

Space-saving Signal Conditioners M3-UNIT Series

UNIVERSAL TRANSMITTER

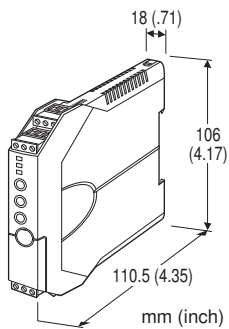
(field- and PC-configurable)

Functions & Features

- Universal input: mV, V, mA, T/C, RTD, resistance and potentiometer
- Easy 'One-Step Cal' calibration using the front three control buttons without needing a PC; PC software is also usable.
- I/O type and ranges are configurable
- Front control button function can be locked
- CE marking
- UL approval

Typical Applications

- Signal conversion between control room and field instrumentation with isolation
- Ideal for use as a fast solution, multifunctional spare part



MODEL: M3LU-[1]/[2][3]

ORDERING INFORMATION

- Code number: M3LU-[1]/[2][3]
- Specify a code from below for each [1] through [3]. (e.g. M3LU-R4/A)
- Orders will be shipped with default factory settings (4 - 20 mA input/4 - 20 mA output).

INPUT - Field-selectable

DC Current & Voltage

Current: 0 - 20 mA DC

Millivolt: -1 - +1 V DC

Voltage: -10 - +10 V DC

Thermocouple

(PR), K, E, J, T, B, R, S, C (WRe 5-26),

N, U, L, P (Platinel II)

RTD

Pt 100, Pt 200, Pt 300, Pt 400, Pt 500, Pt 1000,

Ni 100, Ni 120, Ni 508.4, Ni-Fe 604,

Cu 10 @25°C, Pt 50Ω, JPt 100

Potentiometer

Total resistance 80 - 4000 Ω

Resistance

Total resistance 10 - 4000 Ω

OUTPUT - Field-selectable

Current

0 - 20 mA DC

Voltage

-2.5 - +2.5 V DC

-10 - +10 V DC

[1] POWER INPUT

AC Power

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

('UL' is not selectable for 'Standards & Approvals' code.)

DC Power

R4: 10 - 32 V DC

(Operational voltage range 9 - 36 V, ripple 10 %p-p max.)

[2] CONFIGURATION OPTIONS

A: PC and field configurable

B: Field configurable

[3] OPTIONS

STANDARDS & APPROVALS

blank: CE marking

/UL: UL approval, CE marking

RELATED PRODUCTS

- PC configurator software (model: M3CFG)

Downloadable at M-System's web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

GENERAL SPECIFICATIONS

Construction: Small-sized front terminal structure

Connection: Euro type connector terminal

Housing material: Flame-resistant resin (gray)

Isolation: Input to output to power

Overrange output: -15 to +115 %

Zero adjustment: -15 to +15 % (front)

Span adjustment: 85 to 115 % (front)

Burnout (T/C & RTD): Upscale, downscale or no burnout selectable; Also detects wire breakdown and overrange input exceeding the electrical design limit for DC input.

Cold junction compensation (T/C): CJC sensor (included) to be attached to the input terminals

Status indicator LED: Tri-color (green/amber/red) LED; Flashing patterns indicate operation status of the transmitter.

Configuration: PC configurator

Programmable features include:

- I/O type and range
- Zero and span adjustments
- Burnout action
- User's linearization table setting
- User's TC/RTD table setting

(Refer to the instruction manual)

'One-Step Cal' calibration: With I/O type and the full-scale range configured via the internal DIP switches, precise 0 % and 100 % ranges are calibrated via the front control buttons with a help of LED.

INPUT SPECIFICATIONS

Input type and range are configurable. See Table 1 for the available input type, the minimum span, the maximum range, the conformance range and the input conversion accuracy.

For type and range configuration, refer to the instruction manual.

