



ORIGINAL INSTRUCTIONS

Instruction Manual
Digital Flow Switch – Integrated display
PF2A7## / PF2W7##(T) series



The intended use of the digital flow sensor is to monitor and control flow and provide an output signal.

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) **, and other safety regulations.
 *) 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

2.1 General specifications

Item	Specifications
Enclosure	IP65 (IEC 60529)
Operating temperature	Operating: 0 to 50 °C : Storage: -25 to 85 °C (no freezing or condensation)
Humidity range	35 to 85% R.H. (no condensation)
Withstand voltage	1000 VAC for 1 min. between charged part and case
Insulation resistance	50 MΩ min (500 VDC Mega) between charged part and case
Materials in contact with fluid	PF2A5##: ADC, NBR, SUS, PBT, Lead glass, Ptlr, FeNi, OFC. PF2W5##(T): PPS, SUS, NBR or FKM.

2 Specifications (continued)

2.2 PF2A7## specifications (for Air)

Model	PF2A 710	PF2A 750	PF2A 711	PF2A 721	PF2A 751	
Applicable fluid	Air and Nitrogen					
Flow	Rated flow range (L/min)	1 to 10	5 to 50	10 to 100	20 to 200	50 to 500
	Setting/display flow range (L/min)	0.5 to 10.5	2.5 to 52.5	5 to 105	10 to 210	25 to 525
	Min. setting / unit (L/min)	0.1	0.5	1.0	2.0	5.0
	Display flow rate range	0 to 999999 L				
Accumulated	Min. setting / display unit	1 L				
	Fluid temperature	0 to 50 °C (No freezing or condensation)				
Linearity	±5% F.S. or less					
Repeatability	±1% F.S. or less		±2% F.S. or less			
Temp. characteristics	±2% F.S. max. (15 to 35 °C, 25°C reference)					
	±3% F.S. max. (0 to 50 °C, 25°C reference)					
Pressure	Rated pressure range	-50 kPa to 0.5 MPa		-50 kPa to 0.75 MPa		
	Proof pressure	1.0 MPa				
Switch output	Output mode	NPN open collector output, PNP open collector output Instantaneous flow output (hysteresis, window comparator mode) Accumulated flow output, Accumulated pulse output				
	Switch operation	Normal output, Reversed output				
	Max. load current	80 mA				
	Max. applied voltage	30 VDC (NPN output)				
	Internal volt. drop	NPN output: 1 V or less (at 80 mA) PNP output: 1.5 V or less (at 80 mA)				
	Response time	1 s or less				
	Repeatability	±1% F.S. max.		±2% F.S. max.		
	Accuracy	±5% F.S. max.				
	Hysteresis	Hysteresis mode: Variable Window comparator mode: Fixed (3 digits)				
	Output protection	Short circuit protection				
	Accumulated pulse width	50 ms				
	Accumulated pulse conversion	0.1 L/pulse	0.5 L/pulse	1 L/pulse	2 L/pulse	5 L/pulse
Display	Display accuracy	±5% F.S. max.				
	Display	3 digits 7 segments, Colour: Red				
	Indicator LED (output)	LED is ON when output is ON OUT1: Green, OUT2: Red				
Supply voltage	12 to 24 VDC ±10%					
Power consumption (no load)	150 mA max.		160 mA max.		170 mA max.	
Port size (Rc, NPT, G)	1/8, 1/4		3/8		1/2	
Weight	250 g		290 g			

2.3 Cable specifications

Conductor	Nominal cross section	AWG23
	Individual wire diameter	approx. 0.72 mm
Insulator	Outside diameter	approx. 1.14 mm
	Colours	Brown, White, Black, Blue
Sheath	Material	oil resistant PVC
	Outer diameter	approx. φ4 mm

