

Space-saving Signal Conditioners *M3-UNIT Series*

THERMOCOUPLE TRANSMITTER
(field- and PC-configurable)

MODEL **M3LT**

MODEL & SUFFIX CODE SELECTION

MODEL _____ **M3LT-R4/□□**

INPUT SELECTION

◆ **Thermocouples**
(PR), K, E, J, T, B, R, S, C (WRe 5-26),
N, U, L, P (Platinel II)

OUTPUT SELECTION

◆ **DC Current:** Usable range 0 – 20mA; min. span 1mA
◆ **DC Voltage:** Usable range ±2.5V; min. span 250mV
Usable range ±10V; min. span 1V

POWER INPUT _____

R4: 10 – 32V DC

CONFIGURATION OPTIONS _____

A : PC and field configurable
B : Field configurable

OPTIONS _____

/UL : UL approval

ORDERING INFORMATION

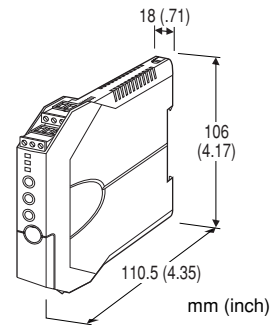
Specify code number (e.g. M3LT-R4/A). Orders will be shipped at default factory settings (K, 0 – 1000°C input/4 – 20mA output).

RELATED PRODUCTS

- PC configurator software (model: M3CON)
Downloadable at M-System's web site:
<http://www.m-system.co.jp>
- PC configurator cable (model: MCN-CON)

GENERAL SPECIFICATIONS

Connection: Removable terminal block
Housing material: Flame-resistant resin (grey)
Isolation: Input to output to power
Overrange output: Approx. -15 – +115%
(Negative current output is not available even within this range.)
Fine zero and span adjustments: ±15% via the front control buttons
Burnout: Upscale (default), downscale or no burnout selectable
Cold Junction Compensation (T/C): CJC sensor (included) to be attached to the input terminals
Configuration
'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.



Functions & Features

- Accepts a thermocouple input and provides an isolated, linearized DC signal
- Easy 'One-Step Cal' calibration using the front three control buttons without needing a PC; PC software is also usable.
- Both input and output type and range are configurable
- Cold junction compensation
- Linearization and burnout
- UL approval

PC configurator (model: M3CON): Via Windows PC connected to the front jack.
Programmable features include:

- I/O type and range
- Zero and span adjustments
- Burnout action

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

INPUT

■ **THERMOCOUPLE:** See Table 1.
Input resistance: 1MΩ minimum
Burnout sensing: 130nA ±10%
Temperature range: See Table 1.

OUTPUT

■ **DC CURRENT**
Maximum range: 0 – 20mA DC
Minimum span: 1mA
Conformance range: 0 – 24mA DC
Offset: Lower range can be any specific value within the output range provided that the minimum span is maintained.
Load resistance: Output drive 12V maximum; e.g. 600Ω [12V/20mA] with 4 – 20mA

DC VOLTAGE**Narrow Spans (mV)**

Maximum range: -2.5 – +2.5V DC

Minimum span: 250mV

Conformance range: -3 – +3V DC

Wide Spans (V)

Maximum range: -10 – +10V DC

Minimum span: 1V

Conformance range: -11.5 – +11.5V DC

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

Load resistance: Output drive 1mA maximum
e.g. 5000Ω [5V/1mA] with 1 – 5V

INSTALLATION

Power input: Operational voltage range 9 – 36V DC;
approx. 3W; ripple 10% p-p max.

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

Dimensions: W18×H106×D110.5 mm
(0.71"×4.17"×4.35")

Weight: 100 g (0.22 lbs)

PERFORMANCE

Accuracy: See Table 1.

Cold junction compensation error:

±0.5°C maximum at 25 ±10°C

±0.9°F maximum at 77 ±18°F

Temp. coefficient: ±0.015%/°C (±0.008%/°F) of -5 to
±55°C (23 to 131°F)

Response time: ≤0.9 sec. (0 – 90%)

Burnout response: ≤10 sec.

Line voltage effect: ±0.1% over voltage range

Insulation resistance: ≥100MΩ with 500V DC

Dielectric strength: 1500V AC @1 minute

(input to output or power to ground)
500V @1 minute (output to power)

STANDARDS & APPROVALS

CE conformity: EMC Directive (89/336/EEC)

EMI EN61000-6-4

EMS EN61000-6-2

Approval: UL/C-UL general safety requirements
(UL 61010-1, CAN/CSA-C22.2 No.1010-1)

INPUT TYPE, RANGE & ACCURACY**TABLE 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	±0.80	36	32 to 4199	32 to 4199	±1.44
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

*1. [Accuracy + Cold Junction Compensation Error 0.5°C (0.9°F)] or ±0.1% of span, whichever is greater.
If the selected output span equals to or narrower than the one-tenth of the maximum span, add 0.2%.

