



Installation and Maintenance Manual

Electromagnetic Digital Flow Switch

LFE * Series



Thank you for purchasing the LFE * Series Electromagnetic type 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 in a safe place for future reference.

To obtain more detailed information about operating this product, please refer to the SMC website (URL <http://www.smcworld.com>) or contact SMC directly.

1 Safety Instructions

These safety instruction are intended to prevent a hazardous situation 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),Japan Industrial Standards(JIS) and other safety regulations.

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

Operator

- This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

- The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
- When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
- Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

1 Safety Instructions (continued)

■ 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 or explosive gases.

Fire or an explosion can result. This product is not designed to be explosion proof.

■ Do not use with flammable or highly permeable fluids.

Fire, explosion, damage or corrosion can result.

■ 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.
- Ensure the flow is shut off before performing maintenance. 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.

■ Do not touch the piping or its connected parts when the fluid is at high temperature.

It may cause burns. Ensure the piping cools sufficiently before touching.

■ 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 leaks occur from parts other than the piping, the product may be faulty.

Cut off power supply and stop supplying fluid.

Do not apply fluid at leaking condition.

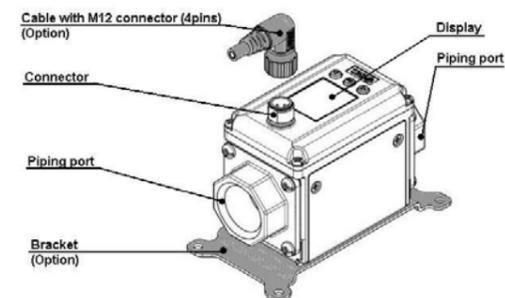
Safety cannot be assured in the case of unexpected malfunction.

2 Specifications

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

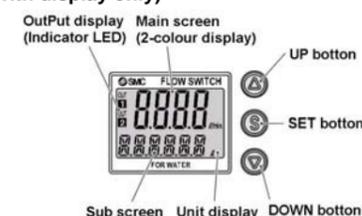
3 Summary of Product parts

3.1 Body



Item	Description
Connector	Connector for electrical connections.
Cable with M12 connector	Cable to supply power and transmit output signals.
Piping port	Port to connect the fluid.
Bracket	Mounting bracket used to install the product.
Display (With display only)	Displays the flow, settings and error codes. (see below.)

3.2 Display (With display only)



Item	Description
Main screen (2-colour display)	Displays the flow, the status of setting mode and error codes.
Sub screen	Displays the accumulated flow, set value, peak/bottom value and line names. In measurement mode, the set status is displayed.
Output display (Indicator LED)	Displays the output status of OUT1 and OUT2. When ON: Orange light is ON.
Unit display	Displays the unit selected.
UP button	Selects the mode and the sub screen display, and increases the ON/OFF set value.
SET button	Press this button to select mode and to confirm a set value.
DOWN button	Selects the mode and the sub screen display, and decreases the ON/OFF set value.

4 Mounting and Installation

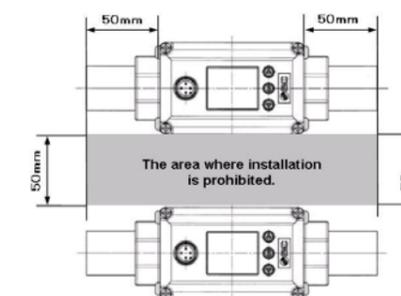
Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information.

4.1 Mounting

- Never mount the product in a location where it will be used as a support.
- Mount the product so that the fluid flows in the direction indicated by the arrow on the side of the body.
- Check the flow characteristics data for pressure loss and the straight inlet pipe length effect on accuracy, to determine inlet piping requirements.
- Do not sharply reduce the piping size.
- The piping port and metal part of the body are grounded to DC (-) blue. Note that a power supply with positive ground cannot be used.

4 Mounting and Installation (continued)

- When several sensors are mounted in parallel, do not mount them in the area where installation is prohibited as shown below. If the product is mounted in the area where installation is prohibited, the accuracy will decrease.

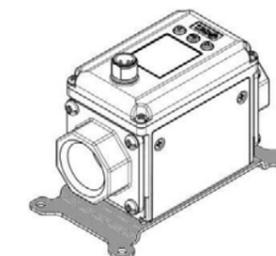


4.2 Installation

- Use the product within the specified operating pressure and temperature range.
- Proof pressure is 2 MPa. Proof pressure could vary according to the fluid temperature. Check the characteristics data for applying pressure.

