

Before Use

Digital Flow Switch

PF2M7##



Thank you for purchasing an SMC PF2M7## Digital Flow Switch. Please read this manual carefully before operating the product and make sure you understand its capabilities and limitations. Please keep this manual handy for future reference.

To obtain the operation manual about this product and control unit, please refer to the SMC website (URL <https://www.smcworld.com>) or contact SMC directly.

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.

- 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.

Operator

- The operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- Read and understand the operation manual carefully before assembling, operating or providing maintenance to the product.

Safety Instructions

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 or an explosion can result. This product is not designed to be explosion proof.	
Do not use the product for flammable fluid. A fire or explosion can result. Only dry air, N ₂ , CO ₂ and Ar 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: <ul style="list-style-type: none"> 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 : <ul style="list-style-type: none"> 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. 	
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 to be used should be UL approved as follows: Circuit (of Class 2) which is of maximum 30 Vrms (42.4 V peak), with UL1310 Class 2 power supply unit or UL1585 Class 2 transformer.
- The product is a UL approved product only if it has a mark on the body.

Summary of Product parts

Item	Description
Socket	Socket for electrical connections.
Piping port	Connected to the fluid inlet at IN side and to the fluid outlet at OUT side.
Flow adjustment valve	Orifice mechanism to adjust the flow.
Lock ring	Used to lock the flow adjustment valve.
Mounting hole	Used to mount the product on a DIN rail or directly to a panel.
Body	The body of the product.
Lead wire and connector	Lead wire to supply power and transmit output signals.

*: The table shows the specifications when a flow adjusting valve is included.

Item	Description
UP button *	Selects the mode or increases the ON/OFF set value. Press this button to change to the peak display mode.
DOWN button *	Selects the mode or decreases the ON/OFF set value. Press this button to change to the bottom display mode.
Main display	Displays the flow value, setting mode, and error indication. Four display modes can be selected: display always in red or green, or display changing from green to red, or red to green, according to the output status (OUT1).
SET button	Press this button to change to another mode and to set a value.
Output display (Operation LED)	Displays the output status of OUT1 and OUT2. OUT1: LED is ON (Orange) when the output is ON. OUT2: LED is ON (Orange) when the output is ON. When the accumulated pulse output mode is selected, the output display is OFF.
Units display	Arbitrary units is ON based on the flow display setting (instantaneous or accumulated flow)
IO-Link status indicator light	LED is ON when OUT1 is used in IO-Link mode. (LED is OFF in SIO mode)

*: If the reversed display has been selected, the UP and DOWN button function will be reversed.

Mounting and Installation

Installation

Refer to the product catalogue or SMC website (URL <https://www.smcworld.com>) for more information about panel cut-out and mounting hole dimensions.

Panel mounting

Insert panel mount adapter B (supplied as an accessory) into section A of panel mount adapter. Push panel mount adapter B from behind until the display is fixed onto the panel. The pin of bracket engages the notched part of panel adapter section C to fix the display.

The switch can be mounted on a panel with a thickness of 1 to 3.2 mm.

Bracket mounting

Mount the bracket using the mounting screws supplied.

The required tightening torque is 0.42±0.04 Nm.

Without flow adjustment valve (using ZS-33-M) With flow adjustment valve (using ZS-33-MS)

Install the product (with bracket) using the M3 screws (4 pcs.). Bracket thickness is approximately 1.2 mm.

DIN rail mounting (using ZS-33-R#)

Mount the DIN rail mounting parts using DIN rail mounting screws and joint screws supplied.

The required tightening torque of the DIN rail mounting screws and joint screws is 0.4±0.05 Nm.

* DIN rail should be prepared by the user.

Piping

- For one-touch fittings, insert the tube until it bottoms out, to ensure it cannot be pulled out.
- Insertion with excessive force can cause damage.
- For piping of the product, hold the piping with a wrench on the metal part of the product. Holding other parts of the product with a wrench may damage the product.
- Ensure that there is no leakage after piping.
- Use this product within the specified operating pressure and temperature ranges.
- Proof pressure is 1.0 MPa.

Wiring

- ### Wiring of connector
- Connections should only be made with the power supply turned off.
 - Use separate routes for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
 - Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply. When a switch-mode power supply is connected to the product, 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.

- ### Connecting/Disconnecting
- When mounting the connector, insert it straight into the socket, holding the lever and connector body, and push the connector until the lever hooks into the housing, and locks.
 - When removing the connector, press down the lever to release the hook from the housing and pull the connector straight out.