CALCULATION EXAMPLES OF OVERALL ACCURACY IN %

1) K thermocouple, 0 – 1000°C, 4 – 20mA DC output

Absolute value accuracy (Table 1): 0.25°C

CJC error (0.5°C) added: 0.75°C

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

Output span 16mA (20 – 4) ≥ 2mA (max. span 20mA × 0.1) ⇒ No adding 0.2%

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

2) K thermocouple, 50 – 150°C, 2.0 – 2.5V DC output

Absolute value accuracy (Table 1): 0.25°C

CJC error (0.5°C) added: 0.75°C

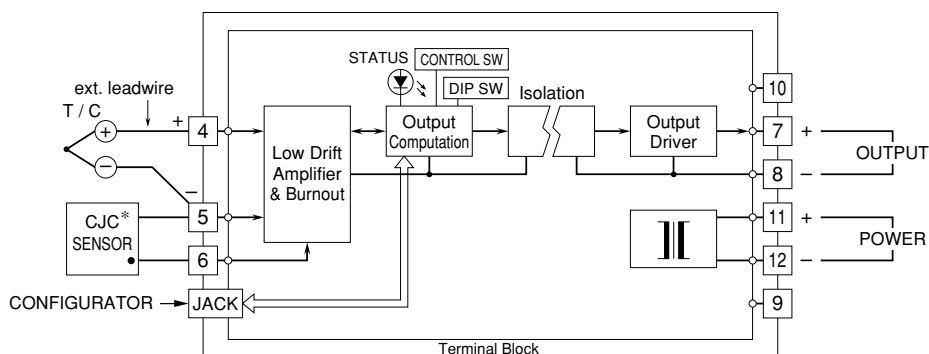
$0.75^{\circ}\text{C} / (150 - 50)^{\circ}\text{C} \times 100 = 0.75\% > 0.1\%$

Output span 0.5V (2.5 – 2.0) ≤ 0.5 (max. span 5V × 0.1) ⇒ Add 0.2%

⇒ Overall accuracy including CJC error = 0.75 + 0.2 = ±0.95% of span

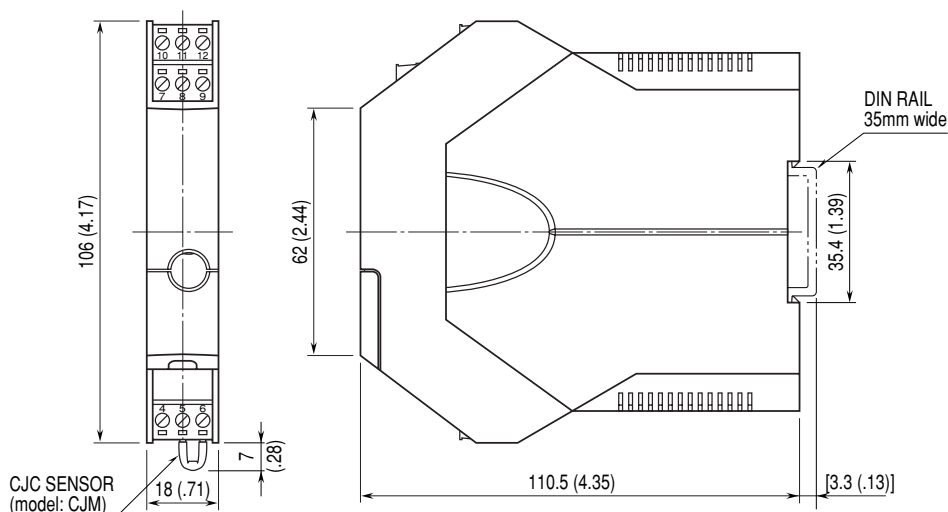
Specifications subject to change without notice.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



*The CJC Sensor is secured to the terminal 6.
Loosen only the terminal 4 – 5 and connect the T/C extension wires.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS mm (inch)



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

ONE-STEP-CAL CALIBRATION

CONFIGURATION MODES & DIP SW

When you program the transmitter module, two configuration modes are available: Field Configuration using DIP SW / control buttons, and PC Software. (Option B type is for the field configuration only.)

The internal DIP switches are used to configure input and output type. Once the module is configured, precise ranges are set up with the front control buttons using a simulator connected to the input terminals and a multimeter connected to the output terminals as a reference.

INPUT & OUTPUT RANGING

For example, suppose that the DIP switches are configured for the J type thermocouple (-210 – +1200°C full-range). Turn the power supply to the transmitter on and press MODE button to enter to the Input Calibration Mode. Apply the desired minimum (e.g. 0°C) and maximum (e.g. 400°C) input levels and push the DOWN (zero) and UP (span) respectively to set the input range to 0 – 400°C.

Then the output range can be calibrated in a similar manner after moving to the Output Calibration Mode by pressing MODE button again. Increase or decrease the simulated input until the output meter shows the desired levels and push the DOWN (zero) and UP (span) respectively for the minimum (e.g. 4mA) and maximum (e.g. 20mA) levels.

