



Installation and Maintenance Manual

Flow Monitor

LFE0 Series



Thank you for purchasing the LFE0 Series Flow Monitor. 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 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 | 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 manual is intended for those who have knowledge of machinery using pneumatic equipment, and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this manual carefully and understand it before assembling, operating or providing maintenance to the product.

Warning

- 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 catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 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.
- 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 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.

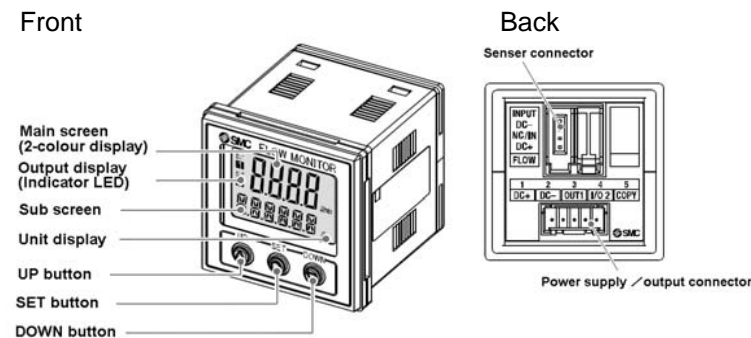
Caution

- 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 the power supply and stop supplying fluid. Do not apply fluid under leaking conditions. 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

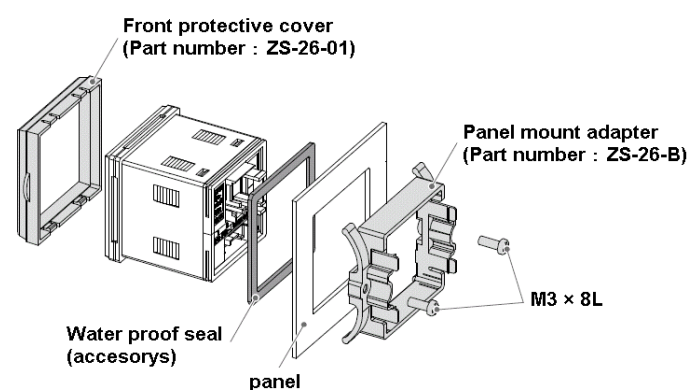


| Item | Description |
|--------------------------------|---|
| Main screen (2-colour display) | Displays the flow value, setting mode and the error code. |
| Sub screen | Displays the accumulated flow, set value, peak/bottom value, fluid temperature and line name. |
| Output display (Indicator LED) | Displays the output status of OUT1 and OUT2. When ON: Orange LED is ON. |
| Unit indication | Indicates the units currently selected. |
| UP button | Selects the mode, the display shown at the sub screen, or increases the ON/OFF set value. |
| SET button | Press this button to change the mode and to set a value. |
| DOWN button | Selects the mode, the display shown at the sub screen, or decreases the ON/OFF set value. |

4 Mounting and Installation

4.1 Installation

- Mounting with panel mount adapter**
Fix the panel mount adapter to the flow monitor with the M3x8L screws (2 pcs) supplied.
Panel mount adapter (Part number: ZS-26-B)
Front protective cover (Part number: ZS-26-01)



- * The panel mount adapter can be rotated 90 degrees for mounting.
- * The panel mount adapter should be fixed firmly with screws. Otherwise, fluids such as water may enter. After the product makes contact with the panel, the screws should be further tightened 1/4 to 1/2 turn.

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

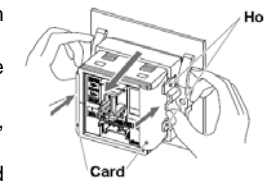
4 Mounting and Installation (continued)

- Removing the panel mount adapter**

The flow monitor with panel mount adapter can be removed from the panel by removing 2 screws, and releasing the hooks on both sides.

This can be done by inserting a suitable piece of thin card (as shown in the figure). Pull the panel mount adapter to the front, and remove the flow monitor.

If the panel mount adapter is pulled forward with the hook caught, the product and the adapter may be damaged.



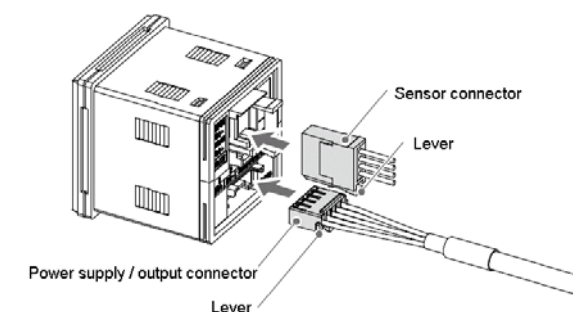
4.2 Wiring

- Wiring Connections**

Connections should only be made with the power supply turned off. Use a separate route for the Flow monitor 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 or 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 the Sensor connector and Power supply/output connector**

- 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.



- Sensor connector**

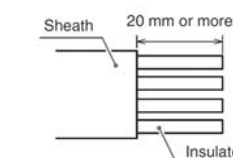
| | |
|---|---|
| 1 | DC (+) : Brown |
| 2 | N.C. / IN : White (unused / temp sensor: 1-5 V) |
| 3 | DC (-) : Blue |
| 4 | INPUT : Black (flow sensor: 1-5 V) |

- Power supply / output connector**

| | |
|-------|---------|
| Copy | : Grey |
| OUT2 | : White |
| OUT1 | : Black |
| DC(-) | : Blue |
| DC(+) | : Brown |

- Sensor cable connection**

- Strip the sensor cable as shown in the figure on the right. Refer to the product catalogue or SMC website (URL <http://www.smcworld.com>) for more detailed information about the sensor connector type, applicable wire gauge and the connection method.

