

**Plug-in Signal Conditioners M-UNIT**

**2-input MATH FUNCTION MODULE**

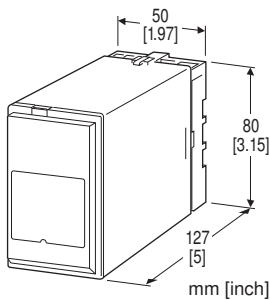
(field-programmable)

**Functions & Features**

- Providing temperature or pressure compensation for a gas flow, and other arithmetic operations
- Microprocessor based
- Equation and parameters selectable on site via hand-held programmer PU-2x
- Loop testing
- Isolation up to 2000 V AC
- High-density mounting

**Typical Applications**

- Various flowmeters
- Adding two flows
- Ratio calculation
- Calculating average temperature



**MODEL: JF-[1][2]-[3][4]**

**ORDERING INFORMATION**

- Code number: JF-[1][2]-[3][4]
- Specify a code from below for each of [1] through [4].  
(e.g. JF-6A-B/3/Q)
- Special output range (For codes Z & 0)
  - Parameters
- Use Ordering Information Sheet (No. ESU-1980) to specify parameters. Default setting will be used if not otherwise specified.  
( $K_0 = 1, K_1 = 1, K_2 = 1, A_0 = 0 \%, A_1 = 0 \%, A_2 = 0 \%$ )
- Specify the specification for option code /Q  
(e.g. /C01/S01)

**[1] INPUT**

- Current
- A:** 4 - 20 mA DC (Input resistance 100  $\Omega$ )
- Voltage
- 6:** 1 - 5 V DC (Input resistance 1 M $\Omega$  min.)

**[2] OUTPUT**

- Current
- A:** 4 - 20 mA DC (Load resistance 750  $\Omega$  max.)
  - B:** 2 - 10 mA DC (Load resistance 1500  $\Omega$  max.)
  - C:** 1 - 5 mA DC (Load resistance 3000  $\Omega$  max.)
  - D:** 0 - 20 mA DC (Load resistance 750  $\Omega$  max.)
  - E:** 0 - 16 mA DC (Load resistance 900  $\Omega$  max.)
  - F:** 0 - 10 mA DC (Load resistance 1500  $\Omega$  max.)
  - G:** 0 - 1 mA DC (Load resistance 15 k $\Omega$  max.)
  - Z:** Specify current (See OUTPUT SPECIFICATIONS)
- Voltage
- 1:** 0 - 10 mV DC (Load resistance 10 k $\Omega$  min.)
  - 2:** 0 - 100 mV DC (Load resistance 100 k $\Omega$  min.)
  - 3:** 0 - 1 V DC (Load resistance 1000  $\Omega$  min.)
  - 4:** 0 - 10 V DC (Load resistance 10 k $\Omega$  min.)
  - 5:** 0 - 5 V DC (Load resistance 5000  $\Omega$  min.)
  - 6:** 1 - 5 V DC (Load resistance 5000  $\Omega$  min.)
  - 4W:** -10 - +10 V DC (Load resistance 10 k $\Omega$  min.)
  - 5W:** -5 - +5 V DC (Load resistance 5000  $\Omega$  min.)
  - 0:** Specify voltage (See OUTPUT SPECIFICATIONS)

**[3] POWER INPUT**

- AC Power
- B:** 100 V AC
  - C:** 110 V AC
  - D:** 115 V AC
  - F:** 120 V AC
  - G:** 200 V AC
  - H:** 220 V AC
  - J:** 240 V AC
- DC Power
- S:** 12 V DC
  - R:** 24 V DC
  - V:** 48 V DC

**[4] OPTIONS (multiple selections)**

- Equation (Refer to the EQUATION table)
- /1:** Temperature compensation for DP flowmeter (ideal gas)
  - /2:** Pressure compensation for DP flowmeter (ideal gas)
  - /3:** Addition/subtraction
  - /4:** Multiplication
  - /5:** Division
- Other Options
- blank:** none
  - /Q:** Option other than the above (specify the specification)

**SPECIFICATIONS OF OPTION: Q (multiple selections)**

- COATING (For the detail, refer to our web site.)
- /C01:** Silicone coating
  - /C02:** Polyurethane coating
  - /C03:** Rubber coating

**TERMINAL SCREW MATERIAL**

/S01: Stainless steel

**EQUATION****Equation parameters**X<sub>0</sub>: output (%)X<sub>1</sub> to X<sub>2</sub>: input (%)K<sub>0</sub> to K<sub>2</sub>: gain ±29.999A<sub>0</sub> to A<sub>2</sub>: bias (%) ±299.99 %**EQUATION**

/1: Temperature compensation for DP flowmeter (ideal gas)

$$X_0 = \frac{K_1 X_1}{\sqrt{K_2 X_2 + A_2}}$$

where X<sub>0</sub> : compensated flow (linear characteristic)X<sub>1</sub> : uncompensated flow (square root extraction available)X<sub>2</sub> : temperature

/2: Pressure compensation for DP flowmeter (ideal gas)

$$X_0 = K_1 X_1 \sqrt{K_2 X_2 + A_2}$$

where X<sub>0</sub> : compensated flow (linear characteristic)X<sub>1</sub> : uncompensated flow (square root extraction available)X<sub>2</sub> : pressure

/3: Addition/subtraction

$$X_0 = K_0 \{K_1 (X_1 + A_1) + K_2 (X_2 + A_2)\} + A_0$$

/4: Multiplication

$$X_0 = K_0 (K_1 X_1 + A_1) (K_2 X_2 + A_2) + A_0$$

/5: Division

$$X_0 = \frac{K_0 (K_1 X_1 + A_1)}{(K_2 X_2 + A_2)} + A_0$$

**RELATED PRODUCTS**

- Programming Unit (model: PU-2x)
- PC configurator software (model: JXCON)