The front LEDs' colors and flashing patterns help you to easily identify the transmitter's status and confirm the setup actions in each step of Calibration Modes. See detailed explanation in "Calibration Flow Chart."

The calibrated input and output ranges are stored in the internal memory. The module reads the DIP-switch-calibrated configuration only once after the power supply is turned on. Set the switches with the power supply removed.

FINE ZERO & SPAN ADJUSTMENTS

After the transmitter is installed and operational, fine zero and span tuning can be also performed using the front control buttons. Both zero and span are adjustable within ±15%.

PC SOFTWARE CONFIGURATION

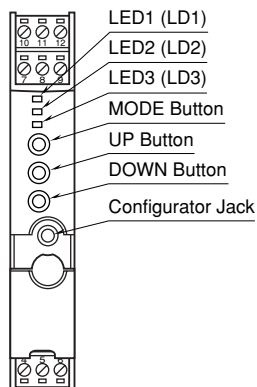
When you need to apply the same setting to multiple transmitters, downloading one setting from the PC is convenient. The PC Configurator Software (model: M3CON) is available separately.

Turn the transmitter to PC Configuration Mode (See Table 2) and all programmable features can be set up on a PC regardless of other DIP SW setting except that the output type must be selected with the DIP SW1-1 through SW1-4 (See Table 7).

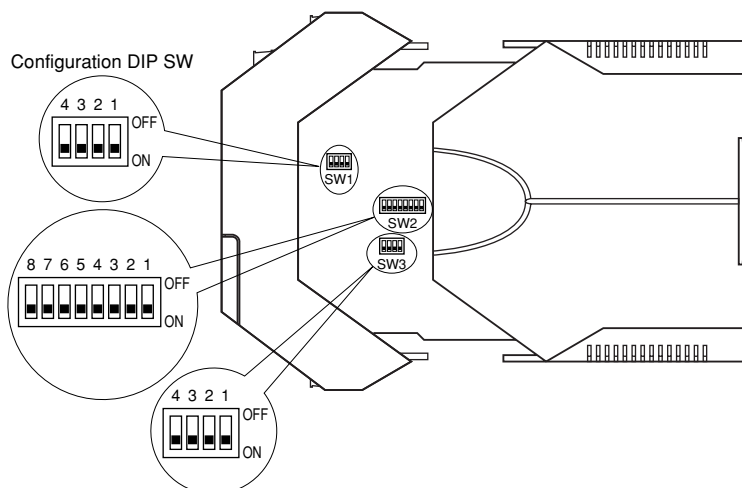
For detailed information on the PC configuration, refer to the M3CON instruction manual.

EXTERNAL & INTERNAL VIEWS

FRONT VIEW



SIDE VIEW



DIP SWITCH SETTINGS

CONFIGURATION MODE (SW2)

Table 2

MODE	SW2-8	Configuration mode can be confirmed with the front LED.
DIP SW	OFF	
PC	ON	

THERMOCOUPLE TYPE (SW2)

Table 3

T/C	SW2-7	SW2-6	SW2-5	SW2-4
(PR)	OFF	OFF	OFF	ON
K (CA)	OFF	OFF	OFF	OFF
E (CRC)	OFF	OFF	ON	OFF
J (IC)	OFF	OFF	ON	ON
T (CC)	OFF	ON	OFF	OFF
B (RH)	OFF	ON	OFF	ON
R	OFF	ON	ON	OFF
S	OFF	ON	ON	ON
C (WRe 5-26)	ON	OFF	OFF	OFF
N	ON	OFF	OFF	ON
U	ON	OFF	ON	OFF
L	ON	OFF	ON	ON
P (Platinel II)	ON	ON	OFF	OFF

BURNOUT (SW3)

Table 4

BURNOUT	SW3-4	SW3-3
No burnout	OFF	ON
Upscale	OFF	OFF
Downscale	ON	OFF

COLD JUNCTION COMPENSATION (SW3)

Table 5

COLD JUNCTION COMP	SW3-2
Disable	ON
Enable	OFF

OUTPUT TYPE (SW2 & 1)

Table 6

OUTPUT	SW2-3	SW2-2	SW1-4	SW1-3	SW1-2	SW1-1
0 – 20mA	OFF	OFF	OFF	ON	OFF	OFF
-2.5 – +2.5V	OFF	ON	ON	OFF	OFF	ON
-10 – +10V	ON	OFF	ON	OFF	ON	OFF

OUTPUT TYPE / PC CONFIG (SW1)

Table 7

OUTPUT	SW1-4	SW1-3	SW1-2	SW1-1
0 – 20mA	OFF	ON	OFF	OFF
-2.5 – +2.5V	ON	OFF	OFF	ON
-10 – +10V	ON	OFF	ON	OFF

CALIBRATION FLOW CHART

