

Electromagnetic Type Digital Flow Switch/ Piping Connection Parts: Stainless Steel 304



Piping connection parts material: Stainless steel 304

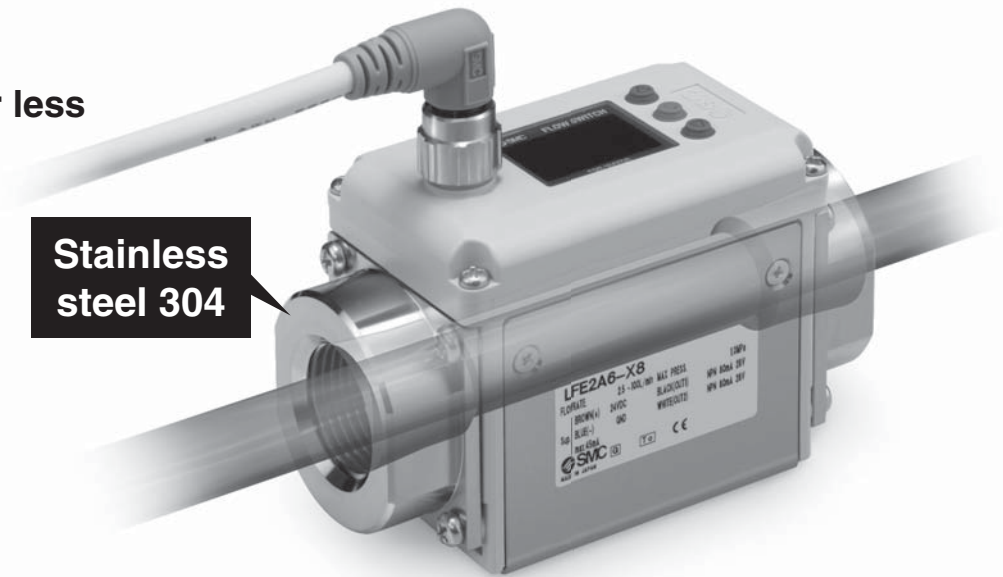
● Pressure loss:

0.02 MPa or less

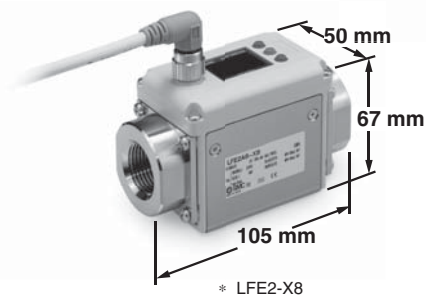
● Repeatability:

±1.5 % F.S.
(Analogue output)

Stainless steel 304



● Compact



● 3-colour/2-screen display



Instantaneous flow rate is displayed.

Parameters below can be set.

- Set value ● Flow direction ● Accumulated value
- Line name ● Peak/Bottom value

● Current consumption:

45 mA

Reduced by up to 10 % when the display is off.

● Enclosure:

IP65

● Variations

| Integrated display type/ Remote type | Flow range | | | | | | | |
|---|--------------------|---------|------------------|--------------------|----------|----------|--------------------|-----------|
| | 0.5 l/min | 2 l/min | 5 l/min | 10 l/min | 20 l/min | 50 l/min | 100 l/min | 200 l/min |
| LFE1-X8 | Rated flow range | | | Display flow range | | | | |
| LFE2-X8 | Rated flow range | | | | | | Display flow range | |
| LFE3-X8 | Display flow range | | Rated flow range | | | | | |

Application example

Flow control of cleaning solution for environments and workpieces sensitive to copper



LFE-X8



15-EU658-UK

3-colour display

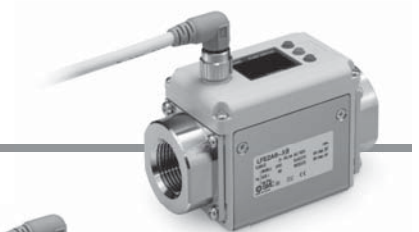
Electromagnetic Type Digital Flow Switch

LFE-X8



RoHS

Integrated display type



How to Order

Output specifications

| Symbol | OUT |
|--------|---------------------|
| J | Analogue 1 to 5 V |
| K | Analogue 4 to 20 mA |

Remote type sensor unit

LFE 1 J 3 [] [] - X8

Integrated display type

LFE 1 B 3 [] [] - X8

Rated flow range

| Symbol | Rated flow range |
|--------|------------------|
| 1 | 0.5 to 20 l/min |
| 2 | 2.5 to 100 l/min |
| 3 | 5 to 200 l/min |

