

## Super-mini Signal Conditioners Mini-M Series

### RATIO/BIAS TRANSMITTER

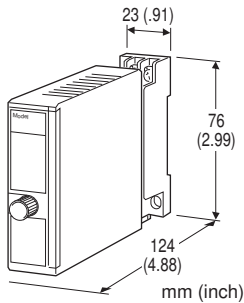
(output bias)

#### Functions & Features

- Provides precise matching of DC control signals to final control elements in open- or closed-loop systems
- Easy ratio/bias setting with the front digital display
- Ratio adjustable from 0.1 to 4.00 or from -0.1 to -4.00; Bias adjustable to  $\pm 100\%$

#### 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: M2REB-[1]-[2][3]-[4][5]

#### ORDERING INFORMATION

- Code number: M2REB-[1]-[2][3]-[4][5]
- Specify a code from below for each [1] through [5]. (e.g. M2REB-S-6A-M2/CE/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: Proportional; ratio 0.1 to 4.00

R: Inverted; ratio -0.1 to -4.00

#### [2] INPUT

##### Current

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

- G: 0 - 1 mA DC (Input resistance 1000  $\Omega$ )
- H: 10 - 50 mA DC (Input resistance 100  $\Omega$ )
- K: 0 - 100  $\mu$ A DC (Input resistance 1000  $\Omega$ )
- GW: -1 - +1 mA DC (Input resistance 1000  $\Omega$ )
- FW: -10 - +10 mA DC (Input resistance 100  $\Omega$ )
- Z: Specify current (See INPUT SPECIFICATIONS)

##### Voltage

- 2: 0 - 100 mV DC (Input resistance 100 k $\Omega$  min.)
- 3: 0 - 1 V DC (Input resistance 1 M $\Omega$  min.)
- 4: 0 - 10 V DC (Input resistance 1 M $\Omega$  min.)
- 5: 0 - 5 V DC (Input resistance 1 M $\Omega$  min.)
- 6: 1 - 5 V DC (Input resistance 1 M $\Omega$  min.)
- 4W: -10 - +10 V DC (Input resistance 1 M $\Omega$  min.)
- 5W: -5 - +5 V DC (Input resistance 1 M $\Omega$  min.)
- 0: Specify voltage (See INPUT SPECIFICATIONS)

#### [3] 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)

#### [4] POWER INPUT

##### AC Power

- M2: 100 - 240 V AC (Operational voltage range 85 - 264 V, 47 - 66 Hz)
- (90 - 264 V for UL)

##### DC Power

- R: 24 V DC (Operational voltage range 24 V  $\pm 10\%$ , ripple 10 %p-p max.)
- R2: 11 - 27 V DC (Operational voltage range 11 - 27 V, ripple 10 %p-p max.) (Select '/N' for 'Standards & Approvals' code.)
- P: 110 V DC (Operational voltage range 85 - 150 V, ripple 10 %p-p max.) (110 V  $\pm 10\%$  for UL)

**[5] OPTIONS (multiple selections)****Standards & Approvals (must be specified)**

/N: Without CE or UL

/CE: CE marking

/UL: UL approval, CE marking

**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 M-System's web site.)**

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating (UL not available)

**TERMINAL SCREW MATERIAL**

/S01: Stainless steel (UL not available)

**GENERAL SPECIFICATIONS****Construction:** Plug-in**Connection:** M3 screw terminals (torque 0.8 N·m)**Screw terminal:** Chromated 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**Ratio adjustment****Proportional:** 0.10 to 4.00; 0.01 increments**Inverted:** -0.10 to -4.00; 0.01 increments**Bias adjustment:** -100 to +100 %; 1 % increments**Ratio/bias selector:** Double-throw SW (front)**UP/DOWN control:** Double-throw, momentary SW (front)**Equation:**  $X_o = KX_i + B$  (proportional) $X_o = KX_i + B + 100\%$  (inverted)

where

 $X_o$ : Output (%) $K$ : Ratio

Linear characteristics

0.1 to 4.00 (proportional)

-0.1 to -4.00 (inverted)

 $X_i$ : Input (approx. -10 to +120 %) $B$ : Bias (-100 to +100 %)**INDICATORS****Ratio/bias digital display:** Red LED; 6.4 mm (.25") 7 segment, 3 digits**Polarity indicator:** Dual color (red/green) LED; Red with a positive set value; Green with a negative set value.**Power saving mode:** Indicators turn off if the switches are untouched for 1 minute.**INPUT SPECIFICATIONS****DC Current:**

Shunt resistor attached to the input terminals (0.5 W)

Specify input resistance value for code Z.

