Sensor: Pt, Au, Ni, Fe, lead glass (not RoHS compliant), Al ₂ O ₃)		
	Weight	With Rc ports	610 g	1190 g
Weight		With NPT ports	610 g	1190 g
		With G ports	630 g	1220 g
		Lead wire with connector	90 g	

2.1 IO-Link specifications

IO-Link type	Device
IO-Link version	V1.1
Communication speed	COM2 (38.4 kbps)
Min. cycle time	3.3 ms
Process data length	Input Data: 6 bytes, Output Data: 0 byte
On request data communication	Available
Data storage function	Available
Event function	Available
Vendor ID	131 (0x0083)
Device ID	PF3A703H-xx-Lx 0X0190 (400) PF3A703H-xx-L3x 0X0191 (401) PF3A703H-xx-L4x 0X0192 (402) PF3A706H-xx-Lx 0X0193 (403) PF3A706H-xx-L3x 0X0194 (404) PF3A706H-xx-L4x 0X0195 (405) PF3A712H-xx-Lx 0X0196 (406) PF3A712H-xx-L3x 0X0197 (407) PF3A712H-xx-L4x 0X0198 (408)
IODD file	SMC-PF3A7*H**L*-*-yyyymmdd-IODD1.1

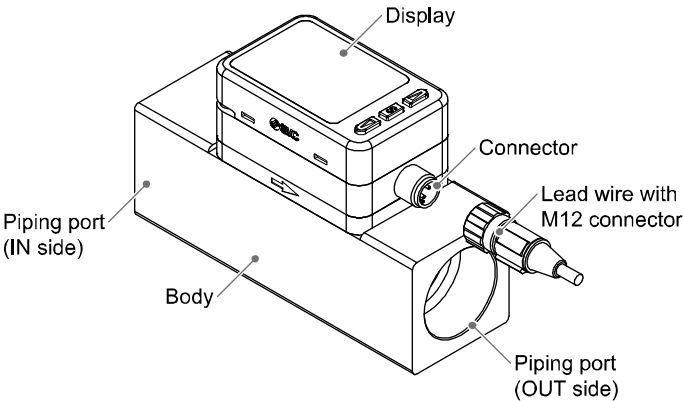
- The IODD configuration file can be downloaded from the SMC website (URL: <https://www.smcworld.com>).

Warning

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

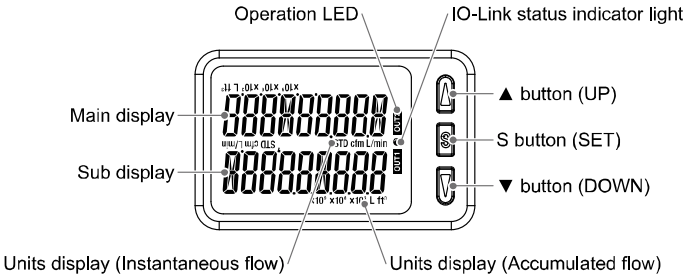
3 Names of Individual parts

3.1 PF3A7##H-L



Element	Description
Connector	Connector for electrical connections.
Lead wire with M12 connector	Lead wire for power supply and output signals.
Piping port	Port to connect the fluid inlet at IN and fluid outlet at OUT.
Body	Body of the product.
Display	Displays the flow, settings and error codes (See below).

3.2 Display



Element	Description
Main display	Displays the instantaneous flow value and error codes. (2 colour display)
Operation LED	Indicates the output status of OUT. When the output is ON: Orange LED is ON. When the accumulated pulse output mode is selected, the output display will turn off.
Sub display	Displays the accumulated flow, set value and peak/bottom value when in measurement mode.
▲ button (UP)	Selects the mode and the display shown on the Sub display or increases the switch point.
S button (SET)	Press this button to change the mode and to set a value.
▼ button (DOWN)	Selects the mode and the display shown on the Sub display or decreases the switch point.
Units display (Instantaneous flow)	Indicates the flow measurement units currently selected.
Units display (Accumulated flow)	Indicates the flow measurement units currently selected.
IO-Link status indicator light	LED is ON when OUT1 is used in IO-Link mode. (LED is OFF in SIO mode)

- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more details of the IO-Link indicator light operation and display.