Output specifications

| Symbol | OUT1 | OUT2 |
|--------|------|---------------------|
| A | NPN | NPN |
| B | PNP | PNP |
| C | NPN | Analogue 1 to 5 V |
| D | NPN | Analogue 4 to 20 mA |

Port size

| Symbol | Port size | Applicable model | | |
|--------|-----------|------------------|------|------|
| | | LFE1 | LFE2 | LFE3 |
| 3 | 3/8 | ● | — | — |
| 4 | 1/2 | ● | — | — |
| 6 | 3/4 | — | ● | — |
| 8 | 1 | — | — | ● |

Piping connection parts material: Stainless steel 304

Option

| Symbol | Lead wire with M12 connector (Length 3 m) | Bracket | Unit specifications |
|--------|---|---------|---------------------|
| — | ● | — | l/min |
| 1 | — | — | l/min |
| 2 | ● | ● | l/min |
| 3 | — | ● | l/min |
| 4*1 | ● | — | gal/min |
| 5*1 | — | — | gal/min |
| 6*1 | ● | ● | gal/min |
| 7*1 | — | ● | gal/min |

*1 Options 4, 5, 6, and 7 cannot be selected when the output specification is J or K.

Reference: 1 [l/min] = 0.2642 [gal/min]

1 [gal/min] = 3.785 [l/min]

Thread type

| Symbol | Type |
|--------|------|
| — | Rc |
| F | G |



Remote type sensor unit

Remote type monitor unit

(For details, refer to page 5.)

Specifications (Integrated Display Type)

| Model | | LFE1-X8 | LFE2-X8 | LFE3-X8 |
|---|-----------------------------|--|-----------------------|----------------|
| Applicable fluid*1 | | Water, Conductive fluids which do not corrode the fluid contact materials.*1 | | |
| Applicable fluid conductivity*1 | | 5 μ S/cm or more (micro siemens) | | |
| Detection method | | Electrostatic capacity type | | |
| Ground*10 | | Negative ground | | |
| Rated flow range*11 | | 0.5 to 20 l/min | 2.5 to 100 l/min | 5 to 200 l/min |
| Display flow range | | 0.4 to 24.0 l/min | 2.0 to 120.0 l/min | 4 to 240 l/min |
| Set flow range | | 0.4 to 24.0 l/min | 2.0 to 120.0 l/min | 4 to 240 l/min |
| Zero-cut flow*2 | | 0.4 l/min | 2.0 l/min | 4 l/min |
| Smallest settable increment | | 0.1 l/min | 0.5 l/min | 1 l/min |
| Accumulated volume per pulse (Pulse width: 50 ms) | | 0.1 l/pulse | 0.5 l/pulse | 1 l/pulse |
| Operating fluid temperature*3 | | 0 to 85 °C (with no freezing or condensation) | | |
| Display units | | Instantaneous flow rate l/min, Accumulated flow L | | |
| Repeatability | | Displayed values: ± 2 % F.S. Analogue output: ± 1.5 % F.S. | | |
| Temperature characteristics | Ambient temperature | ± 5 % F.S. (25 °C reference) | | |
| | Fluid temperature | ± 5 % F.S. (25 °C reference) | | |
| Operating pressure range*3 | | 0 to 1 MPa | | |
| Proof pressure*3 | | 2 MPa | | |
| Accumulated flow range*4 | | 99999999.9 L by 0.1 L | 999999999 L by 1 L | |
| Switch output | | NPN or PNP open collector output | | |
| Switch output | Maximum load current | 80 mA | | |
| | Maximum applied voltage | 28 V DC | | |
| | Internal voltage drop | NPN: 1 V or less (at load current 80 mA) PNP: 1.5 V or less (at load current 80 mA) | | |
| | Response time*5, 7 | 0.25 s/0.5 s/1 s/2 s/5 s | | |
| | Output protection | Short-circuit protection | | |
| | Output mode | Select from hysteresis mode, window comparator mode, accumulated output mode, or accumulated pulse output mode. | | |
| Analogue output | Response time*6, 7 | 0.25 s/0.5 s/1 s/2 s/5 s | | |
| | Voltage output | Output voltage: 1 to 5 V Output impedance: 1 k Ω | | |
| | Current output | Output current: 4 to 20 mA Max. load impedance: 600 Ω | | |
| Hysteresis | | Variable | | |
| Display method | | 2-screen (Main screen: 4-digit, 7-segment, 2-colour, Red/Green; Sub screen: 6-digit, 11-segment, White) Display values updated 5 times per second | | |
| Status LED | | Output 1, Output 2: Orange | | |
| Power supply voltage | | 24 V DC ± 10 % | | |
| Current consumption | | 45 mA or less (Load current is not included.) | | |
| Environmental resistance | Enclosure*9 | IP65 | | |
| | Operating temperature range | 0 to 50 °C (with no freezing or condensation) | | |
| | Operating humidity range | Operating, Storage: 35 to 85 % R.H. (with no condensation) | | |
| Standards and regulations | | CE marking, RoHS | | |
| Parts material in contact with fluid | | PPS, FKM, Stainless steel 304 | | |
| Port size | | 3/8 (10A) | 1/2 (15A) | 3/4 (20A) |
| Weight (Body)*8 | | Approx. 380 g | Approx. 430 g | Approx. 620 g |