- **DC current:** 50 Ω resistor incorporated
- **DC mV & voltage**

Input resistance: ≥ 1 M Ω

- **Thermocouple**

Input resistance: ≥ 1 M Ω

Burnout sensing: 130 nA \pm 10 %

- **RTD (2-wire, 3-wire or 4-wire)**

Excitation: 0.2 mA \pm 10 %

Allowable leadwire resistance: Max. 20 Ω per wire

- **Resistance (2-wire, 3-wire or 4-wire)**

Excitation: 0.2 mA \pm 10 %

Allowable leadwire resistance: Max. 20 Ω per wire

- **Potentiometer**

Excitation: 0.2 mA \pm 10 %

Allowable leadwire resistance: Max. 20 Ω per wire

OUTPUT SPECIFICATIONS

Output type and range are as follows.

For type and range configuration, refer to the instruction manual.

■ DC CURRENT

Maximum range: 0 - 20 mA DC

Minimum span: 1 mA

Conformance range: 0 - 24 mA DC

(Negative overrange current below 0 mA is not available.)

Offset: Lower range can be any specific value within the

output range provided that the minimum span is maintained.

Load resistance: Output drive 15 V maximum at 22 mA

■ DC VOLTAGE

Narrow Spans (mV)

Maximum range: -2.5 - +2.5 V DC

Minimum span: 250 mV

Conformance range: -3 - +3 V DC

Wide Spans (V)

Maximum range: -10 - +10 V DC

Minimum span: 1 V

Conformance range: -11.5 - +11.5 V DC

Offset: Lower range can be any specific value within the output range provided that the minimum span is maintained.

Load resistance: Output drive 10 mA maximum; 5 mA for negative output

INSTALLATION

Power Consumption

• AC Power input:

Approx. 4 VA at 100 V

Approx. 5 VA at 200 V

Approx. 6 VA at 264 V

• DC power input:

Approx. 2 W

Operating temperature: -25 to +65°C (-13 to +149°F)

Max. 55°C (131°F) for UL approval

Operating humidity: 0 to 95 %RH (non-condensing)

Mounting: DIN rail

Weight: 100 g (3.53 oz)

PERFORMANCE

Accuracy: See Table 1.

Cold junction compensation error:

$\pm 0.5^\circ\text{C}$ maximum at 10 - 40°C

$\pm 1.0^\circ\text{C}$ maximum at 0 - 50°C

$\pm 0.9^\circ\text{F}$ maximum at 50 - 104°F

$\pm 1.8^\circ\text{F}$ maximum at 32 - 122°F

Temp. coefficient:

± 0.015 %/°C [± 0.008 %/°F] at -5 to +55°C [23 to 131°F] of max. range

± 0.03 %/°C [± 0.016 %/°F] for the following conditions:

- DC/TC input spans ≤ 10 mV
- RTD/POT, resistance spans ≤ 80 Ω
- in an ambient exceeding 55°C [131°F] or below -5°C [23°F]

Response time: ≤ 0.2 sec. (0 - 90 %, DC input)

With the Option A, the Sync Filter set to the fastest frequency on the PC Configurator Software. Default is set to have 0.5 sec. response.

Burnout response: ≤ 10 sec.

Line voltage effect: ± 0.1 % over voltage range

Insulation resistance: ≥ 100 M Ω with 500 V DC

Dielectric strength

AC powered: 2000 V AC @ 1 minute

(input to output to power to ground)

DC powered: 1500 V AC @ 1 minute

(input to output or power to ground)

500 V AC @ 1 minute (output to power)

Low Voltage Directive (2006/95/EC)

EN 61010-1: 2001

Installation Category II

Pollution Degree 2

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

Input to output: Basic insulation (300 V)

Approval:

