

SAMTM
Speedy Accuracy Maintainability

SFC1480FX
SFC2480FX series



Passing along the tradition from F to FX, a



SFC1480FX SFC2480FX series



From F to FX: Passing along the tradition

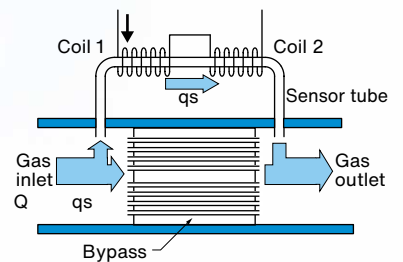
Since the first of our SFC480 series, SAM brand high-performance mass flow controllers have been carrying forward a tradition. We use a waveform diaphragm made of a Ni-Co alloy. By employing this diaphragm in the flow rate control valve, the key component in a mass flow controller, we incorporate a simple valve design that does not use any sliding sections and reduces the occurrence of particulate contamination. With a high corrosion resistance and stable control performance, we leave the competition behind and our customers satisfied. Our flow rate sensor, another key component in mass flow controllers, employs a coil type thermal sensor based on technology



Diaphragm valve

we have been accumulating for half a century, and it is extremely reliable. In the SFC1480F series, thanks to the latest digital control technology, we have developed a dual-range mass flow controller, and a hybrid mass flow controller in which digital control technology reaches its peak. Our reputation is solid because our customers feel we offer an incomparable product.

By inheriting the full tradition of the SAM brand, the SFC1480FX/SFC2480FX series are our most advanced models.



Basic design of the sensor

Circuit

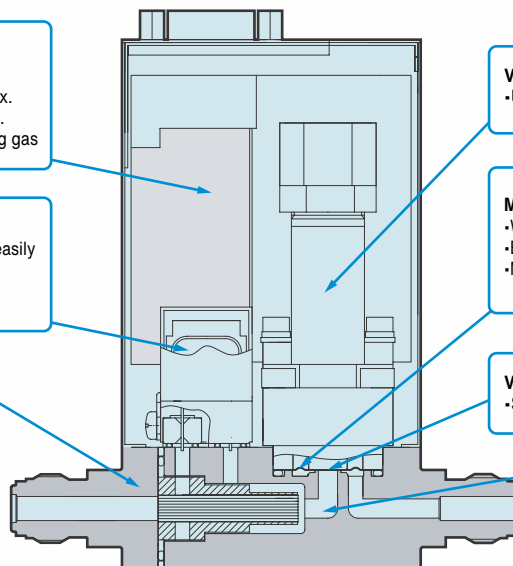
- Less overshoot
- High speed response: 0 to 100%; 1.0 sec. max.
0 to 20%; 1.5 sec. max.
- Guaranteed precision when actually measuring gas

Sensor

- Larger diameter that doesn't clog easily
- Ni-free sensor (standard)
- Ni sensor for CIF3, HF

Housing material

- SUS316L (standard)



Valve actuator

- Uses a layered-piezoelectric element

Metal diaphragm

- Waveform Ni-Co alloy diaphragm
- Extremely corrosion-proof with stable control
- No sliding surfaces and less creation of particles