Used as switch output device (ZS-33-D(M))

Wire colour	Description
Brown	DC(+)
White	OUT2/Analogue output
Black	OUT1
Blue	DC(-)

Used as IO-Link device (ZS-33-DM)

Wire colour	Description
Brown	L+
White	N.C./OUT2
Black	C/Q
Blue	L-

Outline of Settings

Power is supplied.

The product code is displayed for approximately 3 sec. after power is supplied. Then, measurement mode will be displayed. After moving on to the measurement mode, the switch operation will start.

[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

Press the SET button once. Press the SET button for 2 to 5 seconds. Press the SET button for 5 seconds or longer.

Change of Set Flow and Hysteresis (Simple setting mode)

Change the Function Settings (Function selection mode)

Other Settings •Key-lock

*: The outputs will continue to operate during setting.
*: Simple setting mode and function selection mode settings are reflected each other.

Flow Setting

Switch operation

When the flow exceeds the set value, the switch will turn ON. When the flow falls below the set value by the amount of hysteresis or more, the switch will turn OFF. The default setting is to turn on the flow switch when the flow reaches the centre of the upper limit of the rated flow range. If this condition, shown to the below, is acceptable, then keep these settings.

Simple setting mode

<Operation> *: The Product outputs will continue operating during setting.

(1) Press the SET button once in measurement mode. [P_1] or [n_1] and the [current set value] are displayed alternately.

(2) Change the set value using the UP or DOWN button, and press the SET button to set the value. Then, the setting moves to hysteresis setting.

- Press the UP button continuously to keep increasing the set value.
- Press the DOWN button continuously to keep decreasing the set value.

(3) [H_1] and the current set value are displayed in turn.

(4) Change the hysteresis by pressing the UP or DOWN button and press the SET button. Setting is completed and the product returns to measurement mode.

Function Setting

Function selection mode

In measurement mode, press the SET button for 2 to 5 seconds, to display [F 0]. The [F 0] indicates the mode for changing each Function Setting. Press the SET button for 2 seconds or longer in function selection mode to return to measurement mode.

Default setting

The default setting is as follows. If no problem is caused by this setting, keep these settings.

Item	Default setting
[F 0] ⇔ [FLU]	[FLU] Switch the flow rate (Std) Standard condition [REF] Setting the units criteria (L) L/min (L) [Unit] Measurement unit setting +1 [norP] SW output PNP/NPN setting +4 [o] SW/external input setting +4-5 [OUT1] Setting of OUT1 [tot] OUT1 output configuration setting
[P_1] Set value	50% of maximums rated flow PF2M701: 0.5 L/min, PF2M702: 1.0 L/min PF2M705: 0.25 L/min, PF2M710: 0.5 L/min PF2M725: 12.5 L/min, PF2M750: 25 L/min PF2M711: 50 L/min
[H_1] Hysteresis	5% of maximums rated flow PF2M701: 0.05 L/min, PF2M702: 0.1 L/min PF2M705: 0.25 L/min, PF2M710: 0.5 L/min PF2M725: 1.3 L/min, PF2M750: 2.5 L/min PF2M711: 5 L/min
[dt1] Delay time setting	(0.00) 0.00 second
[CoL] Display colour setting	[TSOG] ON: Green OFF: Red
[oUR2] Setting of OUT2 +2	[HYS] Hysteresis mode
[zot] OUT2 output configuration setting +2	[2] Normal output
[P_2] Set value +2	50% of maximums rated flow PF2M701: 0.5 L/min, PF2M702: 1.0 L/min PF2M705: 0.25 L/min, PF2M710: 0.5 L/min PF2M725: 12.5 L/min, PF2M750: 25 L/min PF2M711: 50 L/min
[H_2] Hysteresis +2	5% of maximums rated flow PF2M701: 0.05 L/min, PF2M702: 0.1 L/min PF2M705: 0.25 L/min, PF2M710: 0.5 L/min PF2M725: 1.3 L/min, PF2M750: 2.5 L/min PF2M711: 5 L/min
[dt2] Delay time setting +2	(0.00) 0.00 second
[CoL] Display colour setting +2	[TSOG] ON: Green OFF: Red
[F 3] ⇔ [FIL]	[FIL] Digital filter setting (1.0) 1.0 second
[F 4] ⇔ [PrS]	[PrS] Auto-preset function setting (oFF) Manual
[F10] ⇔ [FLo]	[FLo] Display mode (nS) nstantaneous flow
[F11] ⇔ [drE]	[drE] Display resolution setting (1000) 1000-split
[F13] ⇔ [Rev]	[rev] Set Reverse display (oFF) Not reverse
[F14] ⇔ [CUt]	[CUt] Zero cut-off setting (1.0) 1% of maximums rated flow PF2M701: 0.01 L/min, PF2M702: 0.02 L/min PF2M705: 0.05 L/min, PF2M710: 0.1 L/min PF2M725: 0.3 L/min, PF2M750: 0.5 L/min PF2M711: 1 L/min
[F20] ⇔ [nP]	[nP] External input setting -5 (rAC) Accumulated value reset
[F22] ⇔ [AoU]	[AoU] Analogue output setting +3 (1-5) 1 to 5 V Voltage output (when voltage is output) [---] Analogue output is not selectable (for current type output)
[F30] ⇔ [SAVE]	[SAVE] Accumulated flow value hold setting (oFF) Not hold
[F80] ⇔ [oISP]	[oISP] Display OFF mode setting (on) Normal display
[F81] ⇔ [Prn]	[Prn] Security code (oFF) Unused
[F90] ⇔ [ALL]	[ALL] Setting of all functions (oFF) Unused
[F96] ⇔ [S_in]	[S_in] External input signal check +5 No setting due to input signal setting
[F98] ⇔ [TES]	[TES] Output checking (n) Normal output
[F99] ⇔ [In]	[In] Reset to the default settings (oFF) Not recover