UL/C-UL general safety requirements

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

CALCULATION EXAMPLES OF OVERALL ACCURACY

■ CALCULATION EXAMPLES OF OVERALL ACCURACY IN %

• DC Voltage

1) 0 - 200 mV

Absolute value accuracy (Table 1): 40 μ V

$40\mu\text{V} / 200000\mu\text{V} \times 100 = 0.02\% < 0.1\%$

➤ Overall accuracy = ± 0.1 % of span

2) 0 - 4 mV

Absolute value accuracy (Table 1): 10 μ V

$10\mu\text{V} / 4000\mu\text{V} \times 100 = 0.25\% > 0.1\%$

➤ Overall accuracy = ± 0.25 % of span

• Thermocouple

1) K thermocouple, 0 - 1000°C

Absolute value accuracy (Table 1): 0.25°C

CJC error (0.5°C) added: 0.75°C

$0.75^\circ\text{C} / 1000^\circ\text{C} \times 100 = 0.075\% < 0.1\%$

➤ Overall accuracy including CJC error = ± 0.1 % of span

2) K thermocouple, 50 - 150°C

Absolute value accuracy (Table 1): 0.25°C

CJC error (0.5°C) added: 0.75°C

$0.75^\circ\text{C} / (150 - 50)^\circ\text{C} \times 100 = 0.75\% > 0.1\%$

➤ Overall accuracy including CJC error = ± 0.75 % of span

• RTD

1) Pt 100, -200 - 800°C

Absolute value accuracy (Table 1): 0.15°C

$0.15^\circ\text{C} / (800 - -200)^\circ\text{C} \times 100 = 0.015\% < 0.1\%$

➤ Overall accuracy = ± 0.1 % of span

2) Pt 100, 0 - 100°C

Absolute value accuracy (Table 1): 0.15°C

$0.15^\circ\text{C} / 100^\circ\text{C} \times 100 = 0.15\% > 0.1\%$

➤ Overall accuracy = ± 0.15 % of span

STANDARDS & APPROVALS

CE conformity:

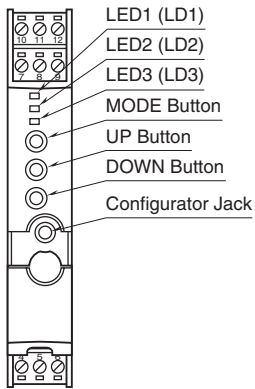
EMC Directive (2004/108/EC)

EMI EN 61000-6-4: 2007

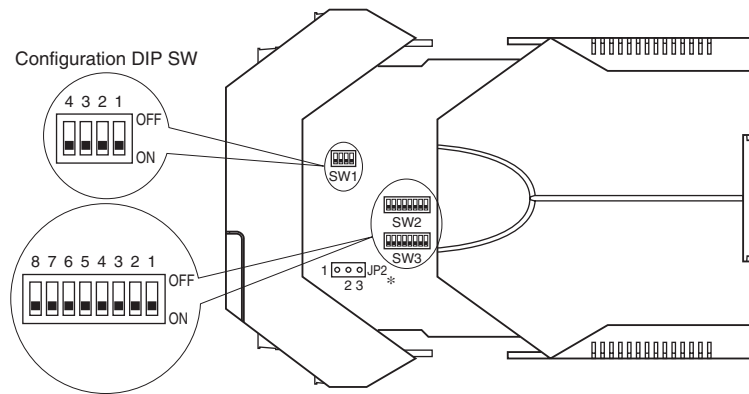
EMS EN 61000-6-2: 2005

EXTERNAL VIEW

FRONT VIEW

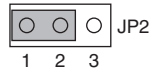


SIDE VIEW

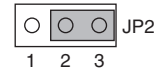


*For Voltage Input (V) range, switch the JP2 jumper to the 2 – 3 position.

Normal Position
 (other than DC Voltage [V] range)



DC Voltage [V] Range Position



INPUT TYPE, RANGE & ACCURACY

Table 1.