Valve orifice

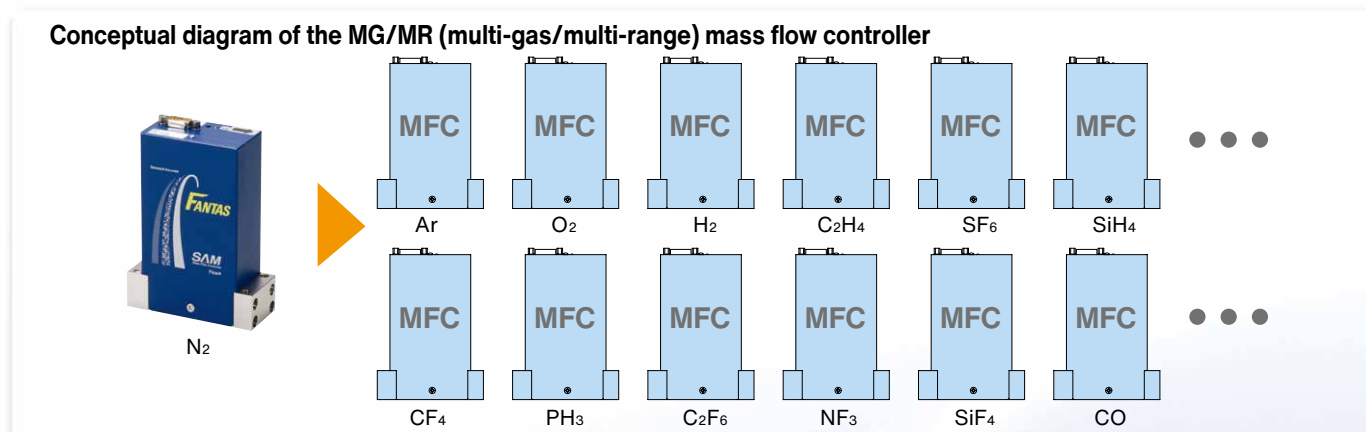
- Simple flow route

Surface finish

- Our unique, special electro-polishing

bold advancement to the next generation.

A bold advancement into the next generation, from G to FX



While inheriting the tradition of our earlier mass flow controllers, the SFC1480FX/SFC2480FX series is a bold advance into the next generation. The major element of innovation in this new series is the combination of many new technologies derived from the development of the G series all-in-one mass flow controller, in a new, next generation mass flow controller.

One core technology that has been fed back from this development is the MG/MR (multi-gas/multi-range) function. In conventional mass flow controllers, one controller could only handle one type of gas and one full scale flow rate range. This means that customers needed to have another mass flow controller for each different system, and for each different process recipe.

Since the FX series flow rate controller is equipped with the MG/MR function, and by preparing up to 14 recipes (full scale ranges of 2 SCCM to 50 SLM) to match the intended flow range, you can change the gas type and flow rate to match the actual gas you want to handle. When connected to a personal computer, the metering conditions can be changed instantly (See page 6).

Actual gas flow rate accuracy guarantee system backs up this MG/MR function. A conventional mass flow controller only guarantees the flow rate precision with N₂ gas. To get the flow rate conditions for your actual gas using a conventional MFC, a conversion factor must be used as a coefficient to convert the flow rate.

| Abbreviation | Standard full-scale flow rate range (N ₂ equivalent) |
|--------------|---|
| MG/MR | Flow range |
| FR-01 | 2~5 SCCM |
| FR-02 | 6~14 SCCM |
| FR-03 | 15~26 SCCM |
| FR-04 | 27~38 SCCM |
| FR-05 | 39~71 SCCM |
| FR-06 | 72~103 SCCM |
| FR-07 | 104~192 SCCM |
| FR-08 | 193~279 SCCM |
| FR-09 | 280~754 SCCM |
| FR-10 | 755~2036 SCCM |
| FR-11 | 2037~5500 SCCM |
| FR-12 | 5501~11000 SCCM |
| FR-13 | 11001~30000 SCCM |
| FR-14 | 30001~50000 SCCM |

The reference values for these coefficients have been based of a variety of values, including calculated values, actually measured values, and empirical values. And, these were merely guidelines or reference values with some gas types. Although the MG/MR function is included, if the gas data deviates from the characteristics of the actual gas, the mass flow controller cannot perform as its designed level. With the FX series mass flow controller, in addition to the flow rate reference for N₂ gas (that ensures conformance with the national standard using the conventional gravimetric method), we installed full scale actual gas metering and exhaust gas processing facilities at our factory. Using these facilities, measurement is made for each type of gas at each full-scale range, and record the data. This is then used as actual gas data.

The advancements in the FX series are not limited to the features above.

