Super-mini Signal Conditioners Mini-M Series

THERMOCOUPLE TRANSMITTER

Functions & Features
- Accepts direct input from a thermocouple and provides a standard process signal
- 5-segment linearization
- Burnout
- High-accuracy cold junction compensation
- Fast response type available
- CE marking
- UL approval

Typical Applications
- High-accuracy cold junction compensation benefits narrow span measurements
- 0.1 μA burnout sensing enables long distance transmission with minimum offset drifts
- Electric furnace (isolation ensured even when 200 V AC power for heater leaks through furnace wall)
- No burnout type can connect to a single T/C in parallel with a recorder

MODEL: M2TS

ORDERING INFORMATION
- Code number: M2TS-[1][2]-[3][4]
- Specify a code from below for each [1] through [4].
- Temperature range (e.g. 0 – 800°C)
- Special output range (For codes Z & 0)
- Specify the specification for option code /Q
- (e.g. /C01/V01)

[1] INPUT THERMOCOUPLE
1: (PR) (Usable Range 0 to 1760°C, 32 to 3200°F)
2: K (CA) (Usable range -270 to +1370°C, -454 to +2498°F)
3: E (CRC) (Usable range -270 to +1000°C, -454 to +1832°F)
4: J (IC) (Usable range -210 to +1200°C, -346 to +2192°F)
5: T (CC) (Usable range -270 to +400°C, -454 to +752°F)
6: B (RH) (Usable range 0 to 1820°C, 32 to 3308°F)
7: R (Usable range -50 to +1760°C, -58 to +3200°F)
8: S (Usable range -50 to +1760°C, -58 to +3200°F)
N: N (Usable range -270 to +1300°C, -454 to +2372°F)
0: Specify

[2] 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 1000 Ω min.)
4: 0 – 10 V DC (Load resistance 100 kΩ min.)
5: 0 – 5 V DC (Load resistance 5000 Ω min.)
6: 1 – 5 V DC (Load resistance 5000 Ω min.)
0: Specify voltage (See OUTPUT SPECIFICATIONS)

[3] POWER INPUT
AC Power
M: 85 – 264 V AC (Operational voltage range 85 – 264 V, 47 – 66 Hz)
(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
(R2: 11 – 27 V DC
(P: 110 V DC
(Operational voltage range 85 – 150 V, ripple 10 %p-p max.)
(110 V ±10 % for UL)

[4] OPTIONS (multiple selections)
Response Time (0 – 90 %)
blank: Standard (≤ 0.5 sec.)
/K: Fast Response (Approx. 25 msec.)
Burnout
blank: Upscale burnout
/BL: Downsacle burnout
MODEL: M2TS

/BN: No burnout

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

ADJUSTMENT
/V01: Multi-turn fine adjustment
/VN: Sealed adjustment holes

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
Zero adjustment: -5 to +5 % (front)
Span adjustment: 95 to 105 % (front)
Burnout: Upscale standard; downscale or no burnout optional
Linearization: Standard
Cold junction compensation: CJC sensor attached to the input terminals

INPUT SPECIFICATIONS

Minimum span: 3 mV
Offset: Max. 1.5 times span
Input resistance: 30 kΩ min.
Burnout sensing: 0.1 μA

MIN. span (in °C)
(PR): min. span 370°C
K (CA): min. span 140°C
E (CRC): min. span 90°C
J (IC): min. span 110°C
T (CC): min. span 140°F
B (RH): min. span 1410°F
R: min. span 650°F
S: min. span 690°F
N: min. span 200°F

MIN. span (in °F)
(PR): min. span 670°F
K (CA): min. span 140°F
E (CRC): min. span 90°F
J (IC): min. span 110°F
T (CC): min. span 140°F
B (RH): min. span 1410°F
R: min. span 650°F
S: min. span 690°F
N: min. span 200°F

Remark: The described accuracy may be partially not satisfied when the temperature ranges below 0°C. Consult factory.

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 ≥ 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: ±0.4 % (at over 400°C or 750°F for R, S and PR; over 770°C or 1420°F for B)
Cold junction compensation error
(at 25°C ±10°C or 77°F ±18°F)
K, E, J, T & N: ±0.5°C or ±0.9°F
S, R & PR: ±1°C or ±1.8°F
Temp. coefficient: ±0.015 %/°C (±0.008 %/°F)
(at over 770°C or 1420°F for B)
Burnout response: ≤ 10 sec.
Line voltage effect: ±0.1 % over voltage range
Insulation resistance: ≥ 100 MΩ with 500 V DC
Dielectric strength: 2000 V AC @1 minute (input to output
STANDARDS & APPROVALS

CE conformity:
- EMI EN 61000-6-4: 2007
- EMS EN 61000-6-2: 2005
- 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 nonincendive Class I, Division 2,
  Groups A, B, C, and D hazardous locations
- UL/C-UL general safety requirements

DIMENSIONS unit: mm (inch)

TERMINAL ASSIGNMENTS unit: mm (inch)

* When mounting, no extra space is needed between units.
Specifications are subject to change without notice.
INSTRUCTION MANUAL

THERMOCOUPLE TRANSMITTER

MODEL M2TS

BEFORE USE ....
Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact M-System’s Sales Office or representatives.