Warning

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

2 Specifications (continued)

2.4 PF2W7## specifications (for Water)

Model	PF2W 704	PF2W 720	PF2W 740	PF2W 711	
Applicable fluid	Water				
Flow	Rated flow range (L/min)	0.5 to 4	2 to 16	5 to 40	10 to 100
	Setting/display flow range (L/min)	0.35 to 4.5	1.7 to 17.0	3.5 to 45.0	7 to 110
	Min. setting / unit (L/min)	0.05	0.1	0.5	1.0
	Display flow rate range	0 to 999999 L			
Accumulated	Min. setting / display unit	1 L			
	Fluid temperature	0 to 50 °C			
Linearity	±5% F.S. or less		±3% F.S. or less		
Repeatability	±2% F.S. or less		±1% F.S. or less		
Temperature characteristics	±2% F.S. max. (15 to 35°C, 25°C reference)				
	±3% F.S. max. (0 to 50°C, 25°C reference)				
Proof pressure	1.5 MPa				
Switch output	Output mode	NPN open collector output, PNP open collector output Instantaneous flow output (hysteresis, window comparator mode) Accumulated flow output, Accumulated pulse output			
	Switch operation	Normal output, Reversed output			
	Max. load current	80 mA			
	Max. applied voltage	30 VDC (NPN output)			
	Internal volt. drop	NPN output: 1 V or less (at 80 mA) PNP output: 1.5 V or less (at 80 mA)			
	Response time	1 s or less			
	Repeatability	±5% F.S. max.		±3% F.S. max.	
	Accuracy	±5% F.S. max.			
	Hysteresis	Hysteresis mode: Variable Window comparator mode: Fixed (3 digits)			
	Output protection	Short circuit protection			
	Accumulated pulse width	50 ms			
	Accumulated pulse conversion	0.05 L/pulse	0.1 L/pulse	0.5 L/pulse	1.0 L/pulse
Display	Display accuracy	±5% F.S. max.			
	Display	3 digits 7 segments, Colour: Red			
	Indicator LED (output)	LED is ON when output is ON OUT1: Green, OUT2: Red			
Supply voltage	12 to 24 VDC ±10%				
Power consumption (no load)	70 mA max.		80 mA max.		
Port size (Rc, NPT, G)	3/8	3/8, 1/2	1/2, 3/4	3/4, 1	
Weight	460 g	520 g	700 g	1,150 g	

2 Specifications (continued)

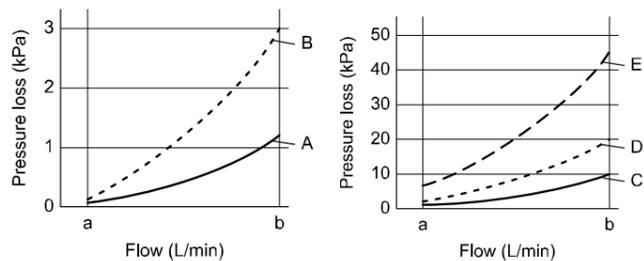
2.5 PF2W7##T specifications (for High Temperature Fluid)

Model	PF2W 704T	PF2W 720T	PF2W 740T	
Applicable fluid	Water			
Flow	Rated flow range (L/min)	0.5 to 4	2 to 16	5 to 40
	Setting/display flow range (L/min)	0.35 to 4.5	1.7 to 17.0	3.5 to 45.0
	Min. setting / unit (L/min)	0.05	0.1	0.5
	Display flow rate range	0 to 999999 L		
Accumulated	Min. setting / display unit	1 L		
	Fluid temperature	0 to 90 °C (no cavitation)		
Linearity	±5% F.S. or less			
Repeatability	±3% F.S. or less			
Temperature characteristics	±5% F.S. max. (0 to 90°C, 25°C reference)			
Proof pressure	1.5 MPa			
Switch output	Output mode	NPN open collector output, PNP open collector output Instantaneous flow output (hysteresis, window comparator mode) Accumulated flow output, Accumulated pulse output		
	Switch operation	Normal output, Reversed output		
	Max. load current	80 mA		
	Max. applied voltage	30 VDC (NPN output)		
	Internal volt. drop	NPN output: 1 V or less (at 80 mA) PNP output: 1.5 V or less (at 80 mA)		
	Response time	1 s or less		
	Repeatability	±5% F.S. max.		±3% F.S. max.
	Accuracy	±5% F.S. max.		
	Hysteresis	Hysteresis mode: Variable Window comparator mode: Fixed (3 digits)		
	Output protection	Short circuit protection		
	Accumulated pulse width	50 ms		
	Accumulated pulse conversion	0.05 L/pulse	0.1 L/pulse	0.5 L/pulse
Display	Display accuracy	±5% F.S. max.		
	Display	3 digits 7 segments, Colour: Red		
	Indicator LED (output)	LED is ON when output is ON OUT1: Green, OUT2: Red		
Supply voltage	12 to 24 VDC ±10%			
Power consumption (no load)	70 mA max.			
Port size (Rc, NPT, G)	3/8	3/8, 1/2	1/2, 3/4	
Weight	710 g			