The PI (Pressure Insensitive) function improves the controller's ability to tolerate variations in the primary pressure. This function improves durability and is currently highly desired in mass flow controllers. The G1 series was developed from the G series as a mass flow controller containing a PI pressure sensor. The FX series inherited the PI technology of the G1 series. Although the FX series models do not have a pressure sensor, they employ a sensor method and housing that can be used with the new PI technology. So, even though the FX series is not as advanced as the G1 series with its full scale PI function, they have greater PI performance by design, when compared with the existing F series.



Actual gas flow rate measurement facility

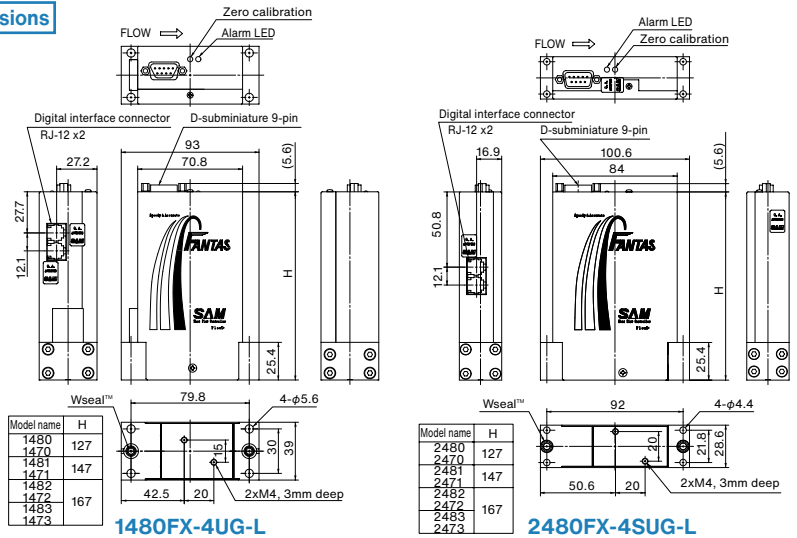
SFC1480FX / SFC2480FX series

For both the 1.5" and 1.125" IGS™

MG/MR Mass Flow Controllers



Dimensions



| Item | | Specifications *1 | | | |
|---|--------------------------------------|---|-------------------------------|--------------------------------------|--------------------------------------|
| Model name | | SFC1480FX SFC2480FX | SFC1481FX SFC2481FX | SFC1482FX SFC2482FX | SFC1483FX SFC2483FX |
| Standard full scale flow rate (N ₂ equivalent) | | 2SCCM ~5,50SCCM | ~11SLM | ~30SLM | ~50SLM |
| Function | | Multi-gas/multi-range | | | |
| Valve operation | | Normally closed / normally open | | | |
| Flow rate control range | | 2~100% F.S. | | | |
| Operation pressure *2 | Inlet pressure | 0.05~0.3 MPa (G) 7.3~43.5 PSI (G) | | 0.1~0.3 MPa (G) 14.5~43.5 PSI (G) | 0.2~0.3 MPa (G) 29.0~43.5 PSI (G) |
| | Outlet pressure | Vacuum to ambient pressure | | | |
| Proof pressure | | 1.0 MPa (G) 145 PSI (G) | | | |
| Temperature | Operation | 5~50 °C | | | |
| | Accuracy guaranteed | 15~35 °C | | | |
| | Heating temperature when not powered | 65°C maximum | | | |
| Humidity | | 35~80%RH (non condensing) | | | |
| Installation position | | Horizontal, Vertical | Horizontal, Vertical (option) | | |
| Accuracy | N ₂ gas | 10~100% | ± (0.5% S.P. + 0.15% F.S.) | | |
| | | 2~10% | ±0.2% F.S. | | |
| | Actual gas | 10~100% | ± (1.5% S.P. + 0.35% F.S.) | | |
| | | 2~10% | ±0.5% F.S. | | |
| Linearity | N ₂ gas | ±0.3% F.S. | | | |
| | Actual gas | ±1.0% F.S. | | | |
| Repeatability | 10~100% | ± (0.1% S.P. + 0.05% F.S.) | | | |
| | 2~10% | ±0.06% F.S. | | | |
| Flow rate sensor guaranteed zero point deviation range | | ±0.5% F.S. / year, max. | | | |
| Temperature dependence | Zero point | ±0.01% F.S. / °C (15~35 °C) | | | |
| | Span | ±0.01% S.P. / °C (15~35 °C) | | | |
| Response Time | 0% → (20~100%) | Max. 1.0 sec. to reach ±2% S.P. of the set value. | | | |
| | 0% → (2~20%) | Max. 1.5 sec. to reach ±0.4% S.P. of the set value. | | | |
| External leakage standard | | Max. 1x10 ⁻¹¹ Pa·m ³ /s (He) | | | |
| Flow rate setting signal | | 0.1 to 5 VDC (absolute rating: Max. ±15 VDC) | | | |
| Flow rate output signal | | 0 to 5 VDC (maximum output: ±15 VDC) | | | |
| Required power | | +15 VDC ±4%, 140 mA max -15 VDC ±4%, 140 mA max | | | |
| Material of gas wetted surface | Housing, flange, valve seat | SUS316L | | | |
| | Diaphragm | Ni-Co alloy | | | |
| | Flow sensor | SUS316L | Ni | | |
| | Seal *3 | SUS316L | | | |
| Surface finish of components that contact the gas | | Specially electro-polished (standard) | | | |
| Fitting | | Wseal™, Cseal, 1/4" UJR male | | | |