Bracket mounting

Mount the product (with bracket) using the mounting screws (M4 x 4 pcs). Bracket thickness is approx. 1.6mm. Refer to the outline dimension drawing for the bracket thickness and mounting hole dimensions.

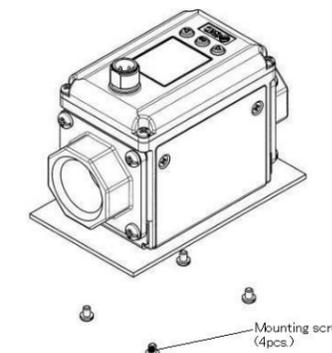


Direct mounting

Mount the product with the screws stated below.

Thread type	Nominal thread size	Tightening torque
Self tapping screws	3	0.32 ±0.03 Nm

Refer to the dimension drawing for mounting hole dimensions. When a self tapping screw is used, it should not be re-used several times.

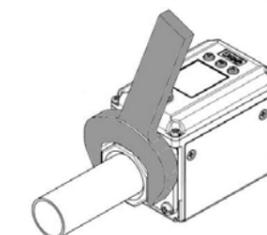


4.3 Piping

When connecting piping to the product, a spanner should be used on the metal piping attachment only.

Using a spanner on other parts may damage the product. In particular, do not let the spanner come into contact with the M12 connector.

The connector can be easily damaged.



Width across flats of attachment

Port	Width
3/8	24 mm
1/2	28 mm
3/4	35 mm
1	41 mm

4 Mounting and Installation (continued)

Tighten to the specified torque for piping. The tightening torque for connection threads is shown in the table below.

Nominal thread size	Tightening torque
Rc(NPT)3/8	22 to 24 Nm
Rc(NPT)1/2	28 to 30 Nm
Rc(NPT)3/4	28 to 30 Nm
Rc(NPT)1	36 to 38 Nm

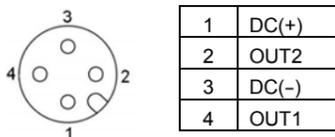
If the tightening torque is exceeded, the product can be damaged. If the correct tightening torque is not applied, the fittings may become loose. Avoid any sealing tape getting inside the port. Ensure there is no leakage from loose piping.

4.4 Wiring

Wiring of connector

Connections should only be made with the power supply turned off. Use separate routes for the Flow switch 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.

Pin number of the connector (on the product)



Pin number of the connector (on the cable)

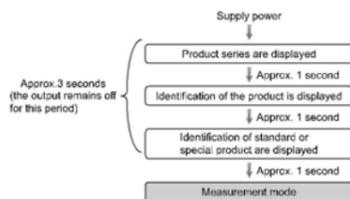


*: When using the lead wire with M12 right angle connector.

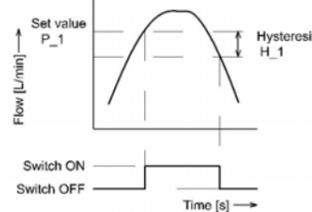
5 Flow Setting

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.



Set ON and OFF points of the switch output. (With display only) **Switch operation** When the flow exceeds the set value, the switch will be turned ON. When the flow falls below the set value by the amount of hysteresis or more, the switch will be turned OFF. If the operation shown is acceptable, keep this setting.



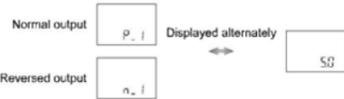
<Operation>

1. Press the SET button in measurement mode to display the set values.



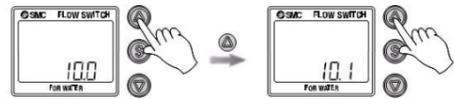
5 Flow Setting (continued)

2. [P_1] or [n_1] and the set value are displayed alternately.

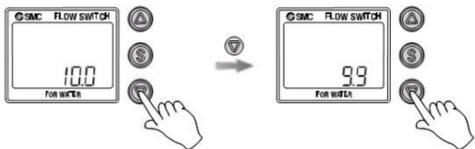


3. Press the UP or DOWN button to change the set value. The UP button is to increase and the DOWN button is to decrease the set value.

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



• Press the DOWN button once to decrease by one digit, press and hold to continuously decrease.



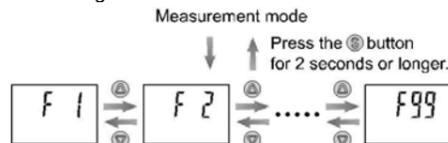
4. Press the SET button to finish the setting. The switch turns on within a set flow range (from P1L to P1H) during window comparator mode. Set P1L (switch lower limit) and P1H (switch upper limit) using the setting procedure above. When reversed output is selected, the main screen displays [n1L] and [n1H]. For models with 2 outputs, [P_2] or [n_2] will be displayed. Set as above. *: If a button operation is not performed for 30 seconds during the setting changes, the set value will start flashing.

