

## Super-mini Signal Conditioners Mini-M Series

### RATIO/BIAS TRANSMITTER

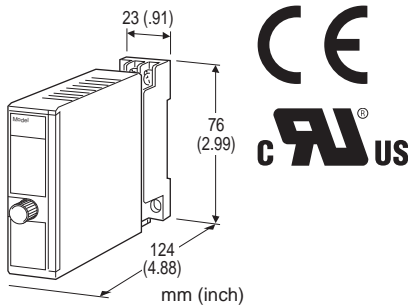
(output bias)

#### 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  $\pm 100\%$
- CE marking
- UL approval

#### 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)

(UL not available)

### 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

#### TERMINAL SCREW MATERIAL

/S01: Stainless steel

## GENERAL SPECIFICATIONS

**Construction:** Plug-in

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

**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 k $\Omega$

Span  $\geq$  1 V :  $\geq$  1 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 V

## INSTALLATION

### Power Consumption

#### • AC Power input:

Approx. 3 VA at 100 V

Approx. 4 VA at 200 V

Approx. 5 VA at 264 V

#### • DC Power input: 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 lbs)

## PERFORMANCE in percentage of span

### Accuracy: $\pm$ 0.2 %

Ratio = 1, Bias = 0 % (proportional)

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

**Temp. coefficient:**  $\pm$ 0.015 %/°C ( $\pm$ 0.008 %/°F)

**Response time:**  $\leq$  0.5 sec. (0 – 90 %)

**Line voltage effect:**  $\pm$ 0.1 % over voltage range

**Insulation resistance:**  $\geq$  100 M $\Omega$  with 500 V DC

**Dielectric strength:** 2000 V AC @1 minute (input to output to power to ground)

## STANDARDS & APPROVALS

### CE conformity:

EMC Directive (2004/108/EC)

EN 61000-6-4 (EMI)

EN 61000-6-2 (EMS)

Low Voltage Directive (2006/95/EC)

EN 61010-1

Installation Category II

Pollution Degree 2

Max. operating voltage 300 V

Input or output to power: Reinforced insulation

Input to output: Basic insulation

**Approval:**

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

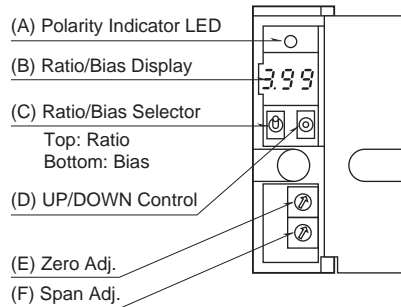
Groups A, B, C, and D hazardous locations

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

UL/C-UL general safety requirements

(UL 61010B-1, CAN/CSA-C22.2 No.1010-1)

**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  $X_o$ .

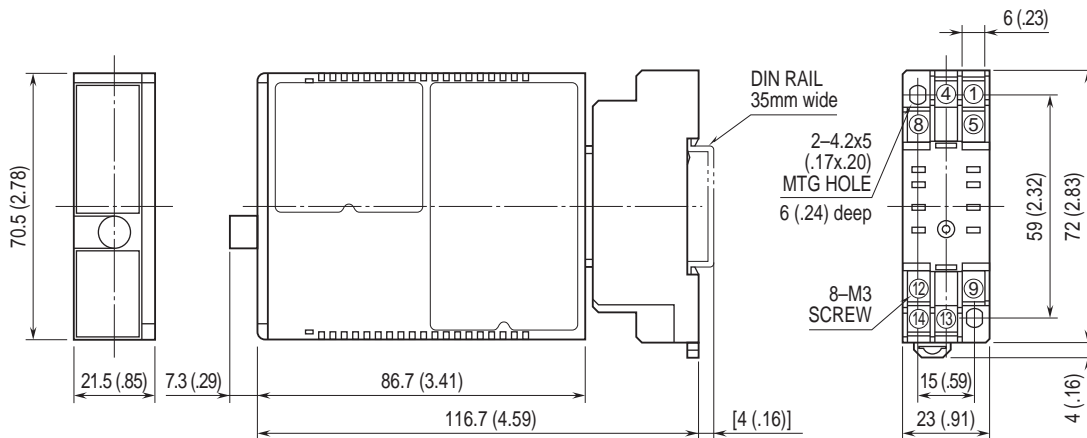
4) If the output has been shifted, go through (1) through (3) again.

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

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

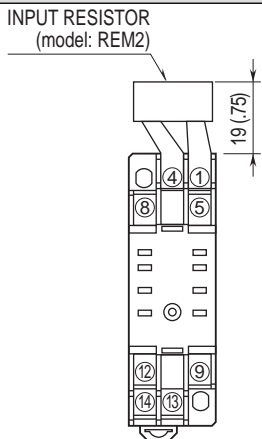
**Inverted characteristics:** ratio ( $K$ ) = -1, Bias ( $B$ ) = 0%

## DIMENSIONS unit: mm (inch)



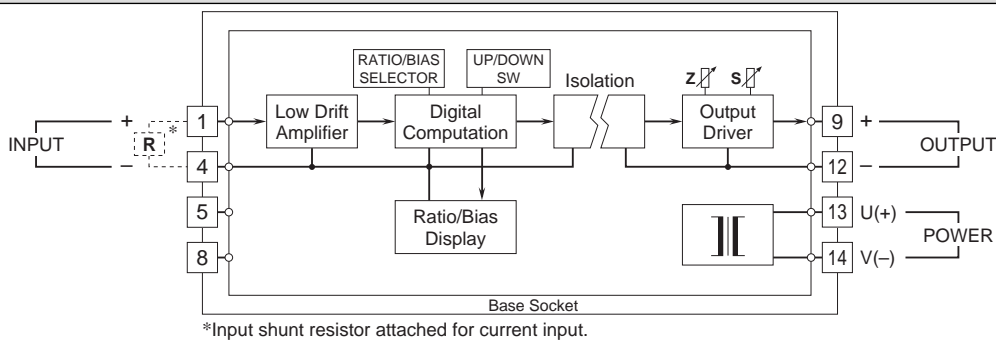
• When mounting, no extra space is needed between units.

## TERMINAL ASSIGNMENTS unit: mm (inch)



Input shunt resistor attached for current input.

## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



Specifications are subject to change without notice.