*1: The specifications above are guaranteed values when the MFC was measured by itself in standard conditions. The MFC may not meet the specifications above, depending on the measurement conditions.

*2: The SFC147*FX/SFC247*FX are also available for use with minute pressure differences. Please inquire separately for the specifications of our minute pressure difference models.

*3: A model using a rubber seal is also available. Please inquire separately about the rubber seal specifications.

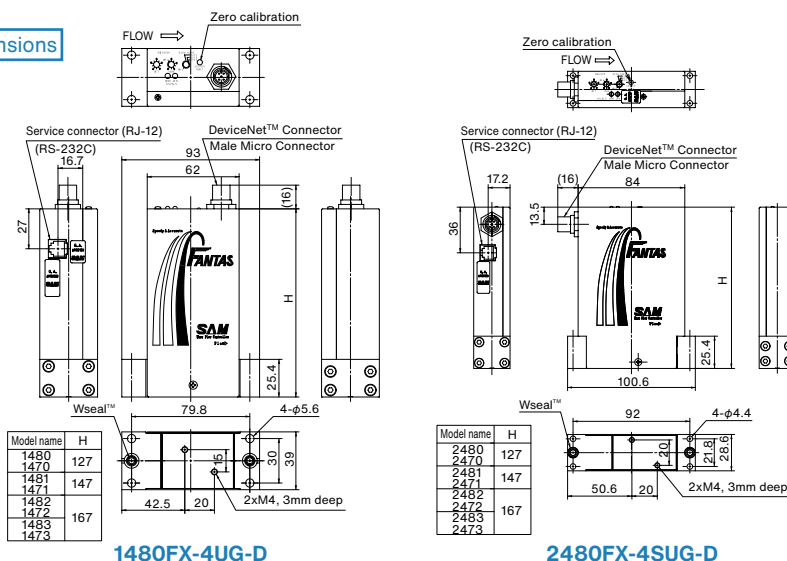
SFC1480FX-D / SFC2480FX-D series

DeviceNet™ communication type For both the 1.5" and 1.125" IGST™

MG/MR Mass Flow Controllers



Dimensions



1480FX-4UG-D

2480FX-4SUG-D

| Item | | Specifications *1 | | | |
|---|--------------------------------------|---|--------------------------------------|--------------------------------------|----------------------------|
| Model name | | SFC1480FX-D SFC2480FX-D | SFC1481FX-D SFC2481FX-D | SFC1482FX-D SFC2482FX-D | SFC1483FX-D SFC2483FX-D |
| Standard full scale flow rate (N ₂ equivalent) | | 2SCCM ~5,500SCCM | ~11SLM | ~30SLM | ~50SLM |
| Function | | Multi-gas/multi-range | | | |
| Valve operation | | Normally closed / normally open | | | |
| Flow rate control range | | 2~100% F.S. | | | |
| Operation pressure *2 | Inlet pressure | 0.05~0.3 MPa (G) 7.3~43.5 PSI (G) | 0.1~0.3 MPa (G) 14.5~43.5 PSI (G) | 0.2~0.3 MPa (G) 29.0~43.5 PSI (G) | |
| | Outlet pressure | Vacuum to ambient pressure | | | |
| Proof pressure | | 1.0 MPa (G) 145 PSI (G) | | | |
| Temperature | Operation | 5~50 °C | | | |
| | Accuracy guaranteed | 15~35 °C | | | |
| | Heating temperature when not powered | 65°C maximum | | | |
| Humidity | | 35~80%RH (non condensing) | | | |
| Installation position | | Horizontal, Vertical | Horizontal, Vertical (option) | | |
