Space-saving Plug-in Signal Conditioners F-UNIT

RATIO TRANSMITTER

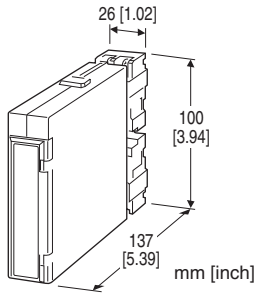
(output bias; thumbwheel switch adjustments)

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 ±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 μA DC (Input resistance 1000 Ω)
K: 0 – 100 μA 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 kΩ min.)
15: 0 – 50 mV DC (Input resistance 10 kΩ min.)
16: 0 – 60 mV DC (Input resistance 10 kΩ min.)
2: 0 – 100 mV DC (Input resistance 100 kΩ min.)
3: 0 – 1 V DC (Input resistance 1 MΩ min.)
4: 0 – 10 V DC (Input resistance 1 MΩ min.)
5: 0 – 5 V DC (Input resistance 1 MΩ min.)
6: 1 – 5 V DC (Input resistance 1 MΩ min.)
4W: -10 – +10 V DC (Input resistance 1 MΩ min.)
5W: -5 – +5 V DC (Input resistance 1 MΩ 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 kΩ max.)
Z: Specify current (See OUTPUT SPECIFICATIONS)
Voltage
1: 0 – 10 mV DC (Load resistance 10 kΩ min.)
2: 0 – 100 mV DC (Load resistance 100 kΩ min.)
3: 0 – 1 V DC (Load resistance 1000 Ω min.)
4: 0 – 10 V DC (Load resistance 10 kΩ 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 kΩ 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 ±10 %, ripple 10 %p-p max.)
P: 110 V DC

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(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)

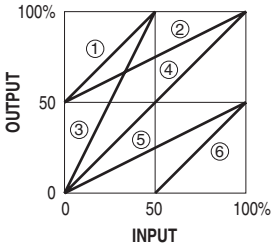
COATING (For the detail, refer to our web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating
TERMINAL SCREW MATERIAL
/S01: Stainless steel

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;
$X_o = F - K X_i + B$ 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

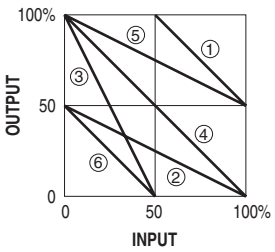
[Examples of Positive Gain]

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 kΩ
Span 10 – 100 mV : ≥ 10 kΩ
Span 0.1 – 1 V : ≥ 100 kΩ
Span ≥ 1 V : ≥ 1 MΩ

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 MΩ 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)

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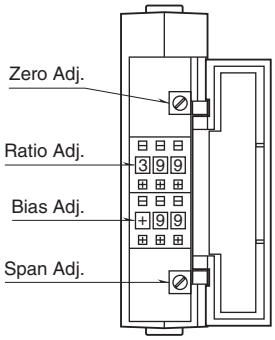
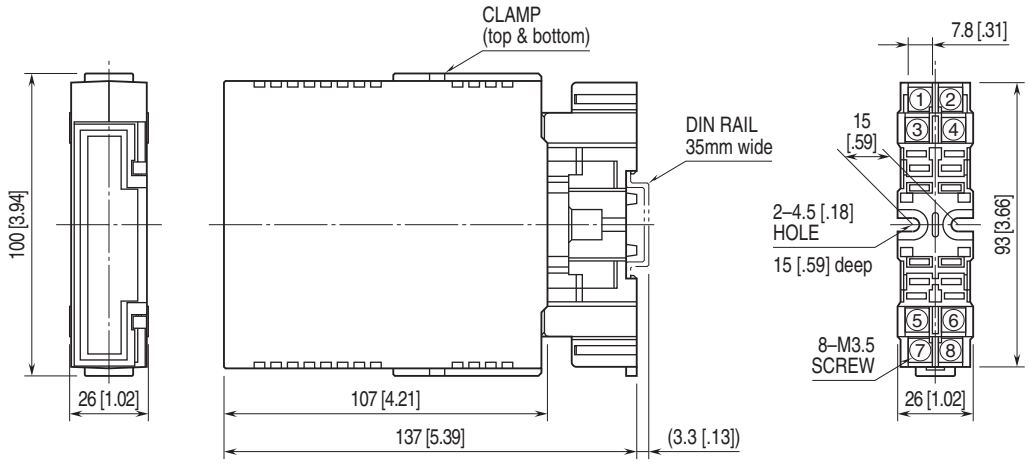
1500 V AC @ 1 minute (I/O to power)

EXTERNAL VIEW

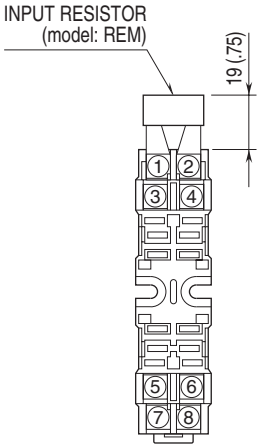


EXTERNAL DIMENSIONS unit: mm [inch]



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

TERMINAL ASSIGNMENTS unit: mm [inch]



Input shunt resistor attached
for current input.

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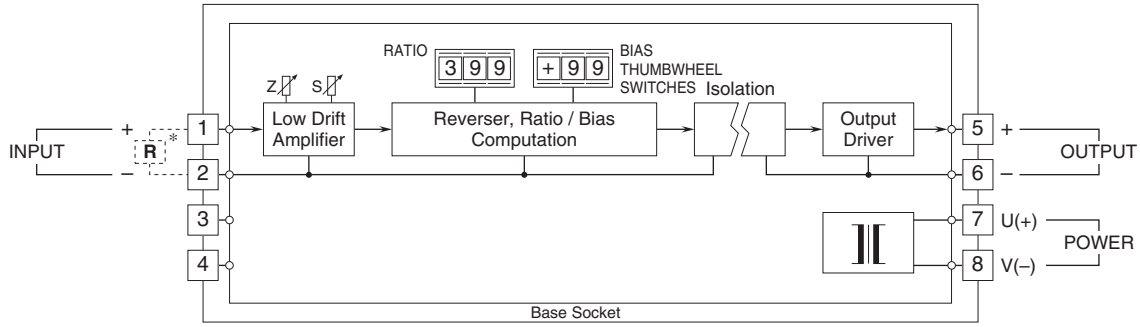
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



*Input shunt resistor attached for current input.

⚠ Specifications are subject to change without notice.

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