6 Function Setting

6.1 Function selection mode (With display only)

In measurement mode, press the SET button for 2 seconds or longer, to display [F 1]. [F□□] indicates the mode for changing each functional setting. Press the SET button for 2 seconds or longer to return to measurement mode.

*: The sub screen will display the content of the function and the setting alternately.



The function number is increased and decreased by the UP and DOWN buttons. Display the required function number and press the SET button.

6.2 Default settings

The default settings are as follows. If these settings are acceptable, retain for use. To change a setting, refer to the SMC website (URL <http://www.smcworld.com>) for more detailed information or contact SMC.

•[F 1] Setting of OUT1

Item	Content	Default setting
Output mode	Selects the switch output type from: Instantaneous flow (either hysteresis or window comparator mode), accumulated flow or accumulated pulse output.	Hysteresis mode
Reversed output	Selects which type of switch output is used, normal or reversed.	Normal output
Set value	Sets the ON or OFF point of the switch output.	50% of rated flow
Hysteresis	Setting of hysteresis can prevent chattering.	5% of rated flow
Display colour	The display colour can be selected.	Output ON: Green Output OFF: Red

6 Function Setting (continued)

•[F 2] Setting of OUT2

Item	Content	Default setting
Output mode	Selects the switch output type from: Instantaneous flow (either hysteresis or window comparator mode), accumulated flow or accumulated pulse output.	Hysteresis mode
Reversed output	Selects which type of switch output is used, normal or reversed.	Normal output
Set value	Sets the ON or OFF point of the switch output.	50% of rated flow
Hysteresis	Setting of hysteresis can prevent chattering.	5% of rated flow

*: The display colour is linked to the setting of OUT1, and cannot be set for OUT2.

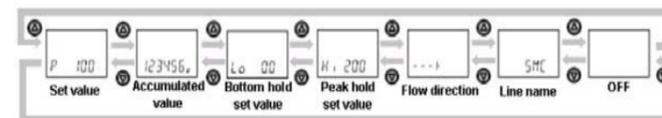
•Other parameter settings

Item	Default setting
[F 3] Response time	1 second
[F10] Sub screen	Display of flow direction
[F20] External input	Accumulated flow external reset
[F22] Analogue output	Free range analogue output for instantaneous flow: OFF
[F30] Accumulated flow	OFF [not held]
[F32] Flow direction mode, Reversed flow detection	Normal flow OFF
[F80] Power saving mode	No setting [display is turned on]
[F81] Security code	OFF
[F82] Input of line name	No name [*****]
[F90] Setting of all functions	OFF
[F98] Output check	OFF
[F99] Reset to the default settings	OFF

6.3 Sub screen display

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

*: After 30 seconds, it will automatically return to the display selected in [F10].



The set values and accumulated output of OUT2 cannot be displayed. (example shown is for 20 L/min type)

7 Other Settings

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

8 Outline Dimensions

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

9 Maintenance

■ 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 installation before operating the product.

10 Troubleshooting

10.1 Error indication (With display only)

Error Name	Display	Content	Remedy
OUT1 over current error	Er 1	The switch output load current has exceeded 80 mA (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 switch output load current has exceeded 80 mA (OUT2).	Turn the power off and remove the cause of the over current. Then turn the power on again.
Excessive instantaneous flow	HHH	The flow rate has exceeded the flow rate range	Reset applied flow to a level within the flow range.
Reverse flow error	LLL	The flow rate is in the reverse direction to the settings.	Apply the flow in the correct direction.
Excessive accumulated flow	999999999 (Displays '999' and '999999' alternately)	The accumulated flow range has been exceeded.	Clear the accumulated flow. (applicable only if the accumulated flow is used)
System error	Er 0	Internal data error has occurred.	Turn the power off and turn it on again.
	Er 4		
	Er 6		
	Er 8		

Error Name	Display	Content	Remedy
Sensor error	Er 10	The power supply voltage has exceeded the range of 24 V ±10%.	Check the power supply voltage, and turn the power off and on again.

10.2 Cross-reference for troubleshooting

Problem	Probable cause	Recommended error handling	Recommended action
Output error	Insufficient fluid supply	Confirm whether the fluid path is full	Fill the fluid path

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

11 Contacts

AUSTRIA	(43) 2262 6228-0	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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