

Space-saving Plug-in Signal Conditioners F-UNIT

RATIO TRANSMITTER

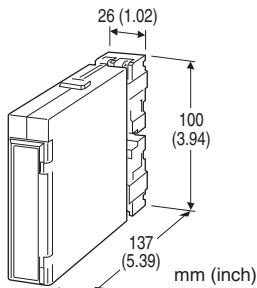
(output bias; thumbwheel switch adjustments)

Functions & Features

- Providing precise matching of DC control signals to final control elements in open- or closed-loop systems
- Easy thumbwheel switch adjustments
- Ratio adjustable from 0.1 to 3.99
- Bias adjustable within $\pm 99\%$
- High-density mounting

Typical Applications

- Ratio control for air/fuel flows or for two flows
- Gain calculation for manipulated variable from a controller
- Large scale signal span adjustment



MODEL: FRTD-[1]-[2][3]-[4][5]

ORDERING INFORMATION

- Code number: FRTD-[1]-[2][3]-[4][5]
- Specify a code from below for each of [1] through [5]. (e.g. FRTD-S-AA-L/Q)
- Special input and output ranges (For codes Z & 0)
- Specify the specification for option code /Q (e.g. /C01/S01)

[1] OUTPUT CHARACTERISTICS

- S: Positive
- R: Negative

[2] INPUT

Current

- A: 4 - 20 mA DC (Input resistance 250 Ω)
- A1: 4 - 20 mA DC (Input resistance 50 Ω)
- B: 2 - 10 mA DC (Input resistance 500 Ω)
- C: 1 - 5 mA DC (Input resistance 1000 Ω)
- D: 0 - 20 mA DC (Input resistance 50 Ω)
- E: 0 - 16 mA DC (Input resistance 62.5 Ω)
- F: 0 - 10 mA DC (Input resistance 100 Ω)

- G: 0 - 1 mA DC (Input resistance 1000 Ω)
- H: 10 - 50 mA DC (Input resistance 100 Ω)
- J: 0 - 10 μ A DC (Input resistance 1000 Ω)
- K: 0 - 100 μ A DC (Input resistance 1000 Ω)
- GW: -1 - +1 mA DC (Input resistance 1000 Ω)
- FW: -10 - +10 mA DC (Input resistance 100 Ω)
- Z: Specify current (See INPUT SPECIFICATIONS)

Voltage

- 1: 0 - 10 mV DC (Input resistance 10 k Ω min.)
- 15: 0 - 50 mV DC (Input resistance 10 k Ω min.)
- 16: 0 - 60 mV DC (Input resistance 10 k Ω min.)
- 2: 0 - 100 mV DC (Input resistance 100 k Ω min.)
- 3: 0 - 1 V DC (Input resistance 1 M Ω min.)
- 4: 0 - 10 V DC (Input resistance 1 M Ω min.)
- 5: 0 - 5 V DC (Input resistance 1 M Ω min.)
- 6: 1 - 5 V DC (Input resistance 1 M Ω min.)
- 4W: -10 - +10 V DC (Input resistance 1 M Ω min.)
- 5W: -5 - +5 V DC (Input resistance 1 M Ω min.)
- 0: Specify voltage (See INPUT SPECIFICATIONS)

[3] OUTPUT

Current

- A: 4 - 20 mA DC (Load resistance 750 Ω max.)
- B: 2 - 10 mA DC (Load resistance 1500 Ω max.)
- C: 1 - 5 mA DC (Load resistance 3000 Ω max.)
- D: 0 - 20 mA DC (Load resistance 750 Ω max.)
- E: 0 - 16 mA DC (Load resistance 900 Ω max.)
- F: 0 - 10 mA DC (Load resistance 1500 Ω max.)
- G: 0 - 1 mA DC (Load resistance 15 k Ω max.)
- Z: Specify current (See OUTPUT SPECIFICATIONS)

Voltage

- 1: 0 - 10 mV DC (Load resistance 10 k Ω min.)
- 2: 0 - 100 mV DC (Load resistance 100 k Ω min.)
- 3: 0 - 1 V DC (Load resistance 1000 Ω min.)
- 4: 0 - 10 V DC (Load resistance 10 k Ω min.)
- 5: 0 - 5 V DC (Load resistance 5000 Ω min.)
- 6: 1 - 5 V DC (Load resistance 5000 Ω min.)
- 4W: -10 - +10 V DC (Load resistance 10 k Ω min.)
- 5W: -5 - +5 V DC (Load resistance 5000 Ω min.)
- 0: Specify voltage (See OUTPUT SPECIFICATIONS)

[4] POWER INPUT

AC Power

- K: 85 - 132 V AC (Operational voltage range 85 - 132 V, 47 - 66 Hz)
- L: 170 - 264 V AC (Operational voltage range 170 - 264 V, 47 - 66 Hz)

DC Power

- R: 24 V DC (Operational voltage range 24 V $\pm 10\%$, ripple 10 %p-p max.)
- P: 110 V DC

(Operational voltage range 85 - 150 V, ripple 10 %p-p max.)