2 Specifications (continued)

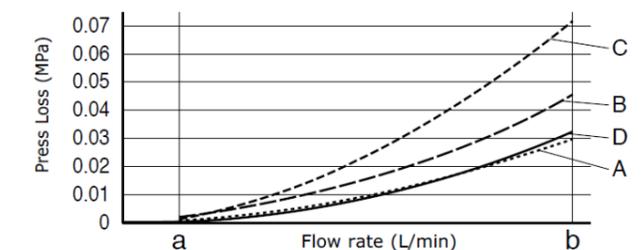
2.6 Flow characteristics (pressure loss)

PF2A7## for Air



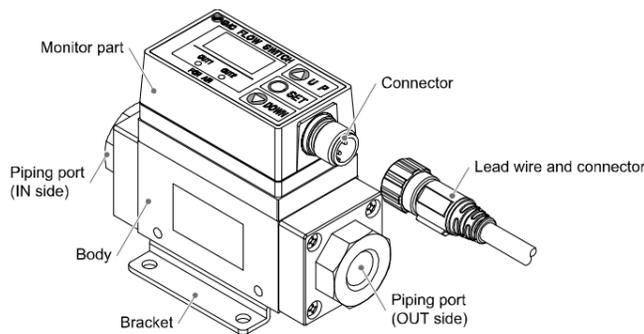
Model	Graph	a(L/min)	b(L/min)
PF2A710	A	1	10
PF2A750	B	5	50
PF2A711	C	10	100
PF2A721	D	20	200
PF2A751	E	50	500

PF2W7##(T) for Water / Fluid



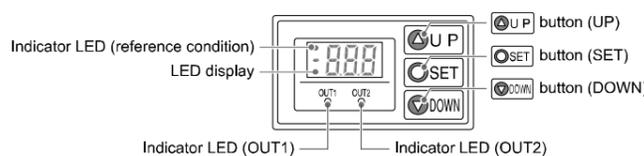
Model	Graph	a (L/min)	b (L/min)
PF2W704 / 704T	A	0.5	4
PF2W720 / 720T	B	2	16
PF2W740 / 740T	C	5	40
PF2W711	D	10	100

3 Name and function of parts



Item	Description
Monitor part	See below.
Piping port	Connected to the fluid inlet at IN side and to the fluid outlet at OUT side.
Body	The body of the product.
Bracket	Bracket for mounting the product.
Connector	M12 connector for electrical connections.
Lead wire and connector	Lead wire to supply power and transmit output signals.

Monitor Part (Display)

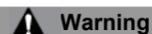


3 Name and function of parts (continued)

Item	Description
Indicator LED (reference condition)	Indicates the reference condition selected. LED is ON (Red) when normal condition is selected.
LED display	Displays the flow value, setting mode, and error indication.
Indicator LED (OUT1)	Indicates the output status of OUT1. LED is ON (Green) when OUT1 is ON. The LED flashes when an over current error occurs. When the accumulated pulse output mode is selected, the indicator LED will turn OFF.
Indicator LED (OUT2)	Indicates the output status of OUT2. LED is ON (Red) when OUT2 is ON. The LED flashes when an over current error occurs. When the accumulated pulse output mode is selected, the indicator LED will turn OFF.
UP button	Selects the mode or increases the ON/OFF Set value.
SET button	Press this button to change to another mode and to set a value.
DOWN button	Selects the mode or decreases the ON/OFF Set value.

