Plug-in Signal Conditioners M-UNIT

DIGITAL MULTIPLIER

Functions & Features
• Accepting two DC inputs and providing a standard process signal proportional to the multiplication of the two signals
• Isolation up to 2000 V AC
• LCD meter
• High-density mounting

Typical Applications
• DC wattmeter (multiplying voltage and current inpus)
• Remote gain control (potentiometer signals pre-converted into 1 – 5 V, provided to the MLS inputs)

mm [inch]
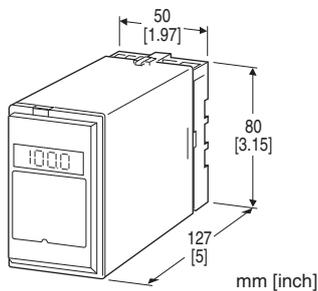
MODEL: MLS–[1][2][3]–[4][5]

ORDERING INFORMATION
• Code number: MLS-[1][2][3]-[4][5]
Specify a code from below for each of [1] through [5].
  (e.g. MLS-6AA-B/E/Q)
• Special input and output ranges (For codes Z & 0)
• Parameters (e.g. K_1 = 0.50, K_2 = 0.90)
• Specify the specification for option code /Q
  (e.g. /C01/S01)

[1] INPUT 1
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)
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.)
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)

[2] INPUT 2
Same range availability as Input 1

[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 100 Ω min.)
4: 0 – 10 V DC (Load resistance 1000 Ω min.)
5: 0 – 5 V DC (Load resistance 500 Ω min.)
6: 1 – 5 V DC (Load resistance 500 Ω min.)
4W: -10 – +10 V DC (Load resistance 2000 Ω min.)
5W: -5 – +5 V DC (Load resistance 1000 Ω min.)
0: Specify voltage (See OUTPUT SPECIFICATIONS)

[4] 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

[5] OPTIONS (multiple selections)

Multiplication Indicator
blank: Without
/E: With (0.0 - 100.0 % display)
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

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 1 or input 2 to output to power
(Negative sides of the input 1 and 2 must be of the same potential.)
Overrange output: 0 to 115 % at 1 – 5 V
Zero adjustment: -5 to +5 % (front)
Span adjustment: 95 to 105 % (front)
Equation: Output = $K_1 \times$ Input 1 $\times K_2 \times$ Input 2
K_1, K_2: 0.10 – 1.15 (parameters)
where $K_1 \times K_2 \geq 0.2$
Input 1, Input 2: 0 – 115 %; forcibly limited to 0 % or 115 % with overrange.
Output: 0 – 115 % with $K_1 \times K_2 \geq 1$;
forcibly limited to 0 % or 115 % with overrange.
0 – [115 $\times K_1 \times K_2$] % with $K_1 \times K_2 < 1$;
forcibly limited to 0 % or [115 $\times K_1 \times K_2$] % with overrange.
K_1, K_2 are ex-factory specified.
[example]

K_1	K_2	INP1	INP2	OUT
1.00	1.15	115 %	100 %	115 %
1.00	1.15	100 %	50 %	57.5 %
1.00	1.15	100 %	-5 %	0 %

■ DISPLAY (Multiplied values indicator)
LCD digital display: 0.0 - 100.0 % (min. digit 0.1 %)
 (No scaling)

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: 10 mV
Offset: Max. 1.5 times span
Input resistance
Span 10 – 100 mV : $\geq$ 10 kΩ
Span 0.1 – 1 V : $\geq$ 100 kΩ
Span $\geq$ 1 V : $\geq$ 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 10 mA max.; 5 mA for negative voltage output; at $\geq$ 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 (80 mA at 24 V)
Operating temperature: -5 to +60°C (23 to 140°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: ±0.2 %
Display accuracy: ± (0.2 % of FS + 1 digit)
Temp. coefficient: ±0.02 %/°C (±0.01 %/°F)
Response time: $\leq$ 0.5 sec. (0 – 90 %)
Line voltage effect: ±0.1 % over voltage range
Insulation resistance: $\geq$ 100 MΩ with 500 V DC
Dielectric strength: 2000 V AC @1 minute (input 1 or input 2 to output to power to ground)