| Accuracy | N ₂ gas | 10~100% | ± (0.5% S.P. + 0.15% F.S.) | | |
| | | 2~10% | ±0.2% F.S. | | |
| | Actual gas | 10~100% | ± (1.5% S.P. + 0.35% F.S.) | | |
| | | 2~10% | ±0.5% F.S. | | |
| Linearity | N ₂ gas | ±0.3% F.S. | | | |
| | Actual gas | ±1.0% F.S. | | | |
| Repeatability | 10~100% | ± (0.1% S.P. + 0.05% F.S.) | | | |
| | 2~10% | ±0.06% F.S. | | | |
| Flow rate sensor guaranteed zero point deviation range | | ±0.5% F.S. / year, max. | | | |
| Temperature dependence | Zero point | ±0.01% F.S. / °C (15~35 °C) | | | |
| | Span | ±0.01% S.P. / °C (15~35 °C) | | | |
| Response Time | 0% → (20~100%) | Max. 1.0 sec. to reach ±2% S.P. of the set value. | | | |
| | 0% → (2~20%) | Max. 1.5 sec. to reach ±0.4% S.P. of the set value. | | | |
| External leakage standard | | Max. 1x10 ⁻¹¹ Pa·m ³ /s (He) | | | |
| Flow rate setting signal | | DeviceNet™ communication *3 | | | |
| Flow rate output signal | | | | | |
| Required power | | +24 VDC, 0.3 A max | | | |
| Material of gas wetted surface | Housing, flange, valve seat | SUS316L | | | |
| | Diaphragm | Ni-Co alloy | | | |
| | Flow sensor | SUS316L | | | Ni |
| | Seal *4 | SUS316L | | | |
| Surface finish of components that contact the gas | | Specially electro-polished (standard) | | | |
| Fitting | | Wseal™, Cseal, 1/4" UJR male | | | |

*1: The specifications above are guaranteed values when the MFC was measured by itself in standard conditions. The MFC may not meet the specifications above, depending on the measurement conditions.

*2: The SFC147*FX/SFC247*FX are also available for use with minute pressure differences. Please inquire separately for the specifications of our minute pressure difference models.

*3: For information about DeviceNet™ communication, see page 6.