*1 For details, refer to the "Applicable Fluids List" on the **Web Catalogue**.

*2 0 l/min is displayed when the flow is less than the zero-cut flow.

*3 When fluids with high temperatures are used, the operating pressure range and proof pressure will be reduced. (For details, refer to the "Operating Pressure Range" on the **Web Catalogue**.)

*4 Cleared when the power supply is turned off. Hold function can be selected. (Interval of 2 or 5 minutes can be selected.) If the 5 minutes interval is selected, the life of the memory element (electronic parts) is limited to 1 million cycles. (If energized for 24 hours, life is calculated as 5 minutes x 1 million = 5 million minutes = about 9.5 years.) Therefore, if using the hold function, calculate the memory life for your operating conditions, and use within this life.

*5 The response time when the set value is 63 % in relation to the step input.

*6 The response time until the set value reaches 63 % in relation to the step input. There might be a 0.05 second delay at response time of 0.25 s or 0.5 s due to the timing of internal processing.

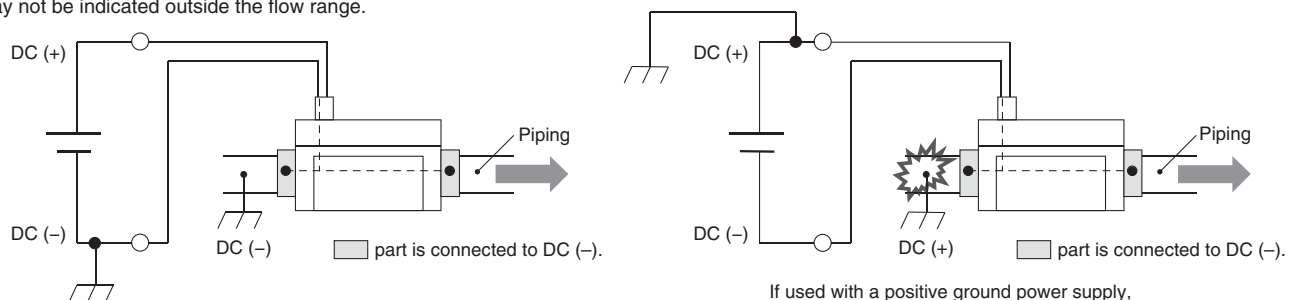
*7 The stability of display and analogue output is improved by increasing the response time setting. (This is the same as the standard product. For details, refer to "Stability" on the **Web Catalogue**.)

*8 When options are used, add the weight of the optional parts.

*9 Enclosure is for digital flow switch with lead wire and M12 connector.

*10 Piping port is grounded to DC(-)/blue line. Power supplies with a positive ground cannot be used. Please consult SMC if the product is to be used in a positive ground environment. (Refer to Figure 1.)

*11 The rated flow range is a flow range in which the product specifications (accuracy and repeatability) of the sensor are satisfied. The correct flow value may not be indicated outside the flow range.



If used with a positive ground power supply, the metal part will short.

