



Installation & Maintenance Manual

Digital Flow Switch

PF3A703H/PF3A706H/PF3A712H



1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger", followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

	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.

This product is class A equipment that is intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

Warning

- Do not disassemble, modify (including changing the printed circuit board) or repair. An injury or failure can result.
- Do not operate the product outside of the specifications. Do not use for flammable or harmful fluids. Fire, malfunction or damage to the product can result. Verify the specifications before use.
- Do not operate in an atmosphere containing flammable, explosive or corrosive gas. Fire, explosion or corrosion can result. This product is not designed to be explosion proof.
- Do not use the product for flammable fluid. Fire or explosion can result. Only air, N₂, are applicable.
- Do not use the product in a place where static electricity is a problem. Otherwise it can cause failure or malfunction of the system.
- If using the product in an interlocking circuit:
 - Provide a double interlocking system, for example a mechanical system
 - Check the product regularly for proper operation. Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
 - Turn off the power supply
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance work. Otherwise an injury can result.

1 Safety Instructions (Continued)

Caution

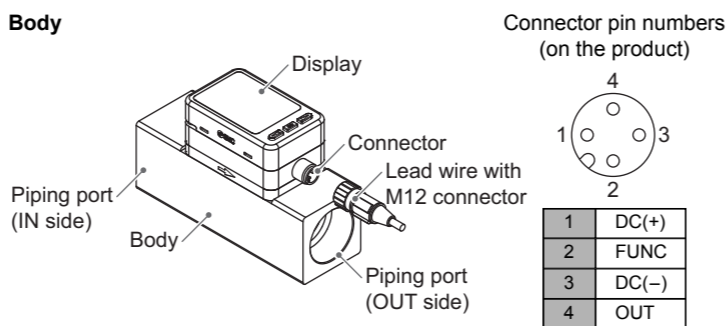
- Do not touch the terminals and connectors while the power is on. Otherwise electric shock, malfunction or damage to the product can result.
- After maintenance is complete, perform appropriate functional inspections and leak tests. Stop operation if the equipment does not function properly or there is a leakage of fluid. When leakage occurs from parts other than the piping, the product might be faulty. Disconnect the power supply and stop the fluid supply. Do not apply fluid under leaking conditions. Safety cannot be assured in the case of unexpected malfunction.

NOTE

- The direct current power supply used should be UL approved as follows. Circuit (Class 2) of maximum 30 Vrms (42.4 V peak) or less, with UL1310 Class 2 power supply unit or UL1585 Class 2 transformer.

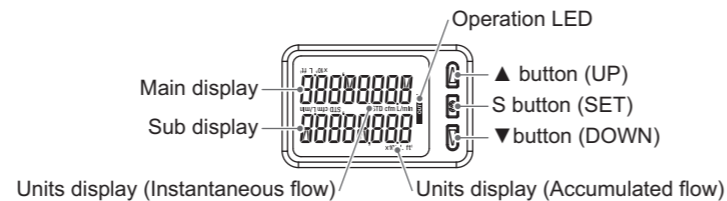
Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

2 Summary of Product parts



Element	Description
Display	See below.
Connector	M12 connector for electrical connections.
Lead wire with M12 connector	Lead wire for power supply and outputs.
Piping port	For piping connections. Connected to the fluid inlet at IN and to the fluid outlet at OUT.
Body	The body of the product.

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 accumulated pulse output mode is selected, the output display will turn off. When the output is ON: Orange LED is ON.
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.

3 Specifications

Refer to the operation manual on SMC website (URL <http://www.smcworld.com>).

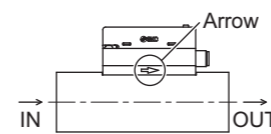
4 Mounting and Installation

Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information.

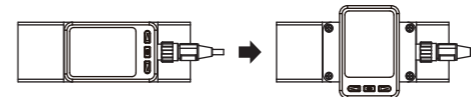
Mounting

- Never mount the product in a place that will be used as a mechanical support during piping.
- Attach the piping so that the fluid flows in the direction indicated by the arrow on the body.
- Never mount the product upside down.
- The monitor with integrated display can be rotated. Rotating the display with excessive force will damage the end stop.
- Visibility decreases if the display is viewed from the opposite side to the buttons. Check the settings and display from in front of the display.

oFlow direction



oRotation of the display



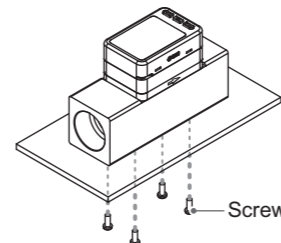
Installation

Direct mounting

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

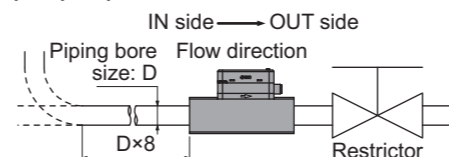
Product number	Suitable screws	Tightening torque	Thread depth
PF3A703H	Equivalent to M4	1.5 Nm±10%	7
PF3A706H	Equivalent to M5	3 Nm±10%	8
PF3A712H	Equivalent to M6	5.2 Nm±10%	9

- Prepared by the user.
- Refer to the dimension from SMC website (URL <http://www.smcworld.com>) for mounting hole size.