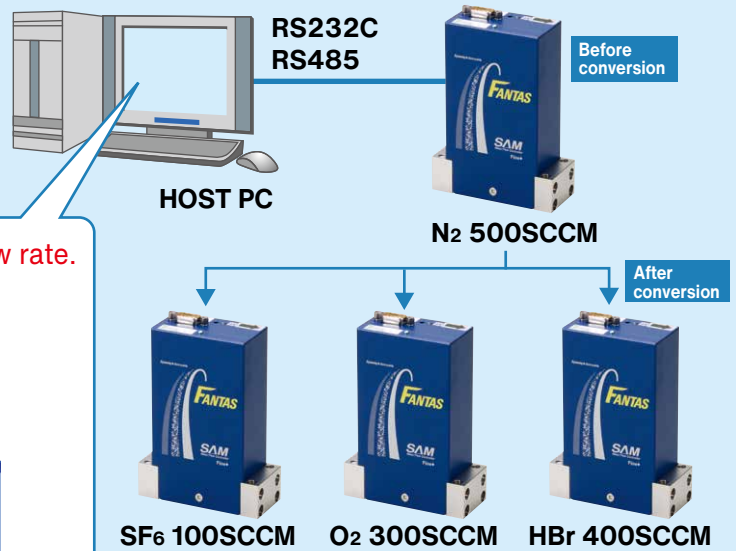
*4: A model using a rubber seal is also available. Please inquire separately about the rubber seal specifications.

How to use the MG/MR conversion program

Gas type and flow rate can be converting using an MG/MR conversion program. Connect the mass flow controller to a personal computer using a digital communication cable, and use our proprietary program. One can convert the data easily with a simple GUI interface program. Following the program instructions, first select the gas type, and then flow rate units. A flow rate range will appear, and it can be changed. Enter a flow rate value and the setting is complete.

Users can change the gas type and flow rate.

<MG/MR conversion program> Select the correction amount data according to the gas type and flow rate you want to control



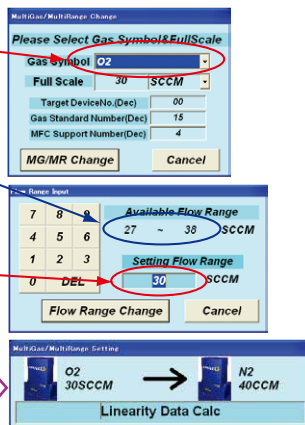
Simple operation to set the gas type and flow rate.

Select a gas type

The flow rate range is displayed (user settable).

Enter a flow rate

A screen that shows the program is converting.



* For details about the operation, see the instruction manual

Models compatible with the DeviceNet™ communication system

About DeviceNet™

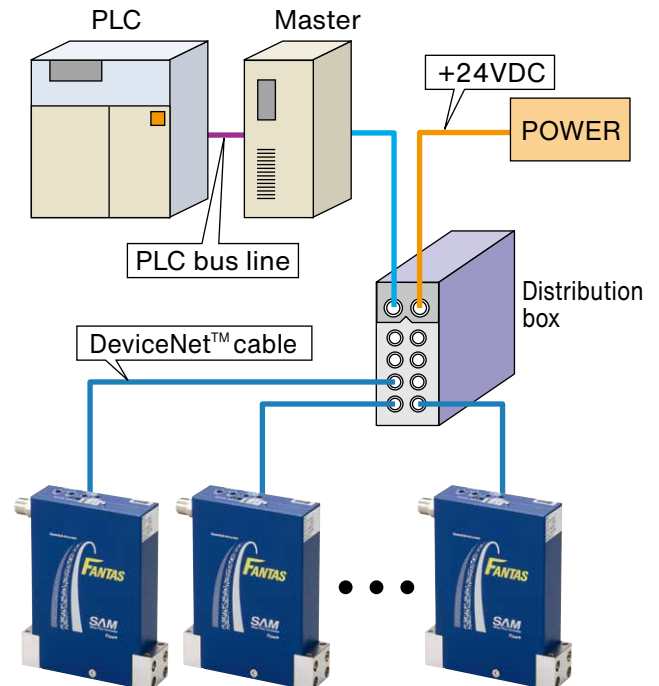
This is a field network recognized world wide, and it is approved as a standard sensor bus by the SEMI.

Field devices can be connected using serial communication in place of an I/O connection, allowing transfer of a large volume of data effectively.

The DeviceNet™ specifications are administrated by the ODVA (ODVA, Inc.) a non-profit body established to promote the spread of this system world-wide.