Figure 1

LFE-X8

Specifications (Remote Type Sensor Unit)

| Model | | LFE1-X8 | LFE2-X8 | LFE3-X8 |
|--------------------------------------|-----------------------------|--|------------------|----------------|
| Applicable fluid*1 | | Water, Conductive fluids which do not corrode the fluid contact materials.*1 | | |
| Applicable fluid conductivity*1 | | 5 μ S/cm or more (micro siemens) | | |
| Detection method | | Electrostatic capacity type | | |
| Ground*5 | | Negative ground | | |
| Rated flow range*6 | | 0.5 to 20 l/min | 2.5 to 100 l/min | 5 to 200 l/min |
| Operating fluid temperature*2 | | 0 to 85 °C (with no freezing or condensation) | | |
| Repeatability | | Analogue output: ± 1.5 % F.S. | | |
| Temperature characteristics | Ambient temperature | ± 5 % F.S. (25 °C reference) | | |
| | Fluid temperature | ± 5 % F.S. (25 °C reference) | | |
| Operating pressure range*2 | | 0 to 1 MPa | | |
| Proof pressure*2 | | 2 MPa | | |
| Analogue output | Response time*3 | 0.5 s | | |
| | Voltage output | Output voltage: 1 to 5 V Output impedance: 1 k Ω | | |
| | Current output | Output current: 4 to 20 mA Max. load impedance: 600 Ω | | |
| Power supply voltage | | 24 V DC ± 10 % | | |
| Current consumption | | 42 mA or less (Load current is not included.) | | |
| Environmental resistance | Enclosure | IP65 | | |
| | Operating temperature range | 0 to 50 °C (with no freezing or condensation) | | |
| | Operating humidity range | Operating, Storage: 35 to 85 % R.H. (with no condensation) | | |
| Standards and regulations | | CE marking, RoHS | | |
| Parts material in contact with fluid | | PPS, FKM, Stainless Steel 304 | | |
| Port size | | 3/8 (10A) | 1/2 (15A) | 3/4 (20A) |
| Weight (Body)*4 | | Approx. 375 g | Approx. 425 g | Approx. 615 g |

*1 For details, refer to the "Applicable Fluids List" on the **Web Catalogue**.

*2 When fluids with high temperatures are used, the available pressure range will be reduced. (For details, refer to the "Operating Pressure Range" on the **Web Catalogue**.)

*3 The response time until the set value reaches 63 % in relation to the step input.

*4 When options are used, add the weight of the optional parts.

*5 Piping port and the metal part of the body are grounded to DC(-)/blue line. Power supplies with a positive ground cannot be used. Please consult SMC if the product is to be used in a positive ground environment.

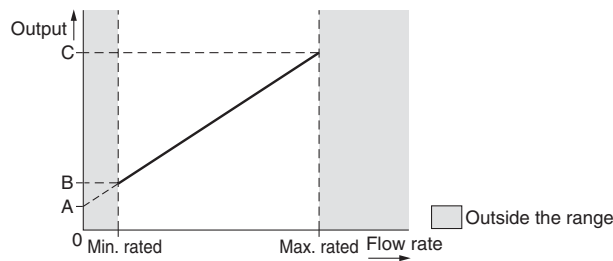
*6 The rated flow range is a flow range in which the product specifications (accuracy and repeatability) of the sensor are satisfied. The correct flow value may not be indicated outside the flow range.

Analogue Output

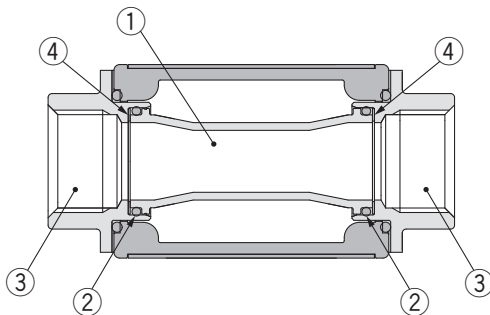
Flow/Analogue output

| | A | B | C |
|----------------|------|--------|-------|
| Voltage output | 1 V | 1.1 V | 5 V |
| Current output | 4 mA | 4.4 mA | 20 mA |

| Model | Rated flow [l/min] | |
|-------|--------------------|---------|
| | Minimum | Maximum |
| LFE1 | 0.5 | 20 |
| LFE2 | 2.5 | 100 |
| LFE3 | 5 | 200 |



Fluid Passage Structure

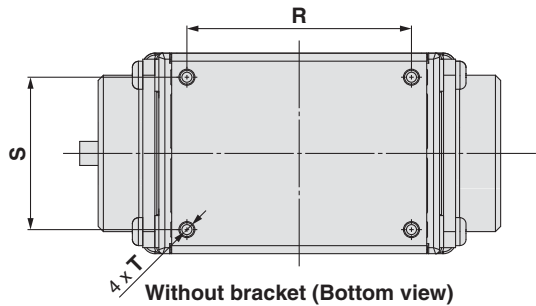


| No. | Description | Material |
|-----|-------------|---------------------|
| 1 | Pipe | PPS |
| 2 | O-ring | FKM |
| 3 | Attachment | Stainless steel 304 |
| 4 | Spacer | FKM |