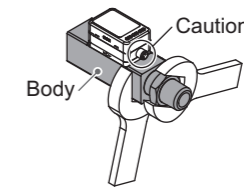
Piping

- 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 or more. 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 Mounting and 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) of the fitting only. 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
Rc1, NPT1	36 to 38 Nm
Rc1 1/2, NPT1 1/2, Rc2, NPT2	48 to 50 Nm

Port size	Width across flats of attachment
1	45 mm
1 1/2	60 mm
2	70 mm

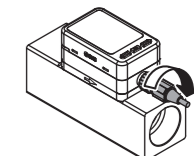
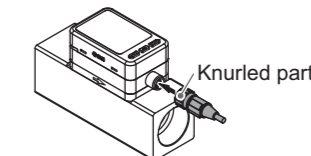
Wiring

Connection

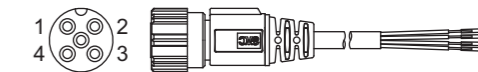
- Connections should only be made with the power supply turned off.
- Use a separate route for the product wiring and any power or high voltage wiring. If wires and cables are routed together with power or high voltage cables, malfunction may result due to noise.
- If a commercially available switching power supply is used, be sure to ground the frame ground (FG) terminal. If the product is connected to the commercially available switching power supply, switching noise will be superimposed and the product specifications will not be satisfied. In that case, insert a noise filter such as a line noise filter/ ferrite between the switching power supplies or change the switching power supply to the series power supply.

Connecting/ Disconnecting

- Align the lead wire connector with the connector key groove, and insert it straight in. Turn the knurled part clockwise. Connection is complete when the knurled part is fully tightened. Check that the connection is not loose.
- To remove the connector, loosen the knurled part and pull the connector straight out.



Connector pin numbers (lead wire)



Pin number	Wire colour	Description
1	Brown	DC(+)
2	White	FUNC
3	Blue	DC(-)
4	Black	OUT

5 Outline of Settings

Power is supplied.

The output will not operate for 3 seconds after supplying power.
The identification code of the product is displayed.

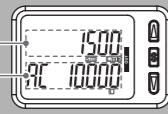
[Measurement mode]

Measurement mode is the condition where the flow is detected and displayed, and the switch function is operating.

This is the basic mode; other modes should be selected for set-point changes and other function settings.

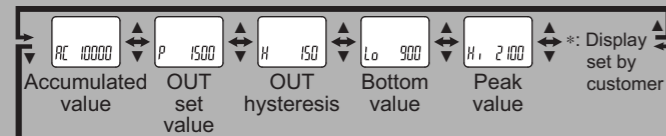
Measurement mode screen

Current flow rate (Main display)
Set value or peak/bottom value (Sub display)

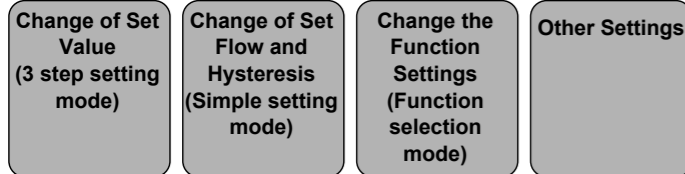
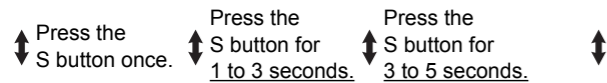


Sub display

In measurement mode, the display of the sub display can be temporarily changed by pressing the ▲ or ▼ buttons.



*: Arbitrary display mode can be added to the sub display by setting the [F10] sub display.
(The default setting does not include arbitrary display.)
*: The example shown is for the 3000 L/min type.



*: The outputs will continue to operate during setting.
*: If a button operation is not performed for 30 seconds during the setting, the display will flash. (This is to prevent the setting from remaining incomplete if, for instance, an operator were to leave during setting.)
*: 3 step setting mode, simple setting mode and function selection mode settings will reflect on each other.