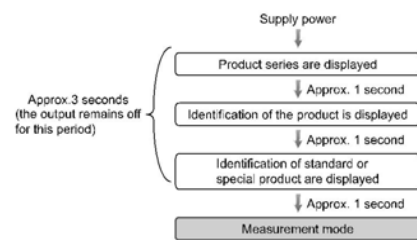


5 Flow Setting

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.

Be sure to select the correct sensor to be connected.



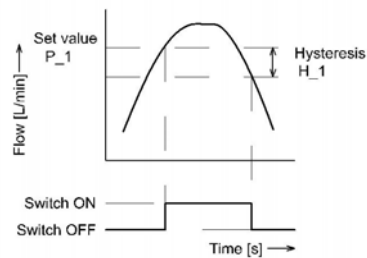
5.2 Setting the ON and OFF points of the switch output

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 this condition, shown right, is acceptable, keep these settings.

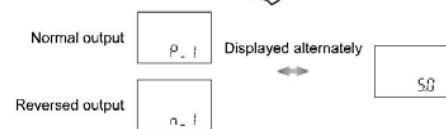


<Operation>

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

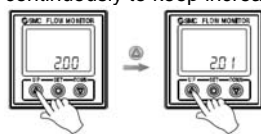


2. [P_1] or [n_1] and the set value are displayed alternately.

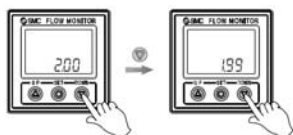


3. Press the UP or DOWN button to change the set value. The UP button is to increase and the DOWN button is to decrease the set value.

- Press the UP button once to increase by one digit, and press it continuously to keep increasing the set value.



- Press the DOWN button once to decrease by one digit, and press it continuously to keep decreasing the set value.



4. Press the SET button to complete the setting.

In window comparator mode, the switch operates within a set flow range (from P1L to P1H).

Set P1L (switch lower limit) and P1H (switch upper limit) using the setting procedure above.

When reversed output has been 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

In measurement mode, press the SET button for 2 seconds or longer, to display [F 0].

[F0] indicates the mode for changing each function 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 using the UP and DOWN buttons. Select to display the function to be changed, and press the SET button.

6.2 Default settings

The default settings are shown below.

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 0] Selection of the sensor to be connected

| Item | Content | Default setting |
|---------------------------|--|----------------------|
| Range of connected sensor | Set the flow rate range of the sensor to be connected. | Rated flow 20[L/min] |

- [F 1] Setting of OUT1

| Item | Content | Default setting |
|-----------------|---|-------------------------------------|
| Output mode | Select the switch output mode from: Instantaneous flow (either hysteresis or window comparator mode), accumulated flow or accumulated pulse output. | Hysteresis mode |
| Reversed output | Select which type of switch output is required, normal or reversed. | Normal output |
| Set value | Set the ON or OFF point of the switch output. | 50% of rated flow |
| Hysteresis | Set the hysteresis to prevent chattering. | 5% of rated flow |
| Display colour | Select the display colour. | Output ON: Green Output OFF: Red |

- [F 2] Setting of OUT2

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

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

6 Function Setting (continued)

- Other parameter settings

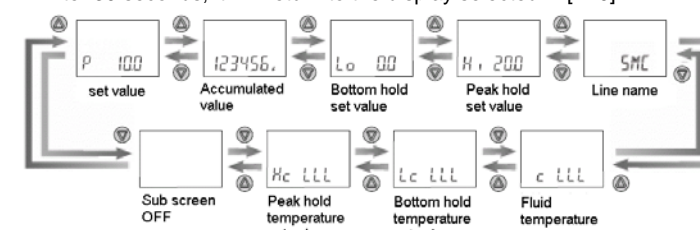
| Item | Default setting |
|--|--|
| [F 3] Response time | 1 second |
| [F10] Sub screen | Display of flow direction |
| [F20] External input | Accumulated flow external reset |
| [F22] Analogue output | Free range analogue output for instantaneous flow: OFF |
| [F30] Accumulated flow | OFF [not held]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

- *: There is no analogue output free range function for fluid temperature.

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 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

Error indication

| 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. |

10 Troubleshooting (continued)

| Error Name | Display | Content | Remedy |
|--|---|--|---|
| Reverse flow error | LLL | The flow is in the reverse direction to the settings. | Apply the flow in the correct direction. |
| Excessive accumulated flow | 99999999 (Display '999' and '999999' alternately) | The accumulated flow range has been exceeded. | Clear the accumulated flow. (applicable only if the accumulated flow is used) |
| Temperature upper limit exceeded | c HHH | The fluid temperature is above 110°C. | Reduce the fluid temperature. |
| Temperature lower limit exceeded | | The fluid temperature is below -10°C. | Increase the fluid temperature. |
| Temperature sensor disconnection error | | The temperature sensor output is not connected. | Connect the temperature sensor output. |
| | | The remote sensor does not have a temperature sensor. | Check that the remote sensor can measure temperature. |
| Temperature sensor failure | c LLL | If an error is displayed after checking the sensor temperature lower limit and the temperature sensor connections, then the temperature sensor in the remote sensor may be faulty. | Contact SMC |

| Error Name | Display | Content | Remedy |
|--------------|---------|-----------------------------------|--|
| System error | Er 0 | Internal data error has occurred. | Turn the power off and turn it on again. |
| | Er 4 | | |
| | Er 6 | | |
| | Er 8 | | |

If the error cannot be reset after the above measures are taken, then please contact SMC. Refer to the SMC website (URL <http://www.smcworld.com>) for more detailed information about troubleshooting.

11 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 |
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SMC Corporation

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