[5] OPTIONS

blank: none

/Q: With options (specify the specification)

SPECIFICATIONS OF OPTION: Q (multiple selections)

COATING (For the detail, refer to M-System's web site.)

/CO1: Silicone coating

/CO2: Polyurethane coating

/CO3: Rubber coating

TERMINAL SCREW MATERIAL

/SO1: Stainless steel

GENERAL SPECIFICATIONS

Construction: Plug-in

Connection: M3.5 screw terminals (torque 0.8 N·m)

Screw terminal: Nickel-plated steel (standard) or stainless steel

Housing material: Flame-resistant resin (black)

Isolation: Input to output to power

Overrange output: Approx. -10 to +120 % at 1 - 5 V

Zero adjustment: -5 to +5 % (front)

Span adjustment: 95 to 105 % (front)

Equation: $X_o = KX_i + B$ for positive ratio;

$X_o = F - KX_i + B$ for negative ratio

where X_o : output (%)

X_i : input (%)

K : ratio

(0.1 - 3.99 conformance range)

B : bias (-99 - +99 %)

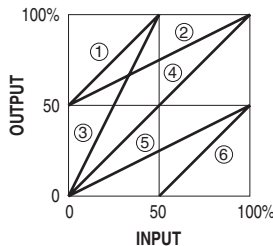
F : 100 %

(factory setting: $K = 1$, $B = 0$ %)

Ratio/bias adjustment: 3-digit thumbwheel switches

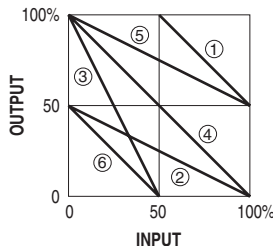
[Examples of Positive Gain]

- ① $K = 1$ $B = 50\%$
- ② $K = 0.5$ $B = 50\%$
- ③ $K = 2$ $B = 0$
- ④ $K = 1$ $B = 0$
- ⑤ $K = 0.5$ $B = 0$
- ⑥ $K = 1$ $B = -50\%$



[Examples of Negative Gain]

- ① $K = 1$ $B = 50\%$
- ② $K = 0.5$ $B = -50\%$
- ③ $K = 2$ $B = 0$
- ④ $K = 1$ $B = 0$
- ⑤ $K = 0.5$ $B = 0$
- ⑥ $K = 1$ $B = -50\%$



INPUT SPECIFICATIONS

■ **DC Current:**

Shunt resistor attached to the input terminals (0.5 W)

Specify input resistance value for code Z.

■ **DC Voltage:** -300 - +300 V DC

Minimum span: 3 mV

Offset: Max. 1.5 times span

Input resistance

Span 3 - 10 mV : ≥ 10 k Ω

Span 10 - 100 mV : ≥ 10 k Ω

Span 0.1 - 1 V : ≥ 100 k Ω

Span ≥ 1 V : ≥ 1 M Ω

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 - +12 V DC

Minimum span: 5 mV

Offset: Max. 1.5 times span

Load resistance: Output drive 1 mA max. at ≥ 0.5 V

INSTALLATION

Power input

• **AC:** Approx. 4.5 VA

• **DC:** 24 V approx. 70 mA

110 V approx. 20 mA

Operating temperature: -5 to +55°C (23 to 131°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Mounting: Surface or DIN rail; Standard Rack Mounting

Frame BX-16H available

Weight: 200 g (0.44 lb)

PERFORMANCE in percentage of span

Ratio setting accuracy: ± 0.2 %

(at 0.1 - 3.99 conformance range)

Bias setting accuracy: ± 1 %

Accuracy: ± 0.3 % (with ratio = 1, bias = 0 %)

Temp. coefficient: ± 0.015 %/°C (± 0.008 %/°F)