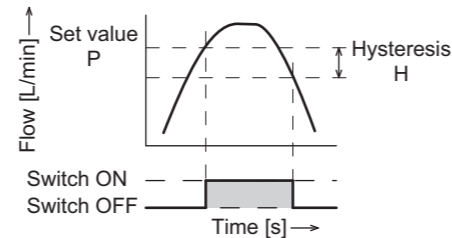
6 Change of Set Value

3 step setting mode

In the 3 step setting mode, the set value selected in the sub display and the hysteresis can be changed in just 3 steps.

Default settings

When shipped, the default setting is as follows.
When the flow exceeds the set value [P], the switch will be turned ON. When the flow falls below the set value by the amount of hysteresis [H] or more, the switch will turn OFF.
If the operation shown in the diagram below is acceptable, then keep these settings.
For more detailed settings, set each function in the function selection mode.

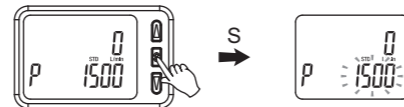


Item	PF3A703H	PF3A706H	PF3A712H
[P] Set value of OUT	1500 L/min	3000 L/min	6000 L/min
[H] Hysteresis of OUT	150 L/min	300 L/min	600 L/min

<Operation>

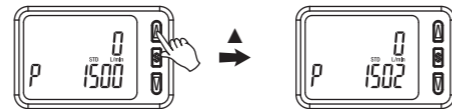
[Hysteresis mode]
In the 3 step setting mode, the set value (P or n) and hysteresis (H) can be changed.
Set the items on the sub display (set value and hysteresis) using the ▲ or ▼ buttons.
When changing the set value, follow the operation below. The hysteresis setting can be changed in the same way.

- 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) will start flashing.

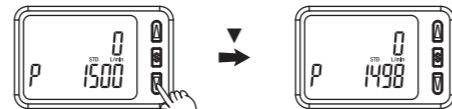


- Press the ▲ or ▼ button to change the set value.
The ▲ button is to increase and the ▼ button is to decrease the set value.

• Press the ▲ button once to increase the value by one digit, press and hold to continuously increase.



• Press the ▼ button once to reduce the value by one digit, press and hold to continuously reduce.



• When ▲ and ▼ buttons are pressed simultaneously for 1 second or more, the set value is displayed as [- - -], and the set value will be set to the same as the displayed value automatically. Afterwards, it is possible to adjust the value by pressing ▲ or ▼.

- Press the S button to complete the setting.

To change setting, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.

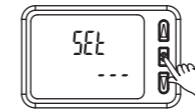
7 Change of Set Flow and Hysteresis

Simple setting mode

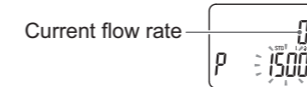
In the simple setting mode, the set value and hysteresis can be changed while checking the current flow rate (main display).

<Operation>

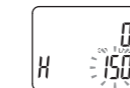
- [Hysteresis mode]
- Press the S button for 1 second or longer (but less than 3 seconds) in measurement mode. [SET] is displayed on the main display. When the button is released while in the [SET] display, the current flow value is displayed on the main display, [P_1] or [n_1] is displayed on the sub display (left) and the set value is displayed on the sub display (right).



- Change the set value using the ▲ or ▼ button, and press the SET button to set the value. Then, the setting moves to hysteresis setting.



- Change the set value using the ▲ or ▼ button, and press the S button to set the value.



- Press and hold the S button for 2 seconds or longer to complete the OUT setting.
(If the button is pressed for less than 2 seconds, the setting will be returned to P.)

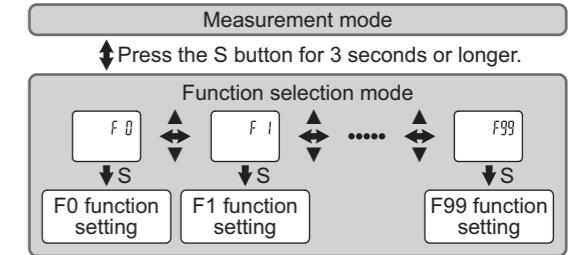
*1: Selected items of (1) to (3) become valid after pressing the S button.
*2: After enabling the setting by pressing the S button, it is possible to return to measurement mode by pressing the S button for 2 seconds or longer.
*3: When the output mode is set to error output or output OFF, the simple setting mode cannot be used.
(the setting returns to measurement mode by releasing the button when [SET] is displayed).

To change setting, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.

8 Change the Function Settings

Function selection mode

In measurement mode, press the S button for 3 seconds or longer, to display [F 0].
The [F□□] indicates the mode for changing each Function Setting. Press the S button for 2 seconds or longer in function selection mode to return to measurement mode.