INPUT TYPE	MIN. SPAN	MAXIMUM RANGE	ACCURACY *1					
DC Current	1mA	0 to 20mA	±0.1%					
DC Millivolt	4mV	-1 to +1V	±10µV at F.S. input ≤50mV ±40µV at F.S. input ≤200mV ±60µV at F.S. input ≤500mV ±80µV at F.S. input >500mV					
DC Voltage	1V	-10 to +10V	±0.1%					
Potentiometer	80Ω	0 to 4000Ω	±0.1%					
Resistance	10Ω	0 to 4000Ω	±0.1%					
Thermocouple	°C				°F			
	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY *1	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY *1
(PR)	20	0 to 1760	0 to 1760	±1.00	36	32 to 3200	32 to 3200	±1.80
K (CA)	20	-270 to +1370	-150 to +1370	±0.25	36	-454 to +2498	-238 to +2498	±0.45
E (CRC)	20	-270 to +1000	-170 to +1000	±0.20	36	-454 to +1832	-274 to +1832	±0.36
J (IC)	20	-210 to +1200	-180 to +1200	±0.25	36	-346 to +2192	-292 to +2192	±0.45
T (CC)	20	-270 to +400	-170 to +400	±0.25	36	-454 to +752	-274 to +752	±0.45
B (RH)	20	100 to 1820	400 to 1760	±0.75	36	212 to 3308	752 to 3200	±1.35
R	20	-50 to +1760	200 to 1760	±0.50	36	-58 to +3200	392 to 3200	±0.90
S	20	-50 to +1760	0 to 1760	±0.50	36	-58 to +3200	32 to 3200	±0.90
C (WRe 5-26)	20	0 to 2315	0 to 2315	±0.25	36	32 to 4199	32 to 4199	±0.45
N	20	-270 to +1300	-130 to +1300	±0.30	36	-454 to +2372	-202 to +2372	±0.54
U	20	-200 to +600	-200 to +600	±0.20	36	-328 to +1112	-328 to +1112	±0.36
L	20	-200 to +900	-200 to +900	±0.25	36	-328 to +1652	-328 to +1652	±0.45
P (Platinel II)	20	0 to 1395	0 to 1395	±0.25	36	32 to 2543	32 to 2543	±0.45
RTD	°C				°F			
	MIN. SPAN	MAXIMUM RANGE	ACCURACY *1	MIN. SPAN	MAXIMUM RANGE	ACCURACY *1		
Pt 100 (JIS '97, IEC)	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 200	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 300	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 400	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 500	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 1000	20	-200 to +850	±0.15	36	-328 to +1562	±0.27		
Pt 50 (JIS '81)	20	-200 to +649	±0.15	36	-328 to +1200	±0.27		
JPt 100 (JIS '89)	20	-200 to +510	±0.15	36	-328 to +950	±0.27		
Ni 100	20	-80 to +260	±0.15	36	-112 to +500	±0.27		
Ni 120	20	-80 to +260	±0.15	36	-112 to +500	±0.27		
Ni 508.4	20	-50 to +200	±0.15	36	-58 to +392	±0.27		
Ni-Fe 604	20	-200 to +200	±0.15	36	-328 to +392	±0.27		
Cu 10 @25°C	20	-50 to +250	±0.50	36	-58 to +482	±0.90		

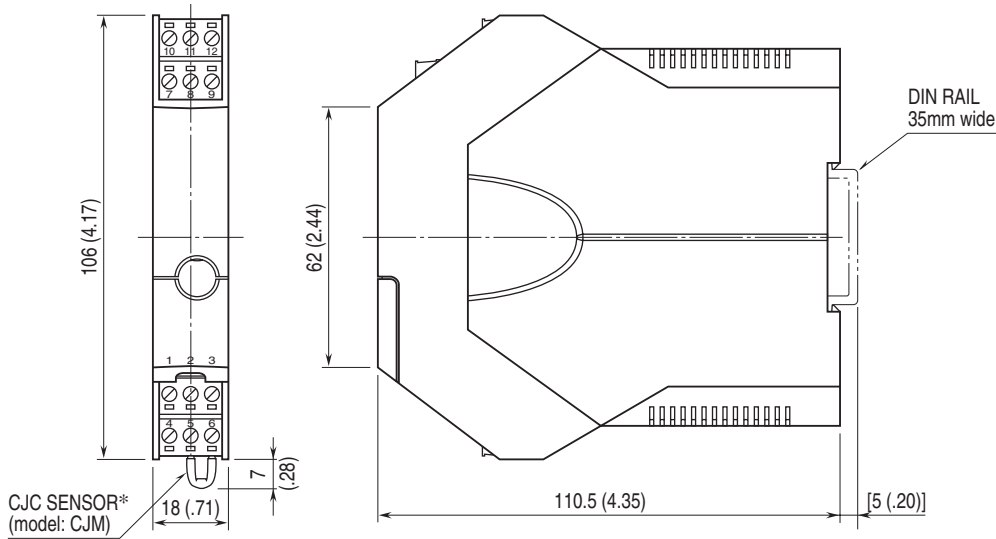
*1. DC input: Or ±0.1% of span, whichever is greater.