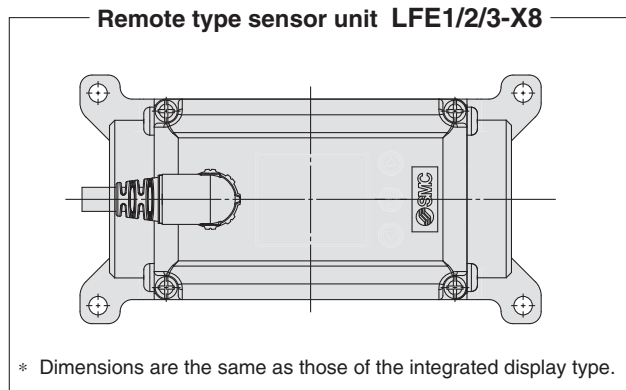
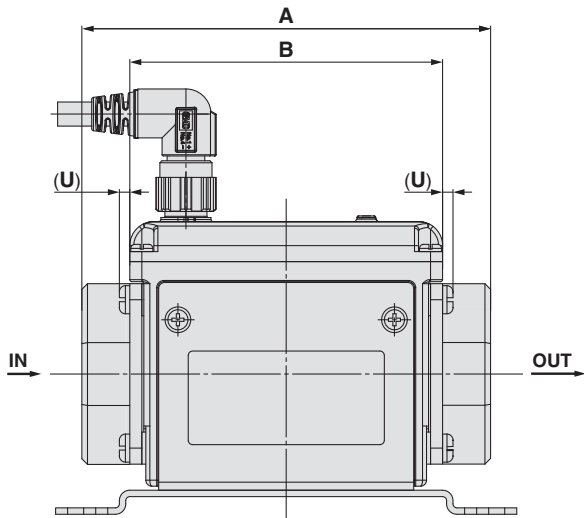
Other specifications are the same as the standard product. For details, refer to the **Web Catalogue**.

Dimensions

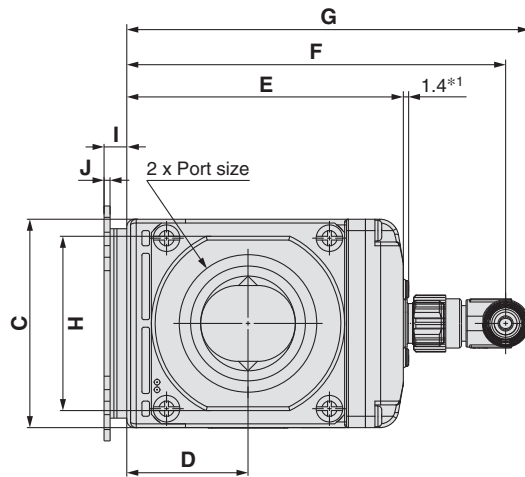
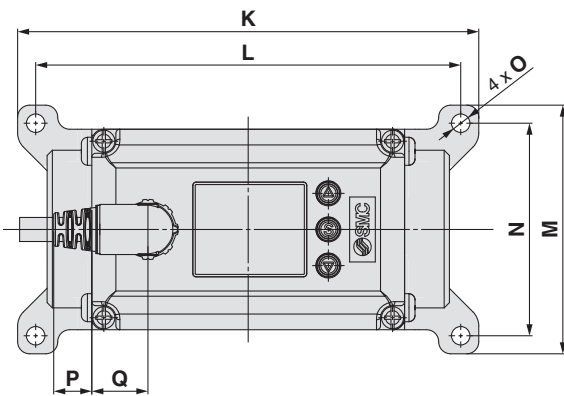
Integrated display type LFE1/2/3-X8



* The electrical entry for lead wire with M12 connector does not rotate and is limited to only one entry direction.