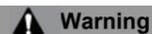
4 Installation

4.1 Installation



- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified operating rated flow, operating pressure and temperature range.
- Tighten to the specified tightening torque. If the tightening torque is exceeded the mounting screws, brackets and the product can be broken. Insufficient torque can cause displacement of the product from its correct position.
- Do not drop, hit or apply excessive shock to the product.

4.2 Environment



- 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

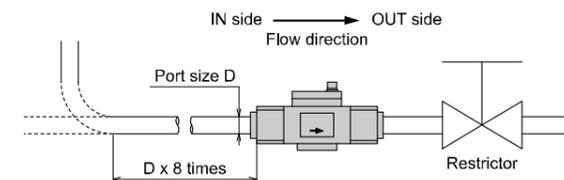
- Never mount the product in a location that will be used as a foothold.
 - The rotation angle of the monitor is 270°, in steps of 90°. Rotating the display with excessive force will damage the end stop.
 - Install the product with bracket (SMC Part number ZS-29-T) using M4 screws (4 pcs.).
 - Bracket thickness is approximately 1.6 mm.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for mounting dimensions.

4.4 Piping

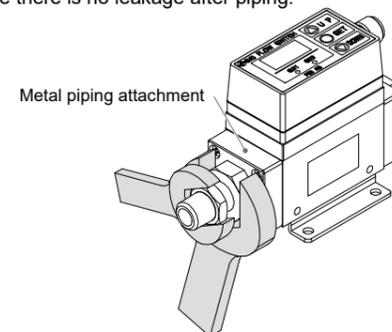
- Use the product within the specified operating pressure range and temperature range.
- Proof pressure is 1.0 MPa.
- Connect the piping to the fittings.
- Mount the product so that the fluid direction is the same as the arrow indicated on the product.
- Never mount the product upside down.
- The piping on the IN side must have a straight section of piping whose length is 8 times the piping diameter or more.

4 Installation

- Avoid sudden changes in the piping size on the IN side of the product.



- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material (tape) does not enter inside the port.
- When connecting the piping, hold the metal piping attachment of the body with a spanner. Using a spanner on other parts may damage the product.
- The required tightening torque of the fittings is given in the table below. If the tightening torque is exceeded, the product can be damaged. If the correct tightening torque is not applied, the fittings may become loose.
- Ensure there is no leakage after piping.



Nominal Thread size	Tightening torque (N·m)
Rc (NPT) 1/8, G1/8	7 to 9
Rc (NPT) 1/4, G1/4	12 to 14
Rc (NPT) 3/8, G3/8	22 to 24
Rc (NPT) 1/2, G1/2	28 to 30
Rc (NPT) 3/4, G3/4	28 to 30
Rc (NPT) 1, G1	36 to 38

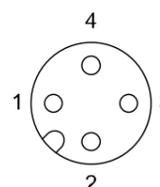
5 Wiring

5.1 Wiring



- Wiring should only be performed with the power supply turned OFF.
- Confirm proper insulation of wiring.
- Use separate routes for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply. Switching noise will be superimposed and the product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and ferrite core, between the switch-mode power supply and the product, or by using a series power supply instead of a switch-mode power supply.

5.1.1 M12 Connector Pin numbers (on the product)



Pin number	Wire colour	Signal
1	Brown	DC (+)
2	White	OUT2
3	Blue	DC (-)
4	Black	OUT1