**DC Voltage:** -30 - +30 V DC**Minimum span:** 100 mV**Offset:** Max. 1.5 times span**Input resistance**Span 0.1 - 1 V :  $\geq 100 \text{ k}\Omega$ Span  $\geq 1 \text{ V}$  :  $\geq 1 \text{ M}\Omega$ **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  $\geq 0.5 \text{ V}$ **INSTALLATION****Power Consumption****AC:**

Approx. 3 VA at 100 V

Approx. 4 VA at 200 V

Approx. 5 VA at 264 V

**DC:** Approx. 3 W**Operating temperature:** -5 to +55°C (23 to 131°F)**Operating humidity:** 30 to 90 %RH (non-condensing)**Mounting:** Surface or DIN rail**Weight:** 150 g (0.33 lb)**PERFORMANCE in percentage of span****Accuracy:**  $\pm 0.2 \%$ 

Ratio = 1, Bias = 0 % (proportional)

Ratio = -1, Bias = 0 % (inverted)

**Temp. coefficient:**  $\pm 0.015 \text{ \%}/^\circ\text{C}$  ( $\pm 0.008 \text{ \%}/^\circ\text{F}$ )**Response time:**  $\leq 0.5 \text{ sec.}$  (0 - 90 %)**Line voltage effect:**  $\pm 0.1 \%$  over voltage range**Insulation resistance:**  $\geq 100 \text{ M}\Omega$  with 500 V DC**Dielectric strength:** 2000 V AC @1 minute (input to output to power to ground)

## STANDARDS & APPROVALS

### EU conformity:

EMC Directive

EMI EN 61000-6-4

EMS EN 61000-6-2

Low Voltage Directive

EN 61010-1

Installation Category II

Pollution Degree 2

Input or output to power: Reinforced insulation (300 V)

Input to output: Basic insulation (300 V)

RoHS Directive

EN 50581

### Approval:

UL/C-UL nonincendive Class I, Division 2,

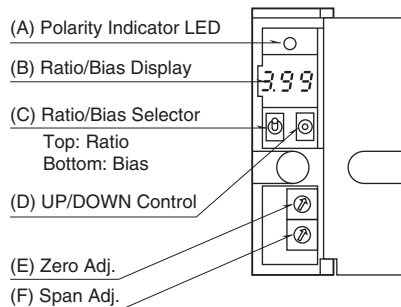
Groups A, B, C, and D

(ANSI/ISA-12.12.01, CAN/CSA-C22.2 No.213)

UL/C-UL general safety requirements

(UL 61010-1, CAN/CSA-C22.2 No.61010-1)

## FRONT VIEW



The front cover cannot be turned open by 180 deg. when there is no extra space between units.

### • How to Set the Ratio

Turn the Ratio/Bias Selector (C) to the top.

The Ratio/Bias Display (B) shows the current ratio (0.10 - 4.00). Press UP/DOWN Control (D) until the display shows a desired set value.

The Polarity Indicator LED (A) is red when the set value is in positive range, green when in negative range.

### • How to Set the Bias

Turn the Ratio/Bias Selector (C) to the bottom.

The Ratio/Bias Display (B) shows the current bias (0 - 100%). Press UP/DOWN Control (D) until the display shows a desired set value.

The Polarity Indicator LED (A) is red when the set value is in positive range, green when in negative range.