*1: Setting is only possible for models with the units selection function.
*2: Only available for models with switch outputs for both OUT1 and OUT2.
*3: This function is available for models with analogue output. Analogue free span function can be selected.
*4: This function is available in IO-Link compatible products.
*5: This function is available for models with external input.

Other Settings

- o Snap shot function o Peak/bottom value indication o Reset
 - o Key-lock function o Zero-clear function
- To set each of these functions, refer to the SMC website (URL <https://www.smcworld.com>) for more detailed information, or contact SMC.

Maintenance

How to reset the product after a power cut or forcible de-energizing

The setting of the product will be retained as it was before a power cut or de-energizing. The output condition is also basically recovered to that before a power cut or de-energizing, but may change depending on the operating environment.

Troubleshooting

Error indication

Error Name	Error displayed	Description	Measures
Instantaneous flow error	HHH	Flow exceeding the upper limit of the set flow range is applied.	Reduce the flow.
	LLL	Flow exceeding the lower limit of the set flow range is applied.	Ensure the flow is in the correct direction.
OUT1 over current error	Er 1	The load current applied to the switch output has exceeded the maximum value. (OUT1)	Turn the power off and remove the cause of the over current. Then turn the power on again.
OUT2 over current error	Er 2	The load current applied to the switch output has exceeded the maximum value. (OUT2)	Turn the power off and remove the cause of the over current. Then turn the power on again.
Zero clear error	Er 3	During zero clear operation, pressure greater than ±5% F.S. is applied. (The mode is returned to measurement mode automatically 1 second later).	Retry the zero clear operation without applying fluid.
System error	Er 0	An internal data error has occurred.	Turn the power off and turn it on again.
	Er 4		
	Er 6		
	Er 7		
Accumulated flow error +1	Er 8	The accumulated flow has exceeded the accumulated flow range (For accumulated increment)	Reset the accumulated flow. (Press the UP and DOWN buttons for simultaneously for 1 second or longer)
	Er 14		
	Er 16		
	Er 40		
Accumulated flow error -1	Er 9	The accumulated flow has reached the set accumulated flow. (For accumulated decrement)	Reset the accumulated flow. (Press the UP and DOWN buttons for simultaneously for 1 second or longer)
	Er 10		
Version does not match	Er 15	Version of master and IO-Link does not match. Mismatch because master version is 1.0.	Align the master IO-Link version to the device.

*1: A decimal point will be displayed depending on the flow range or measurement unit setting.
*: If the error cannot be reset after the above measures are taken, or errors other than above are displayed, please contact SMC.

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

Specifications / Outline with Dimensions

Refer to the product catalogue or SMC website (URL <https://www.smcworld.com>) for more information about the product specifications and outline dimensions.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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