■ PACKAGE INCLUDES:
Signal conditioner (body + base socket + CJC sensor) ........ (1)
Sealing label (option /VN) .................................... (1 sheet)

■ MODEL NO.
Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL
This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

POINTS OF CAUTION

■ NONINCENDIVE APPROVAL OPTION
• This equipment is suitable for use in Class I, Div. 2, Groups A, B, C and D or Non-Hazardous Locations only.
• WARNING! Before You Remove the Unit from Its Base Socket or Mount It, Turn Off the Power Supply and Input Signal for Safety.
• WARNING! – Explosion Hazard – Substitution of Components May Impair Suitability for Class I, Div. 2.
• WARNING! – Explosion Hazard – Do Not Disconnect Equipment Unless Power Has Been Switched Off or The Area is Known To Be Non-Hazardous.
• The equipment was evaluated for use in the ambient temperature and relative humidity as mentioned in ‘ENVIRONMENT’ section.
• The input and output wiring must be in accordance with Class I, Div. 2 wiring methods and in accordance with the authority having jurisdiction for use in these hazardous locations.

■ CONFORMITY WITH EC DIRECTIVES OR UL
• This equipment is suitable for Pollution Degree 2 and Installation Category II. Reinforced insulation (signal input or output to power input: 300V) and basic insulation (signal input to output: 300V) are maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
• The equipment must be mounted inside a suitable fire enclosure.
• Altitude up to 2000 meters
• Insert noise filters for the power source, input and output connected to the unit. COSEL Model NAC-04-472, TDK Model ZCAT 3035-1330 or equivalent is recommended.
• The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE/UL requirements. Failure to observe these requirements may invalidate the CE/UL conformance.

■ POWER INPUT RATING & OPERATIONAL RANGE
• Locate the power input rating marked on the product and confirm its operational range as indicated below:
  100 – 240V and 85 – 264V AC rating: 85 – 264V
  (90 – 264V for UL), 47 – 66 Hz, approx. 3 – 5VA
  24V DC rating: 24V ±10%, approx. 3W
  11 – 27V DC rating: 11 – 27V, approx. 3W
  110V DC rating: 85 – 150V (110V ±10% for UL), approx. 3W

■ GENERAL PRECAUTIONS
• Before you remove the unit from its base socket or mount it, turn off the power supply and input signal for safety.

■ ENVIRONMENT
• Indoor use
• When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
• Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
• Environmental temperature must be within -5 to +55°C (23 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.
• Be sure that the ventilation slits are not covered with cables, etc.

■ WIRING
• Do not install cables (power supply, input and output) close to noise sources (relay drive cable, high frequency line, etc.).
• Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND ....
• The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.
• With voltage output, do not leave the output terminals shortcircuited for a long time. The unit is designed to endure it without breakdown, however, it may shorten appropriate life duration.

COMPONENT IDENTIFICATION

INSTALLATION
Loosen the fixing screw at the front of the unit in order to separate the body from the base socket.

■ DIN RAIL MOUNTING
Set the base socket so that its DIN rail adaptor is at the bottom. Position the upper hook at the rear side of base socket on the DIN rail and push in the lower. When removing the socket, push down the DIN rail adaptor utilizing a minus screwdriver and pull.

■ WALL MOUNTING
Refer to “EXTERNAL DIMENSIONS.”
**TERMINAL CONNECTIONS**

Connect the unit as in the diagram below or refer to the connection diagram on the side of the unit. Attach the CJC sensor together with input wiring to the input terminals. The CJC sensor is not interchangeable. Check that its serial number is identical to that of the unit.

**CHECKING**

1) Terminal wiring: Check that all cables are correctly connected according to the connection diagram.
2) Power input voltage: Check voltage across the terminal 13 – 14 with a multimeter.
3) Input: Check that the input voltage is within 0 – 100% of full-scale.
   - If the thermocouple or its extension wires are broken, the output goes over 100% (below 0% with downscale) due to burnout function. Check leadwires in such a case.
4) Output: Check that the load resistance meets the described specifications.

**EXTERNAL DIMENSIONS** unit: mm (inch)

**ADJUSTMENT PROCEDURE**

This unit is calibrated at the factory to meet the ordered specifications, therefore you usually do not need any calibration. For matching the signal to a receiving instrument or in case of regular calibration, adjust the output as explained in the following.

**HOW TO CALIBRATE THE OUTPUT SIGNAL**

Use a signal source and measuring instruments of sufficient accuracy level. Turn the power supply on and warm up for more than 10 minutes.
1) ZERO: Apply 0% input and adjust output to 0%.
2) SPAN: Apply 100% input and adjust output to 100%.
3) Check ZERO adjustment again with 0% input.
4) When ZERO value is changed, repeat the above procedure 1) – 3).

Note: Remove the sealing label for VN option.

**MAINTENANCE**

Regular calibration procedure is explained below:

**CALIBRATION**

Warm up the unit for at least 10 minutes. Apply 0%, 25%, 50%, 75%, and 100% input signal. Check that the output signal for the respective input signal remains within accuracy described in the data sheet. When the output is out of tolerance, recalibrate the unit according to the "ADJUSTMENT PROCEDURE" explained earlier.

**TERMINAL ASSIGNMENTS**

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

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**M-SYSTEM WARRANTY**

M-System warrants such new M-System product which it manufactures to be free from defects in materials and workmanship during the 36-month period following the date that such product was originally purchased if such product has been used under normal operating conditions and properly maintained. M-System’s sole liability, and purchaser’s exclusive remedies, under this warranty are, at M-System’s option, the repair, replacement or refund of the purchase price of any M-System product which is defective under the terms of this warranty. To submit a claim under this warranty, the purchaser must return, at its expense, the defective M-System product to the below address together with a copy of its original sales invoice.

THIS IS THE ONLY WARRANTY APPLICABLE TO M-SYSTEM PRODUCT AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. M-SYSTEM SHALL HAVE NO LIABILITY FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES OF ANY KIND WHATSOEVER.

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