Downloadable at our web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

**GENERAL SPECIFICATIONS****Construction:** Plug-in**Connection:** M3.5 screw terminals**Screw terminal:** Chromated steel (standard) or stainless steel**Housing material:** Flame-resistant resin (black)**Isolation:** Input to output to power (non-isolated between inputs)**Overrange input:** Approx. -25 to +125 %**Overrange output:** Approx. -10 to +120 % at 1 - 5 V**Zero adjustment:** -5 to +5 % (front)**Span adjustment:** 95 to 105 % (front)**Adjustments:** Programming Unit (model: PU-2x); equation

and parameters, square root extraction, zero and span, etc. (Refer to the users manual of JXCON for the adjustments configurable with JXCON.)

**INPUT SPECIFICATIONS**■ **DC Current:** Input resistor incorporated**OUTPUT SPECIFICATIONS**■ **DC Current:** 0 - 20 mA DC**Minimum span:** 1 mA**Offset:** Max. 1.5 times span**Load resistance:** Output drive 15 V max.■ **DC Voltage:** -10 - +20 V DC**Span:** Min. 5 mV, max. 20 V**Offset:** Max. 1.5 times span**Load resistance:** Output drive 1 mA max.; at ≥ 0.5 V**INSTALLATION****Power input**

- **AC:** Operational voltage range: rating ±10 %, 50/60 ±2 Hz, approx. 3 VA

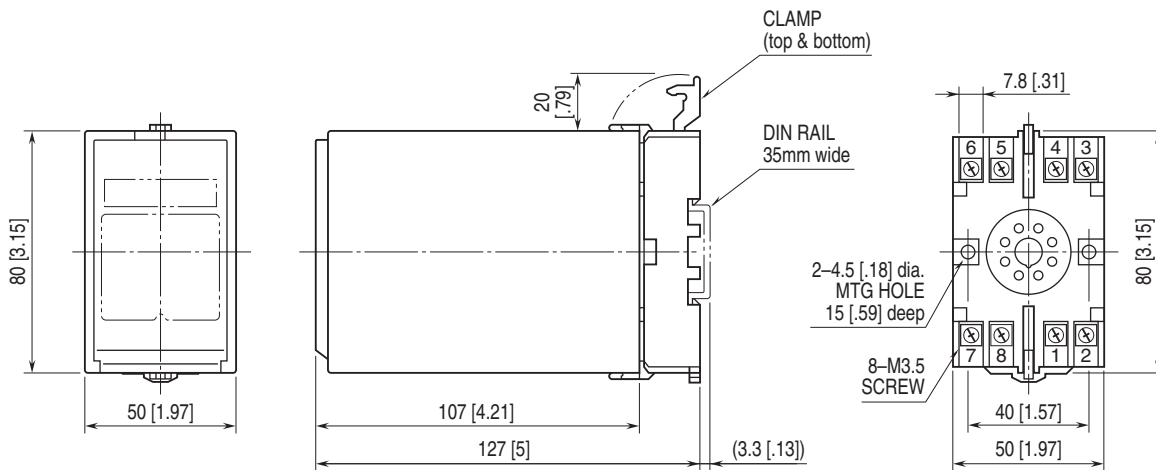
- **DC:** Operational voltage range: rating ±10 %, ripple 10 %p-p max., approx. 2 W (90 mA at 24 V)

**Operating temperature:** -5 to +55°C (23 to 131°F)**Operating humidity:** 30 to 90 %RH (non-condensing)**Mounting:** Surface or DIN rail**Weight:** 350 g (0.77 lb)**PERFORMANCE in percentage of span****Accuracy:** Input accuracy + output accuracy**Input accuracy:** ±0.2 % (gain ≤ 1)

[±0.2 % × gain] with gain &gt; 1

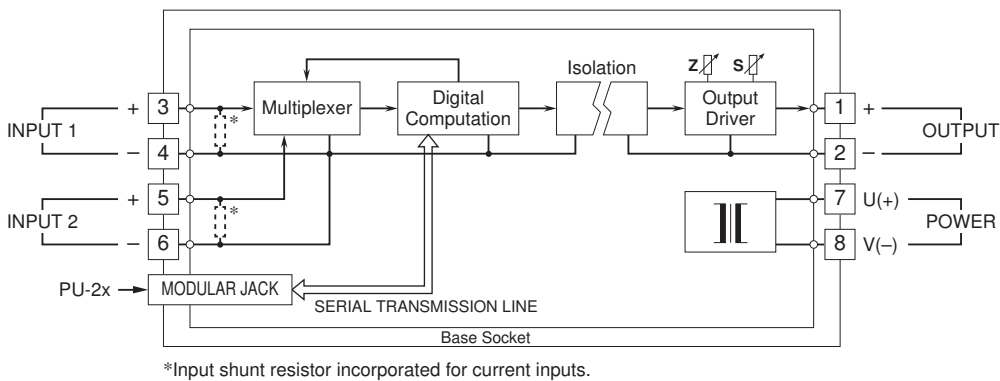
**Output accuracy:** ±0.2 %**Temp. coefficient:** ±0.015 %/°C (±0.008 %/°F)**Response time:** ≤ 1.2 sec. (0 - 90 %)**Line voltage effect:** ±0.1 % over voltage range**Insulation resistance:** ≥ 100 MΩ with 500 V DC**Dielectric strength:** 2000 V AC @1 minute (input to output to power to ground)

**EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]**



• When mounting, no extra space is needed between units.

**SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM**



Specifications are subject to change without notice.