What are the advantages of employing DeviceNet™

- 1) By using serial communication from an I/O connection, one does not need an AD / DA / O board which can decrease configuration and set up costs.
- 2) Only network cables are needed and this reduces cabling costs, which decreases required man-hours, shortening engineering periods, and avoids problems from incorrect wiring.
- 3) DeviceNet™ employs a CAN (Controller Area Network) as a communication controller, and you can use a variety of CAN error detection functions.
- 4) The DeviceNet™ specifications are administrated by the ODVA, and have been normalized as international standards by IEC and SEMI. With this normalization, they are completely open, and lots of control devices are available from multiple vendors. You can choose the optimum device for your application.
- 5) The power for DeviceNet™ is only +24 VDC. You do not need to supply ± 15 VDC for the mass flow controller.



Communication connector pin assignment

Analog interface connector (D-Sub 9-pin)

Connector used : D-Subminiature, 9-pin connector (M3 screw)

Compatible plug : 17JE-13090-02 (D8B) (made by DDK) or equivalent

1) Connector model : L type

| Pin number | Function |
|------------|---|
| 1 | Valve open/close input (+15 VDC = Fully open; -15 VDC = Fully closed) |
| 2 | Output (0 to 5 VDC) |
| 3 | +15 VDC |
| 4 | COM (± 15 VDC) |
| 5 | -15 VDC |
| 6 | Input (0.1 to 5 VDC) |
| 7 | COM (output) |
| 8 | COM (Input) |
| 9 | Valve voltage (0 to 5VDC) |

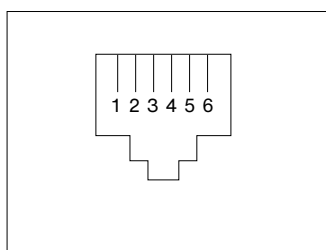
2) Connector model: Q type

| Pin number | Function |
|------------|---|
| 1 | Valve Full open (operate by connecting to COM) |
| 2 | Out put (0 to 5 VDC) |
| 3 | +15 VDC |
| 4 | COM (± 15 VDC) |
| 5 | -15 VDC |
| 6 | Input (0.1 to 5 VDC) |
| 7 | COM (output) |
| 8 | COM (Input) |
| 9 | Valve Full-close (operate by connecting to COM) |

Digital interface connector

Connector used : 43814-6621 (made by Molex) (RJ-12 x 2 connectors)

| Pin number | Signal name | |
|------------|---------------|-------|
| | RS232C | RS485 |
| 1 | COM (Signal) | |
| 2 | No Connection | |
| 3 | Rxd | RS- |
| 4 | Txd | RS+ |
| 5 | N.C. | |
| 6 | N.C. | |



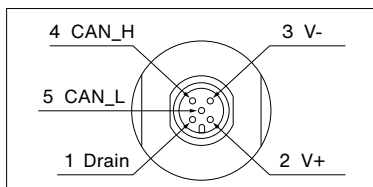
Note 1 : Rxd, Txd: RS232C Input and output

Note 2 : RS-, RS+: RS480 Input and output

DeviceNet™ connector

Connector used : DeviceNet™ Male Micro Connector (CM02-8DR5P(D5) made by DDK, or equivalent)

| Pin number | Signal name |
|------------|-------------|
| 1 | Drain |
| 2 | V+ |
| 3 | V- |
| 4 | CAN_H |
| 5 | CAN_L |



Additional functions

| Function name | Description | Setting and reading methods |
|--|--|---|
| Alarm function | See the item for the alarm function | By command |
| Flow sensor zero reset function | Reset the flow sensor zero | By command or when the switch on the top is pressed |
| Lamp response function | Reset the flow rate using a specified time for the step flow rate setting. | By command |
| Flow control valve voltage monitor output function | Set the flow control valve opening (0 to 5 VDC) | By command or analog voltage output (only L type) |
| Flow control valve fully open / close function | Open and close the flow control valve completely | By command, ± 15 VDC, or contact point connection |