Response time: ≤ 0.5 sec. (0 - 90 %)

Line voltage effect: ± 0.1 % over voltage range

Insulation resistance: ≥ 100 M Ω with 500 V DC

Dielectric strength

Power input code R:

1000 V AC @ 1 minute (input to output)

2000 V AC @ 1 minute (input or output or power to ground)

500 V AC @ 1 minute (I/O to power)

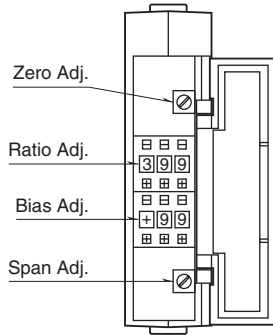
Power input code K, L, P:

1000 V AC @ 1 minute (input to output)

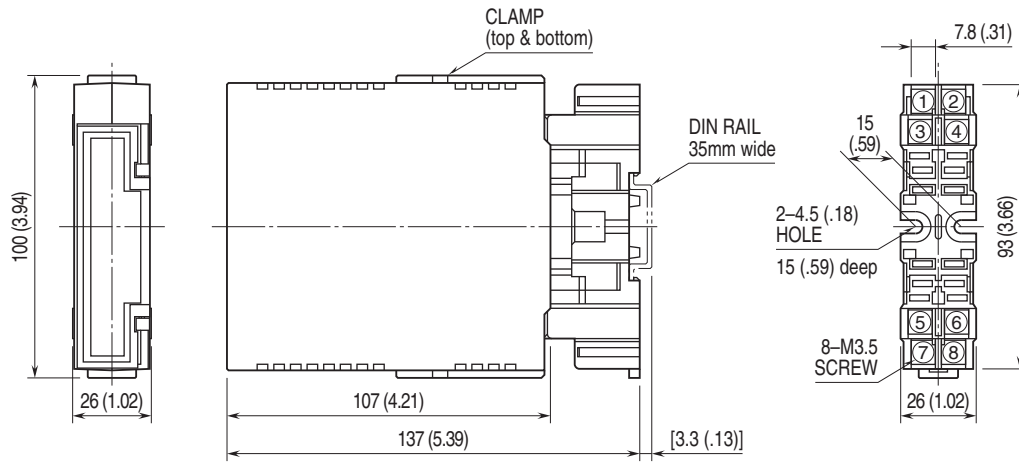
2000 V AC @ 1 minute (input or output or power to ground)

1500 V AC @ 1 minute (I/O to power)

EXTERNAL VIEW

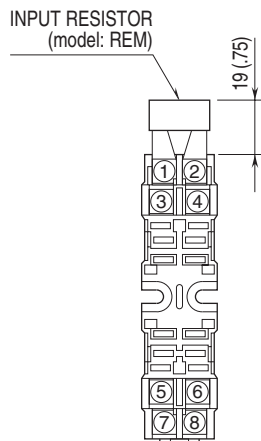


EXTERNAL DIMENSIONS unit: mm (inch)



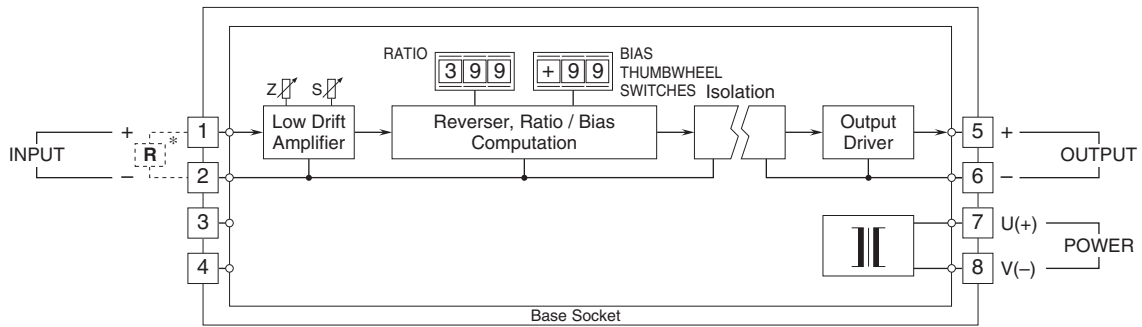
•When mounting, no extra space is needed between units.

TERMINAL ASSIGNMENTS unit: mm (inch)



Input shunt resistor attached for current input.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



*Input shunt resistor attached for current input.



Specifications are subject to change without notice.