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EXTERNAL DIMENSIONS   unit: mm [inch]

CLAMP
(top & bottom)

DIN RAIL
35mm wide

2–4.5 [.18] dia.
MTG HOLE
15 [.59] deep

8–M3.5
SCREW
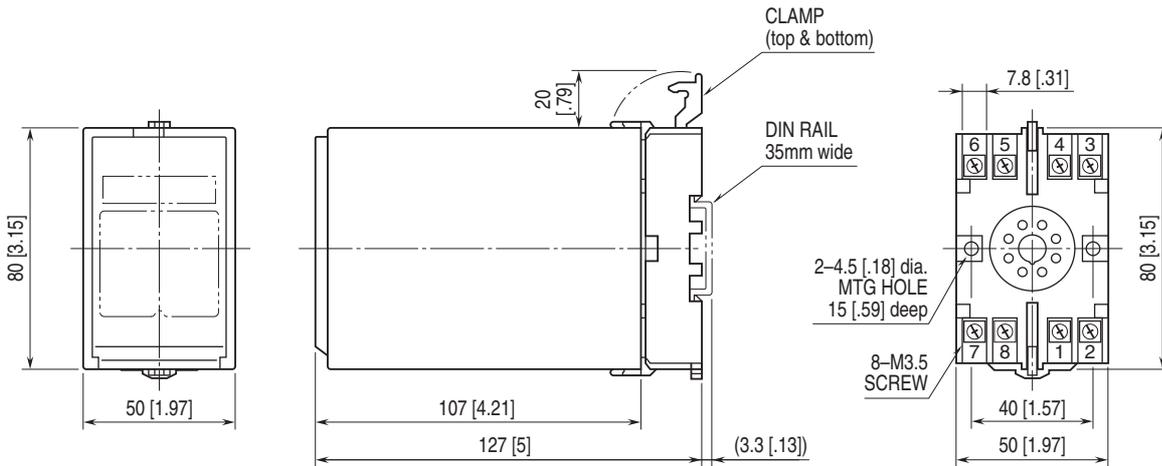
• When mounting, no extra space is needed between units.

TERMINAL ASSIGNMENTS   unit: mm [inch]

INPUT RESISTOR
(model: REM)
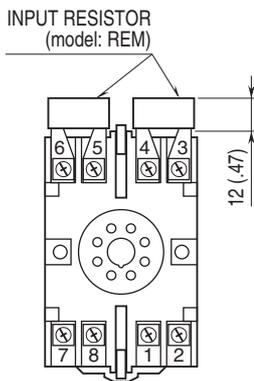
Input shunt resistor attached
for current input.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

INPUT 1

INPUT 2

Input Circuit

Digital Computation

Isolation

Output Driver

OUTPUT

POWER

Base Socket

* Input shunt resistor attached for current inputs.
**Option /E
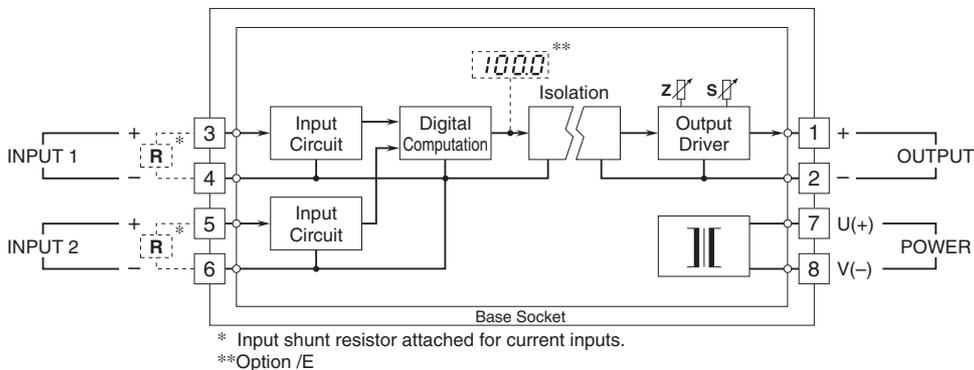
⚠ Specifications are subject to change without notice.