Alarm function

| Alarm cause | Alarm LED display | Alarm output condition |
|--|--------------------------|--|
| Normal operation | Green LED blinks at 1 Hz | No alarm |
| Flow rate setting does not the match flow rate output | Red LED lights | The mis-match between the flow rate setting and the flow rate output is 10% or more of the full scale and has continued for 10 seconds or longer |
| Abnormal ± 15 VDC power supply | Turns off | The ± 15 VDC power supply is outside the range of ± 12 VDC to ± 17 VDC, and has been for 0.5 seconds or longer. |
| EEPROM access error | Red LED lights | Abnormal value in the EEPROM data. |
| Digital communication error | Red LED goes on | Did not receive a normal digital command |
| Change in flow rate control status (Change from the preset status) •Flow rate setting changed •Flow rate output changed •Flow control valve open level changed •Abnormal zero point correction value for the flow sensor | Red LED blinks at 2 Hz | The change in the preset value was 10% or more of the full scale and continued for 10 seconds or longer. Or, the cumulative value of the zero point correction amount for the flow sensor is more than $\pm 20\%$ of full scale |

SFC1480FX/SFC2480FX series ordering information

| Model name | | | | | | | |
|---------------------|----------------------|-------------------------------------|-------------------------|-------------------------|---------------------------------|-------------|-----------|
| Controller or meter | Size | Temperature | Pressure | Flow range | Series | Seal | Operation |
| SFC | 1 | 4 | 8 | 2 | FX | M | C |
| SFC | Mass flow controller | | | | | | |
| FMT | Mass flow meter | | | | | | |
| | 1 | 1.5" size | | | | | |
| | 2 | 1.125" size | | | | | |
| | 4 | Normal temperature type | | | | | |
| | 5 | High temperature type (80°C) | | | | | |
| | 6 | Ultra-high temperature type (150°C) | | | | | |
| | | 8 | Normal pressure type | | | | |
| | | 7 | Low inlet pressure type | | | | |
| | | | 0 | 2~5,500 SCCM (FR-01~11) | | | |
| | | | 1 | 11 SLM (FR-12) | | | |
| | | | 2 | 30 SLM (FR-13) | | | |
| | | | 3 | 50 SLM (FR-14) | | | |
| | | | | FX | Multi gas, multi range, digital | | |
| | | | | | M | Metal seal | |
| | | | | | R | Rubber seal | |

| Optional code | | | | | | | |
|---------------|---------------|----------------------------|----------------------|----------|----------------------|-------|-----------------|
| Fitting | Connector | Gas-contact surface finish | Communication method | Protocol | Flow sensor material | | |
| 4UG | L | | B | L | N | | |
| 4V * | 1/4" UJR male | | | | | Blank | Mass flow meter |
| 4UG | 1.5" Wseal™ | | | | | C | Normally closed |
| 4AG | 1.5" Cseal | | | | | O | Normally open |
| 4SUG ** | 1.125" Wseal™ | | | | | | |
| 4SAG ** | 1.125" Cseal | | | | | | |

| | |
|------|--|
| L | D-sub 9-pin (top mount), valve fully open / fully closed signal, ±15VDC type |
| Q | D-sub 9-pin (top mount), valve fully open / fully closed signal, COM connection type |
| T ** | D-sub 9-pin (upstream side), digital output type |
| D | DeviceNet™ |

| | |
|-------|----------------------------|
| Blank | Special electro-polished |
| K | Machine processed finish |
| Blank | RS232C or DeviceNet™ |
| B | RS485 |
| Blank | SAM protocol or DeviceNet™ |
| L | L protocol |
| Blank | Ni free |
| N | Ni sensor |

Note: * Can measure a 124 mm gap between the faces of a 1/4" UJR male.

** Only the SFC2480FX series can be used with 4SUG, 4SAG fittings and a T connector

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Safety Precaution

Before using any of the products introduced in this catalog, please read the respective user manuals thoroughly.

- The contents of this catalog are correct as of September 2024.
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