4 Installation

4.1 Installation

Warning

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

4.2 Environment

Warning

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

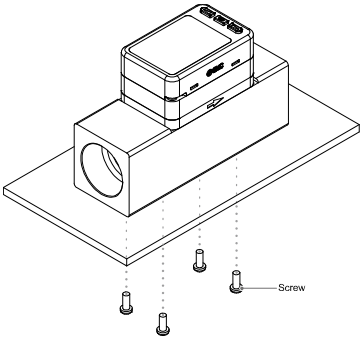
4.3 Mounting

- Never mount the product in a location where it will be used as a mechanical support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- Do not mount the product upside down.
- The monitor with integrated display can be rotated. Rotating the display with excessive force will damage the end stop.

Direct mounting

- Install the product with 4 screws suitable for the product number according to the required tightening torque.

Product number	Suitable screws	Tightening torque	Thread depth
PF3A703H	Equivalent to M4	1.5 N•m ±10%	7 mm
PF3A706H	Equivalent to M5	3.0 N•m ±10%	8 mm
PF3A712H	Equivalent to M6	5.2 N•m ±10%	9 mm



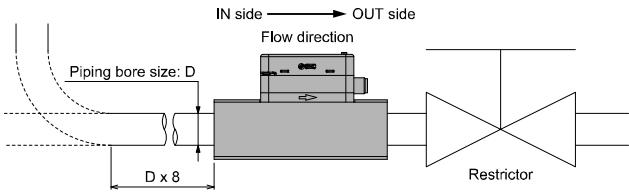
Refer to the operation manual on the SMC website (URL: <https://www.smworld.com>) for mounting hole details and outline dimensions.

4.4 Piping

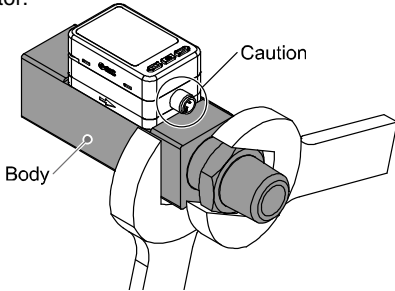
Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port.
- Do not connect equipment or piping which may generate a fluctuation in flow or drift at the IN side of the product.
- When installing a regulator at the IN side of the product, make sure that hunting is not generated.
- The piping on the IN side must have a straight section of piping whose length is 8 times the piping diameter minimum.
- If a straight section of piping is not installed, the accuracy will vary by approximately 3% F.S.
- Avoid sudden changes to the piping size on the IN side of the product.
- The accuracy may vary.
- Do not release the OUT side piping port of the product directly to the atmosphere without connecting piping. The accuracy may vary.

4 Installation (continued)



- Use the correct tightening torque for piping. (Refer to the table below for the required torque values.)
 - If the tightening torque is exceeded, the product can be damaged. If the tightening torque is insufficient, the fittings may become loose.
 - Avoid any sealing tape getting inside the fluid passage.
 - Ensure there is no leakage after piping.
 - When mounting the fitting, a spanner should be used on the body (metal part) only and on the fitting.
- Holding other parts of the product with a spanner may damage the product. Specifically, make sure that the spanner does not damage the M12 connector.



Nominal thread size	Required torque	Width across flats
Rc1、NPT1	36 to 38 N•m	45 mm
Rc1 1/2, NPT1 1/2	48 to 50 N•m	60 mm
Rc2, NPT2	48 to 50 N•m	70 mm

4.5 Wiring

Caution

- Do not perform wiring while the power is on.
- Confirm proper insulation of wiring.
- Do not route wires and cables together with power or high voltage cables.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
- Do not use a cable longer than 20 m.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply.