Default setting

	Function (Main display)	Default Settings
(Main display)	(Left sub display)	(Right sub display)
[F 0]	[rEF] Select display units [Uni] Units selection function *1	[Std] Standard [L] L/min
[F 1]	[oUt] Select output mode [ot] Select switch mode	[HyS] Hysteresis mode [P] Normal output
	[P] Select input switch operation	[1500] 1500 L/min (PF3A703H)
		[3000] 3000 L/min (PF3A706H)
		[6000] 6000 L/min (PF3A712H)
[H] Setting of Hysteresis	[150] 150 L/min (PF3A703H)	
	[300] 300 L/min (PF3A706H)	
	[600] 600 L/min (PF3A712H)	
[CoL] Select display colour	[SoG] Green when ON, Red when OFF	
[F 3]	[FiL] Response time	[1.0] 1 second
[F 5]	[FnC] Select FUNC (switching Analogue output *2/ External input)	[oUt] Analogue output
[F10]	[Sub] Select sub display (Line name setting *3)	[dFE] Default setting
[F13]	[rEv] Select Reverse display	[oFF] Reverse display OFF
[F14]	[Cut] Select Zero cut-off setting	[1.0] 1%F.S. cut
[F30]	[SAv] Accumulated value hold	[oFF] Not stored
[F80]	[dSP] Display OFF mode	[on] Display ON
[F81]	[Pin] Security code	[oFF] Not used
[F90]	[ALL] Setting of all functions	[oFF] Not used
[F96]	[Sin] Check of input signal	[- - -] No input signal
[F98]	[tES] Setting of output check	[n] Normal output
[F99]	[oFF] Reset to the default settings	[oFF] Not used

*1: Setting is only possible for models with the units selection function.
*2: 1 to 5 V or 0 to 10 V can be selected when the analogue voltage output type is used.
Analogue output free range function can be selected.
*3: When Line name is selected, a suitable line name can be input.

To change setting, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.

9 Other Settings

Reset operation

The Accumulated Flow, Peak Value and Bottom Value can be reset. To reset the accumulated value, press the ▼ and S button for 1 second or longer.

Snap shot function

The current flow rate value can be stored to the switch output ON/OFF set point.

When the items on the Sub display (left) are selected in either 3 step setting mode, Simple setting mode or Setting of each function mode, by pressing the ▲ and ▼ buttons simultaneously for 1 second or longer, the value of the sub display (right) will show "----", and the values corresponding to the current flow rate are automatically displayed.

Output mode	Configurable items	Sub display (left)	Snap shot function
Hysteresis mode	OUT set value	P(n)	○
	Hysteresis	H	○
Window comparator mode	OUT set value	PL(nL), PH(nH)	○
	Hysteresis	WH	x

Key-lock function

- Press the S button for 5 seconds or longer in measurement mode. When [oPE] is displayed on the main display, release the button. The current setting "LoC" or "UnLoC" will be displayed on the sub display.
- Select the key locking/un-locking using the ▲ or ▼ button, and press the S button to set.

To use each of these functions, refer to the operation manual from SMC website (URL <http://www.smcworld.com>) or contact SMC.

10 How to Order

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

11 Outline Dimensions (mm)

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

12 Maintenance

How to reset the product after a power loss or when the power has been unexpectedly removed

The settings for the product are retained in memory prior to the power loss or de-energizing of the product.

The output condition is also recoverable to that prior to the power loss or de-energizing. However, this may change depending on the operating environment. Therefore, check the safety of the whole installation before operating the product.

If the installation is using accurate control, wait until the product has warmed up (approximately 10 to 15 minutes) before operation.

13 Troubleshooting

Error display

Error name	Error display	Description	Measures
Instantaneous flow error		Flow rate exceeding the upper limit of the settable flow range is applied.	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.
Accumulated flow error		The accumulated flow has exceeded the accumulated flow range. (For accumulated increment)	Reset the accumulated flow. (Press the ▲ and ▼ buttons simultaneously for 1 second or longer)
		The accumulated flow has reached the set accumulated flow. (For accumulated decrement)	

*: If the error cannot be reset after the above measures are taken, then please contact SMC.

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

14 Contacts

AUSTRIA	(43) 2262 62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3 355 1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103 4020	SLOVENIA	(386) 73 885 412
GREECE	(30) 210 271 7265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23 511 390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1 403 9000	SWITZERLAND	(41) 52 396 3131
ITALY	(39) 02 92711	UNITED KINGDOM	(44) 1908 563888

SMC Corporation

URL <http://www.smcworld.com> (Global) <http://www.smceu.com> (Europe)

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