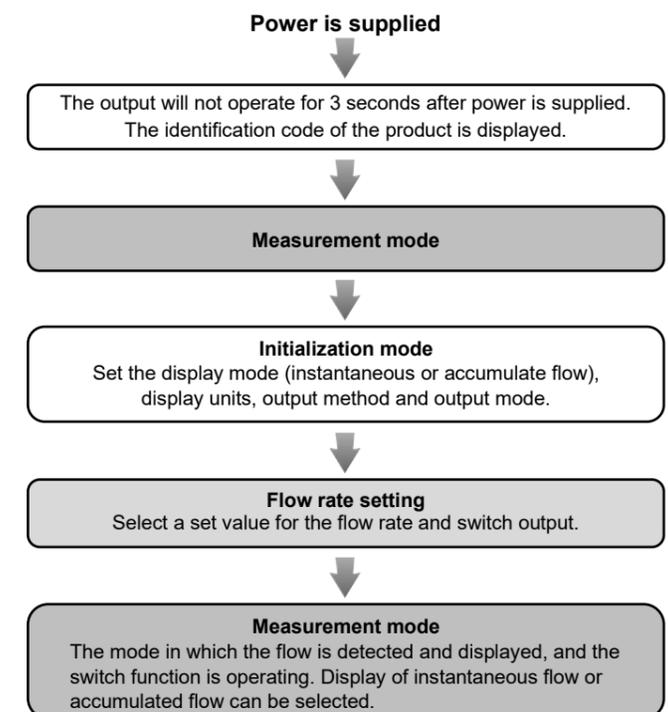
Wire colours when using the SMC lead wire.

5 Wiring (continued)

5.1.2 Connecting

- Align the lead wire M12 connector (SMC Part number ZS-37-A or ZS-37-B) with the connector key groove and insert vertically.
- Connection is complete when the knurled part is fully tightened. Check that the connection is not loose.

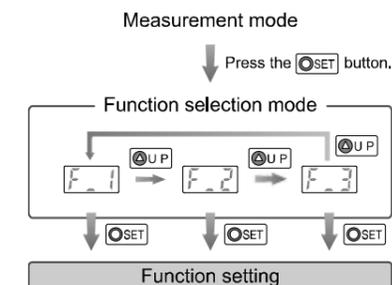
6 Outline of Setting



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

7 Function selection mode

- In measurement mode, press the SET button, to display [F_#].
- This [F_#] indicates the mode for changing each function setting.



*: When OUT1 or OUT2 is assigned to be instantaneous output mode during initialize mode, [F_1] and [F_2] are displayed. When OUT1 or OUT2 is assigned to be accumulated output mode, [F_3] is displayed.

7 Function selection mode (continued)

7.1 Default settings

Item	Default Setting	
[F_1] Input the Set value of instantaneous output	[n_1]* Input of the Set point 1 (OUT1)	50% of max. rated flow [5.0] L/min (PF2A710) [25.0] L/min (PF2A750) [50] L/min (PF2A711) [100] L/min (PF2A721) [250] L/min (PF2A751)
	[n_2]* Input of the Set point 2 (OUT1)	
	[n_3]* Input of the Set point 3 (OUT2)	
	[n_4]* Input of the Set point 4 (OUT2)	
[F_2] Input the Set value of instantaneous output (Auto-preset)	-	
[F_3] Input the Set value of accumulated output	[1nL]* Input the Set value for the lower 3 digits (OUT1)	[0]
	[1nH]* Input the Set value for the upper 3 digits (OUT1)	[0]
	[2nL]* Input the Set value for the lower 3 digits (OUT2)	[0]
	[2nH]* Input the Set value for the upper 3 digits (OUT2)	[0]

*: When Normal output switching operation is selected, n becomes P.

8 Troubleshooting

8.1 Error indication

Error Name	Error Display	Error Type	Troubleshooting Method
Excessive instantaneous flow	- - -	Flow has exceeded the upper limit of the display flow range.	Reduce the flow.
OUT1 over current error	Er1	The switch output load current is more than 80 mA (OUT1).	Turn the power off and remove the cause of the over current.
OUT2 over current error	Er2	The switch output load current is more than 80 mA (OUT2).	Then turn the power on again.
System error	Er4	The set data has been changed unexpectedly.	To reset, press UP and DOWN buttons simultaneously for 2 seconds or longer. Then set all data again.
Excessive accumulated flow	999 (flashing)	The display flow range of accumulated flow has been exceeded.	To reset the accumulated flow value, press UP and DOWN buttons simultaneously for 2 seconds or longer.

9 How to Order

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

10 Outline Dimensions (mm)

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for Outline Dimensions.

11 Maintenance

11.1 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.

12 Limitations of Use

12.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

13 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.

14 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.smceu.com> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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