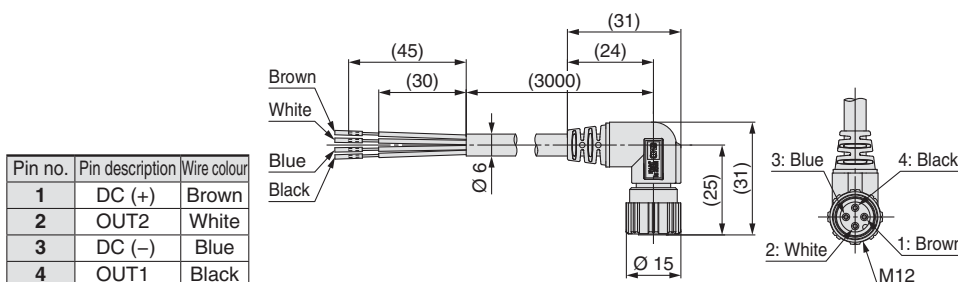
*1 For integrated display type



| Model | Port size | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U |
|---------|-----------|-----|----|----|------|----|-----|-----|----|---|-----|-----|-----|----|----|-----|-----|------|----|----|-----------------|-----|
| LFE1□3□ | 3/8 | 90 | 73 | 40 | 23.5 | 56 | 83 | 89 | 30 | 6 | 1.6 | 96 | 87 | 48 | 39 | 4.6 | 12 | 11.5 | 52 | 28 | Ø 2.5 depth 8.5 | 2 |
| LFE1□4□ | 1/2 | 104 | 73 | 40 | 23.5 | 56 | 83 | 89 | 30 | 6 | 1.6 | 96 | 87 | 48 | 39 | 4.6 | 12 | 11.5 | 52 | 28 | Ø 2.5 depth 8.5 | 2 |
| LFE2□ | 3/4 | 105 | 78 | 50 | 29 | 67 | 94 | 100 | 41 | 6 | 1.6 | 115 | 106 | 62 | 53 | 4.6 | 9.5 | 14 | 56 | 38 | Ø 2.5 depth 8.5 | 2.6 |
| LFE3□ | 1 | 120 | 90 | 55 | 32 | 73 | 100 | 106 | 46 | 6 | 1.6 | 115 | 106 | 62 | 53 | 4.6 | 3.5 | 20 | 68 | 43 | Ø 2.5 depth 8.5 | 2.6 |

* If you are installing directly, choose a self-tapping screw with a screw-in depth of 8 mm. Tighten the screw with a torque of 0.7 to 0.8 N-m.

Lead wire with M12 connector



Cable Specifications

| Conductor | Nominal cross section area | AWG21 |
|-----------|----------------------------|-------------------------------------|
| | External diameter | Approx. 0.9 mm |
| Insulator | Material | Non-lead heat resistant PVC |
| | External diameter | Approx. 1.7 mm |
| | Colours | Brown, White, Black, Blue |
| Sheath | Material | Non-lead heat and oil resistant PVC |
| | Finished external diameter | Ø 6 |

3-colour display

Digital Flow Monitor

LFE0 Series



RoHS



How to Order

LFE0 B - M V C

Type

0 Remote type monitor unit

For remote type sensor unit, select the analogue output 1 to 5 V type.
Applicable sensors: LFE□J□□□

Output specifications

| Symbol | OUT1 | OUT2 |
|----------|------|---------------------|
| A | NPN | NPN |
| B | PNP | PNP |
| C | NPN | Analogue 1 to 5 V |
| D | NPN | Analogue 4 to 20 mA |

Lead wire

N With power supply/output connection lead wire (2 m)

Power supply/output connection lead wire ZS-40-W

N Without power supply/output connection lead wire

Lead wire is shipped together, but does not come connected.

Remote type monitor unit/Unit specifications

| Symbol | Instantaneous flow rate | Accumulated flow |
|----------|-------------------------|------------------|
| M | l/min | L |
| G | gal/min | gal |

Note) G: Made to order
Reference: 1 [l/min] ↔ 0.2642 [gal/min]
1 [gal/min] ↔ 3.785 [l/min]

Option 2

C Without connector
Sensor connector (1 pc.)

Sensor connector (e-con)

Connector is shipped together, but does not come connected.

Option 1

T None
Panel mount adapter

Waterproof seal (Accessory)

Panel mount adapter

Panel

Mounting screw (M3 x 8L) (Accessory)

V Front protective cover + Panel mount adapter
Front protective cover

Waterproof seal (Accessory)

Panel mount adapter

Panel

Mounting screw (M3 x 8L) (Accessory)

Option/Part No.