When used as switch output device

No.	Name	Wire colour	Function
1	DC(+)	Brown	24 VDC
2	FUNC	White	Analogue output or External input
3	DC(-)	Blue	0 V
4	OUT	Black	Switch output

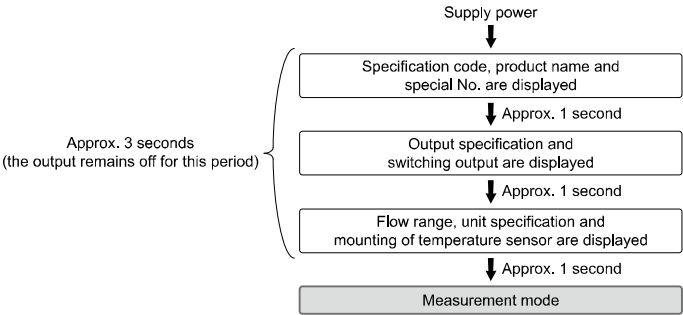
When used as IO-Link device

No.	Name	Wire colour	Function
1	DC(+)	Brown	18 to 30 VDC
2	N.C / Other	White	Not connected / Analogue output or External input
3	DC(-)	Blue	0 V
4	C/Q	Black	IO-Link data / Switch output (SIO)

5 Flow Setting

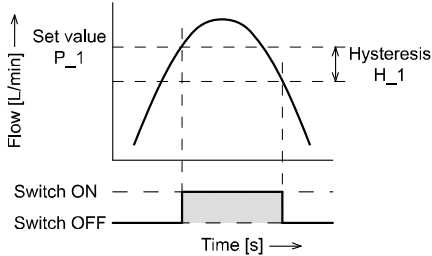
5.1 Measurement mode

The mode in which the flow is detected and displayed, and the switch function is operating. This is the basic operating mode; other modes should be selected for set-point and other function setting changes.



5.2 Switch operation

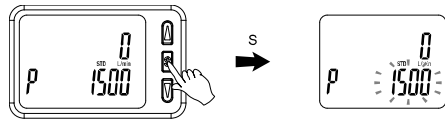
When the flow exceeds the set value [P_1], the switch will be turned ON. When the flow falls below the set value by the amount of hysteresis [H_1] or more, the switch will be turned OFF. If the operation shown below is acceptable, keep this setting.



6 3-step Setting mode

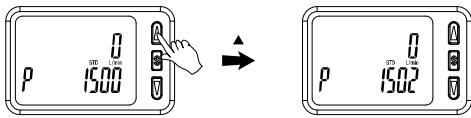
In the 3-step setting mode, the set value (P_1 or n_1) and hysteresis (H_1) can be changed. Set the items on the sub display (set value and hysteresis) using the ▲ or ▼ buttons. When changing the set value, follow the procedure below.

- Press the S button once when the item to be changed is displayed on the sub display. The set value on the sub display (right side) will start flashing.



- Press the UP or DOWN button to change the set value. The UP button is to increase and the DOWN button is to decrease.

- Press the UP button once to increase by one digit, or press and hold to continuously increase.
- Press the DOWN button once to decrease by one digit, or press and hold to continuously decrease.



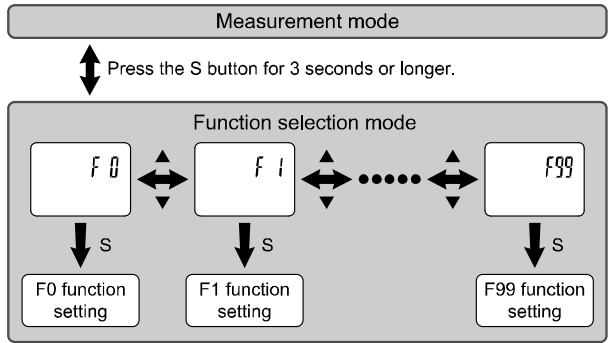
- Press the SET button to finish the setting.

The hysteresis setting can be changed in the same way.

7 Function Setting

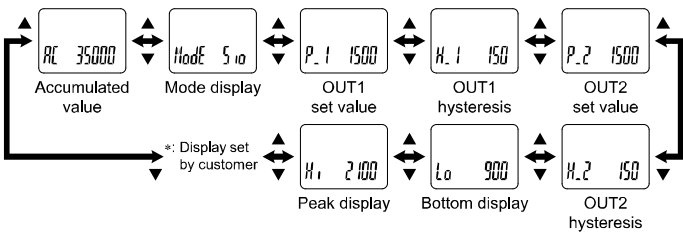
7.1 Function selection mode

In measurement mode, press the SET button for 3 to 5 seconds to display [F 0]. Press the UP or DOWN button to select the function to be changed. Press and hold the SET button for 2 seconds or longer in function selection mode to return to measurement mode.