Thermocouple input: [Accuracy + Cold Junction Compensation Error 0.5°C (0.9°F)] or ±0.1% of span, whichever is greater.

RTD, Resistance input: Or ±0.1% of span, whichever is greater.

For current output, overall accuracy degrades another 0.1% with spans ≤2mA.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)

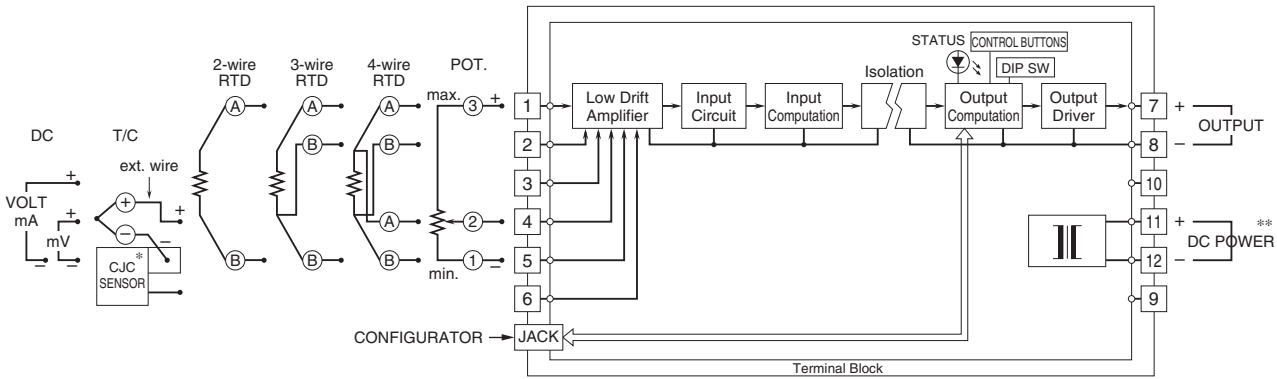


*Used only with a thermocouple input

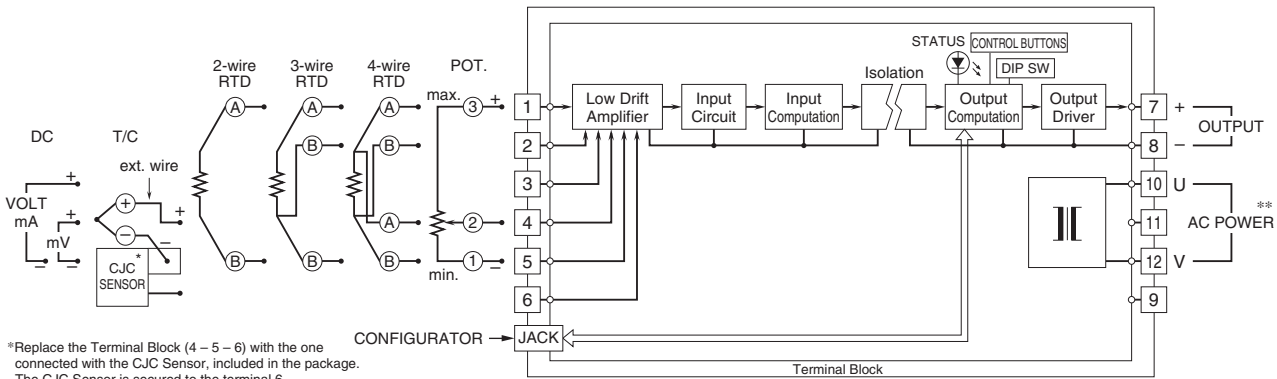
• When mounting, no extra space is needed between units.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

DC POWERED TYPE



AC POWERED TYPE



*Replace the Terminal Block (4 - 5 - 6) with the one connected with the CJC Sensor, included in the package. The CJC Sensor is secured to the terminal 6. Loosen only the terminal 4 - 5 and connect the T/C extension wires.

** Be aware that the AC power and DC power connect to different terminals

Specifications are subject to change without notice.