When only optional parts are required, order with the part numbers listed below.

| Description | Part no. | Note |
|--|------------------|---|
| Panel mount adapter | ZS-26-B | With waterproof seal, mounting screw |
| Front protective cover + Panel mount adapter | ZS-26-C | With waterproof seal, mounting screw |
| Front protective cover only | ZS-26-01 | Separately order panel mount adapter etc. |
| Power supply/output connection lead wire | ZS-40-W | Lead wire length 2 m |
| Sensor connector (e-con) | ZS-28-C-5 | 1 pc. |
| Lead wire with connector for copying | ZS-40-Y | Connect up to 10 slave units |

Specifications

| Model | | LFE0 | | |
|------------------------------|---|---|--|----------------|
| Display flow range | 0.4 to 24.0 l/min (Flow under 0.4 l/min is displayed as "0.00") | 2.0 to 120.0 l/min (Flow under 2.0 l/min is displayed as "0.0") | 4 to 240 l/min (Flow under 4 l/min is displayed as "0.0") | |
| Set flow range | 0.4 to 24.0 l/min | 2.0 to 120.0 l/min | | 4 to 240 l/min |
| Smallest settable increment | 0.1 l/min | 0.5 l/min | | 1 l/min |
| Accumulated volume per pulse | 0.1 l/pulse | 0.5 l/pulse | | 1 l/pulse |
| Display units | Instantaneous flow rate l/min, Accumulated flow L | | | |
| Accuracy | Displayed values: $\pm 0.5\%$ F.S., Analogue output: $\pm 0.5\%$ F.S. | | | |
| Repeatability | $\pm 0.5\%$ F.S. | | | |
| Temperature characteristics | $\pm 0.5\%$ F.S. (25 °C reference) | | | |
| Accumulated flow range*1 | 99999999.9 L by 0.1 L | 999999999 L by 1 L | | |
| Switch output | NPN or PNP open collector output | | | |
| Maximum load current | 80 mA | | | |
| Maximum applied voltage | 28 V DC | | | |
| Internal voltage drop | NPN: 1 V or less (at load current 80 mA) PNP: 1.5 V or less (at load current 80 mA) | | | |
| Response time*2 | 0.5 s/1 s/2 s/5 s | | | |
| Output protection | Short-circuit protection | | | |
| Output mode | Select from hysteresis mode, window comparator mode, accumulated output mode, or accumulated pulse output mode. | | | |
| Flow rate Temperature | Select from hysteresis mode or window comparator mode. | | | |
| Response time*3 | 0.5 s/1 s/2 s/5 s (linked with the switch output) | | | |
| Voltage output | Output voltage: 1 to 5 V Output impedance: 1 k Ω | | | |
| Current output | Output current: 4 to 20 mA Max. load impedance: 600 Ω for 24 V DC | | | |
| Hysteresis | Variable | | | |
| Input/output | Input for copy mode | | | |
| Display method | 2-screen (Main screen: 4-digit, 7-segment, 2-colour, Red/Green; Sub screen: 6-digit, 11-segment, White) Display values updated 5 times per second | | | |
| Status LED | Output 1, Output 2: Orange | | | |
| Power supply voltage | 24 V DC $\pm 10\%$ | | | |
| Current consumption | 50 mA or less | | | |
| Connection | Power supply output 5P connector, sensor connection 4P connector (e-con) | | | |
| Environmental resistance | Enclosure | IP40 (Only front face of the panel is IP65 when optional panel mount adapter and waterproof seal are used.) | | |
| | Operating temperature range | 0 to 50 °C (with no freezing or condensation) | | |
| | Operating humidity range | Operating, Storage: 35 to 85 % R.H. (with no condensation) | | |
| | Withstand voltage | 1000 V AC for 1 minute between terminals and housing | | |
| Insulation resistance | 50 M Ω or more (500 V DC measured via megohmmeter) between terminals and housing | | | |
| Standards and regulations | CE marking, RoHS | | | |
| Weight | Without power supply/output connection lead wire | 50 g | | |
| | With power supply/output connection lead wire | 100 g | | |

*1 Cleared when the power supply is turned off. Hold function can be selected. (Interval of 2 or 5 minutes can be selected.) If the 5 minutes interval is selected, the life of the memory element (electronic parts) is limited to 1 million cycles. (If energised for 24 hours, life is calculated as 5 minutes x 1 million = 5 million minutes = about 9.5 years.) Therefore, if using the hold function, calculate the memory life for your operating conditions, and use within this life.

*2 The response time when the set value is 63 % in relation to the step input.

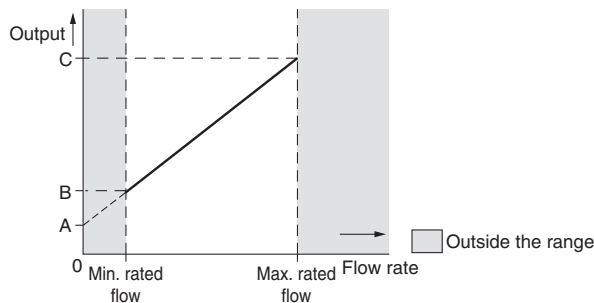
*3 The response time until the set value reaches 63 % in relation to the step input.