7.2 Sub screen display

In measurement mode, the sub screen display can be temporarily changed by pressing the UP or DOWN buttons.



7.3 Default settings

Function (Main display)		Default Settings (Right sub display)
(Main display)	(Left sub display)	
[F 0]	[rEF] Reference condition	[Std] Standard condition
	[Unit] Units selection	[L] L/min
	[NorP] Output NPN/PNP	[PnP] PNP output
[F 1]	[oUt1] Output mode	[HYS] Hysteresis mode
	[1ot1] Switch mode	[1_P] Normal output
	[P_1] Set value	50% of maximum rated flow
	[H_1] Hysteresis	5% of maximum rated flow
	[dt1] Delay time	[0.00] 0.00 s
	[CoL] Display colour	[1SoG] ON: Green OFF: Red (OUT1)
[F 2]	[oUt2] Output mode	[HYS] Hysteresis mode
	[2ot] Switch mode	[2_P] Normal output
	[P_2] Set value	50% of maximum rated flow
	[H_2] Hysteresis	5% of maximum rated flow
	[dt2] Delay time	[0.00] 0.00 s
[F 3]	[CoL] Display colour	[1SoG] ON: Green OFF: Red (OUT1)
	[FIL] Digital filter	[1.0] 1 second
[F 5]	[FuNC] FUNC (analogue output or external input)	[AoUt] Analogue output
[F10]	[Sub] Sub display (Line name)	[dEF] Default setting
[F13]	[rEv] Reverse display	[oFF] OFF
[F14]	[CUt] Zero cut-off	[1.0] 1% F.S. cut
[F30]	[SAvE] Accumulated value hold	[oFF] Not stored
[F80]	[diSP] Display OFF mode	[on] Display ON
[F81]	[Pin] Security code	[oFF] Not used
[F90]	[ALL] Setting of all functions	[oFF] Not used
[F96]	[S_in] Check of input signal	[- - -] No input signal
[F98]	[tESt] Setting of output check	[n] Normal output
[F99]	[ini] Reset to default settings	[oFF] Not used

8 Other Settings

- Reset operation
- Snap shot function
- Peak / Bottom value display
- Key-lock function

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for setting these functions.

9 How to Order

Refer to the SMC website (URL: <https://www.smcworld.com>) for more How to Order details.

10 Outline Dimensions (mm)

Refer to the SMC website (URL: <https://www.smcworld.com>) for details of Outline dimensions..

11 Troubleshooting

11.1 Error indication

Error name	Error display	Description	Measures
Instantaneous flow error		The flow rate has exceeded the upper limit of the settable flow range.	Reset applied flow rate to a level within the settable flow range.
Over current error		The switch output load current is 80 mA or more.	Turn the power off and remove the cause of the over current. Then supply the power again.
System error		An internal data error has occurred.	Turn the power off and on again. If the failure cannot be solved, contact SMC.
	to 		
Accumulated flow error		The accumulated flow has exceeded the accumulated flow range. (For accumulated increment)	Reset the accumulated flow. (Press the ▼ and S buttons simultaneously for 1 second or longer)
		The accumulated flow has reached the set accumulated flow. (For accumulated decrement)	
Version does not match		Version of master and IO-Link does not match.	Align the master IO-Link version to the device.

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

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

12 Maintenance

12.1 General Maintenance

- Caution**
- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
 - If handled improperly, compressed air can be dangerous.
 - Maintenance of pneumatic systems should be performed only by qualified personnel.
 - Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
 - After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
 - If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
 - Do not make any modification to the product.
 - Do not disassemble the product, unless required by installation or maintenance instructions.
-
- **How to reset the product after a power cut or when the power has been unexpectedly removed**
The settings of the product are retained from before the power cut or de-energizing.
The output condition also recovers to that before the power cut or de-energizing, but may change depending on the operating environment. Therefore, check the safety of the whole system before operating the product.

13 Limitations of Use

- 12.1 Limited warranty and Disclaimer/Compliance Requirements**
Refer to Handling Precautions for SMC Products.

14 Product disposal

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

15 Contacts

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

SMC Corporation

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