### • Fine Calibration

Equation:

$$X_o = KX_i + B \text{ (proportional)}$$

$$X_o = KX_i + B + 100 \% \text{ (inverted)}$$

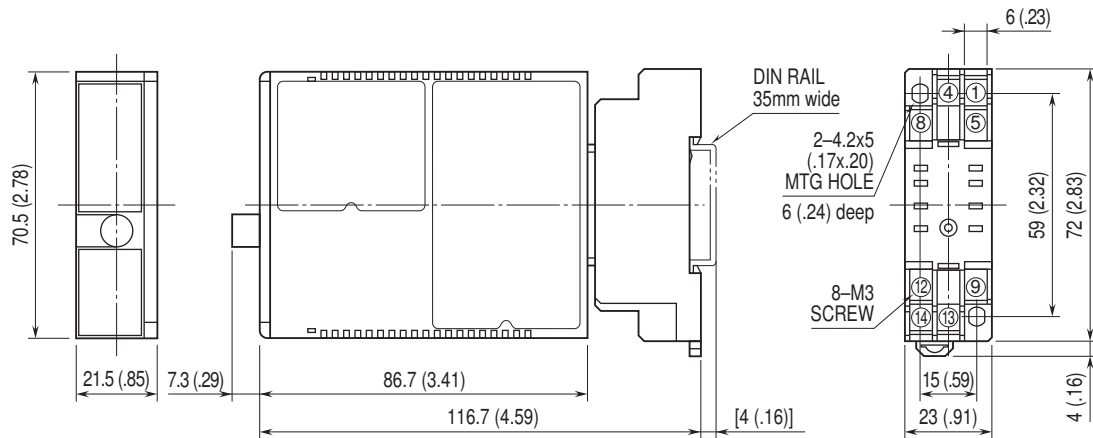
- 1) Calculate the input signal  $X_i$  which results in 0 % output. Apply the calculated input and adjust with Zero Adj. (E) the output  $X_o$  to 0 %.
- 2) Calculate the input signal  $X_i$  which results in 100 % output. Apply the calculated input and adjust with Span Adj. (E) the output  $X_o$  to 100 %.
- 3) Apply the calculated zero point input again and check the output  $X_o$ .
- 4) If the output has been shifted, go through (1) through (3) again.

The unit is factory set and calibrated to the following ratio and bias values.

**Proportional characteristics:** ratio ( $K$ ) = 1, Bias ( $B$ ) = 0%

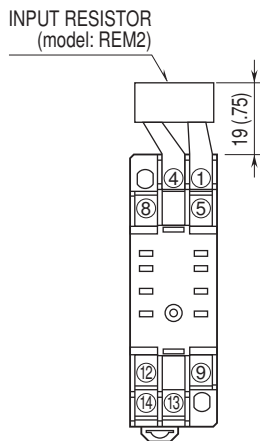
**Inverted characteristics:** ratio ( $K$ ) = -1, Bias ( $B$ ) = 0%

## EXTERNAL DIMENSIONS unit: mm (inch)



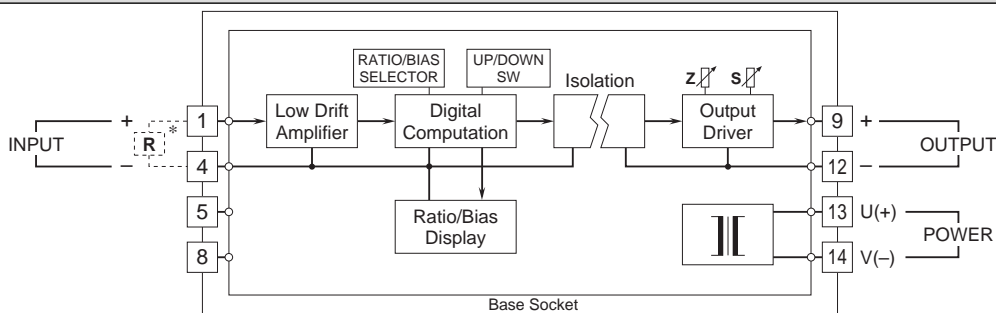
• When mounting, no extra space is needed between units.

## 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.