Analogue Output

Flow/Analogue output

| | A | B | C |
|----------------|------|--------|-------|
| Voltage output | 1 V | 1.1 V | 5 V |
| Current output | 4 mA | 4.4 mA | 20 mA |

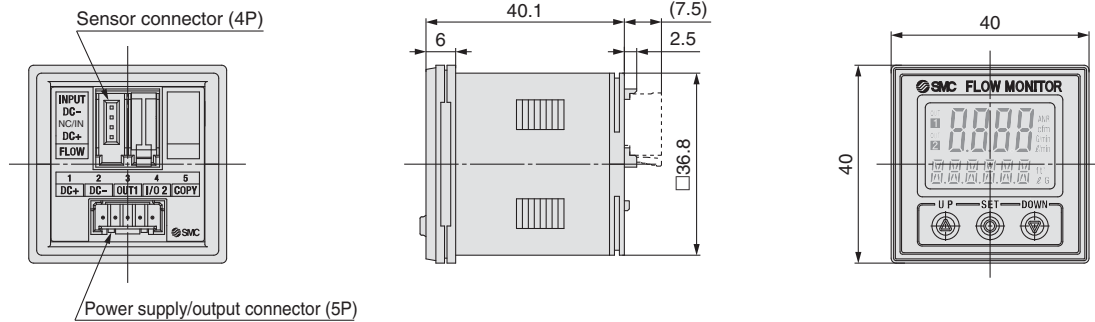
| Connected sensor | Rated flow [l/min] | |
|------------------|--------------------|---------|
| | Minimum | Maximum |
| LFE1 | 0.5 | 20 |
| LFE2 | 2.5 | 100 |
| LFE3 | 5 | 200 |



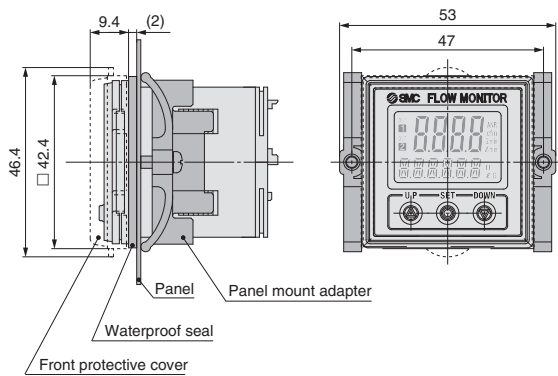
Other specifications are the same as the standard product. For details, refer to the **Web Catalogue**.

LFE0 Series

Dimensions

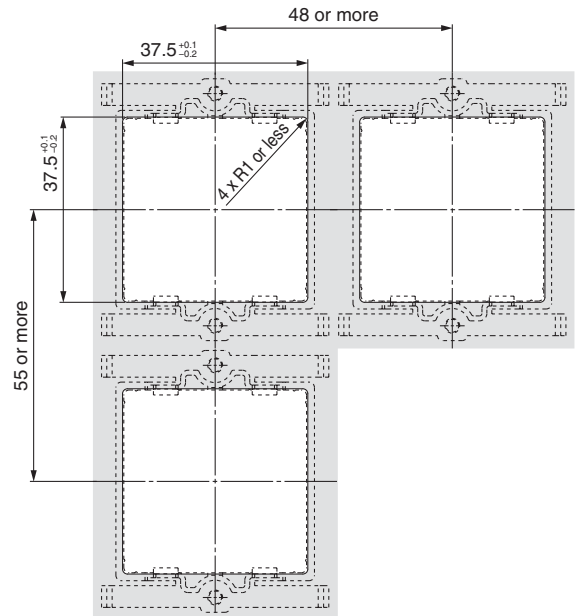


Front protective cover + Panel mount adapter



Panel fitting dimensions

Applicable panel thickness:
 0.5 to 8 mm (Without waterproof seal)
 0.5 to 6 mm (With waterproof seal)



SMC Corporation (Europe)

| | | | |
|----------------|---------------------|-----------------------|-------------------------|
| Austria | ☎ +43 (0)2262622800 | www.smc.at | office@smc.at |
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| Czech Republic | ☎ +420 541424611 | www.smc.cz | office@smc.cz |
| Denmark | ☎ +45 70252900 | www.smc.dk.com | smc@smc-pneumatics.ee |
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