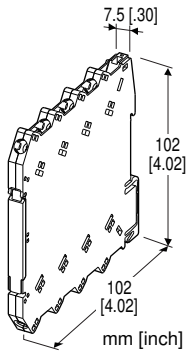
Screw Terminal Ultra-Slim Signal Conditioners M6N Series

THERMOCOUPLE TRANSMITTER

(PC programmable)

Functions & Features

- 7.5-mm wide ultra-slim design
- Low profile allows the M6N module mounted in a 120-mm deep panel
- Accepts a thermocouple input and provides an isolated, linearized DC signal
- Cold junction compensation, linearization and burnout protection
- PC programmable
- High-density mounting
- Power indicator LED



MODEL: M6NXT–[1][2]–R[3]

ORDERING INFORMATION

- Code number: M6NXT-[1][2]-R[3]

Specify a code from below for each of [1] through [3].
(e.g. M6NXT-2Z1-R/UL/Q)

- Temperature range (e.g. 0 – 1000°C)
- Output range (e.g. 4 – 20mA DC)
- Specify the specification for option code /Q (e.g. /C01/SET)

[1] INPUT THERMOCOUPLE

1: (PR)
2: K (CA)
3: E (CRC)
4: J (IC)
5: T (CC)
6: B (RH)
7: R
8: S
N: N
0: Specify (Please provide a emf table.)
(Configurator software is used to change the input type and precise range.)

[2] OUTPUT

Current
Z1: Range 0 – 20 mA DC
Voltage
V2: Range -10 – +10 V DC
V3: Range -5 – +5 V DC
(Configurator software is used to change output over the described range of the selected suffix code.
For changing between suffix codes, set the Output Range Selector on the side of unit before software adjustment.)

POWER INPUT

DC Power
R: 24 V DC
(Operational voltage range 24 V ±10 %, ripple 10 %p-p max.)

[3] OPTIONS (multiple selections)

Standards & Approvals
blank: CE marking
/UL: UL approval, CE marking
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
EX-FACTORY SETTING
/SET: Preset according to the Ordering Information Sheet (No. ESU-7831)(UL not available)

RELATED PRODUCTS

- PC configurator software (model: M6CFG)

Downloadable at our 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

Connection
Input and output: M3 screw terminal (torque 0.5 N·m)
Power input: Via the Installation Base (model: M6NBS) or M3 screw terminal (torque 0.5 N·m)
Recommended solderless terminal: Max. 5.8 mm (0.23") wide; Ones with insulation sleeve do not fit.

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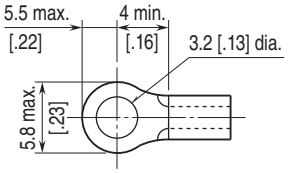
Applicable wire size: 0.2 – 2.5 mm^2
Screw terminal: Nickel-plated steel
Housing material: Flame-resistant resin (black)
Isolation: Input to output to power
Overrange output: -2 – +102 %
(Negative current output is not available.)
Zero adjustment: -2 to +2 % (PC programming)
Span adjustment: 98 to 102 % (PC programming)
Burnout: Upscale standard; downscale or no burnout optional by programming
Linearization: Standard
Cold Junction Compensation: CJC sensor incorporated
Power indicator LED: Green LED turns on when the power is supplied.
Status indicator LED: Orange LED; Blinking patterns indicate different operating status of the transmitter.
Programming: Downloaded from PC; input type and range, output type and range, zero and span, burnout type, user's linearization table, temperature unit, cold junction compensation, response characteristics (version 1.30 or later), cold junction compensation, filter time constant, etc. For detailed information, refer to the users manual for the PC configurator.
Configurator connection: 2.5 dia. miniature jack; RS-232-C level

■Recommended solderless terminal (unit: mm [inch])



INPUT SPECIFICATIONS

Input resistance: ≥ 1 MΩ
Burnout sensing: ≤ 0.2 μA
Temperature range: See Table 1.
If not specified, the input range is shown below.
1 PR: 0 – 1600°C
2 K: 0 – 1000°C
3 E: 0 – 500°C
4 J: 0 – 500°C
5 T: 0 – 300°C
6 B: 500 – 1600°C
7 R: 500 – 1600°C
8 S: 0 – 1600°C
N N: 0 – 1000°C

- **When input signal code is not 0:**
  Refer to the table 1.
- **When input signal code is 0 (custom table)***
  A emf range: -1000 to +1000 mV
  Custom TC start: Lower limit of the emf table to 1000˚C (1832˚F)
  Custom TC step: 1 to 50˚C (1.8 to 90˚F)
  Custom TC points: 2 to 300
  * Specify in the Ordering Information Sheet (ESU-7831).

OUTPUT SPECIFICATIONS

■ DC Current
Output range: 0 – 20 mA DC
Conformance range: 0 – 20.4 mA DC
Minimum span: 1 mA
Offset: Lower range can be any specific value within the output range provided that the minimum span is maintained.
Load resistance: Output drive 11 V max.
(e.g. 4 – 20 mA: 550 Ω [11 V ÷ 20 mA])
If not specified, the output range is 4 – 20 mA DC.

■ DC Voltage
Code V2 (wide spans)
Output range: -10 – +10 V DC
Conformance range: -10.4 – +10.4 V DC
Minimum span: 1 V
Code V3 (narrow spans)
Output range: -5 – +5 V DC
Conformance range: -5.2 – +5.2 V DC
Minimum span: 0.5 V
Offset: Lower range can be any specific value within the output range provided that the minimum span is maintained.
Load resistance: Output drive 1 mA max.
(e.g. 1 – 5 V: 5000 Ω [5 V ÷ 1 mA])
If not specified, the output range is shown below.
V2: 0 – 10 V DC
V3: 1 – 5 V DC

INSTALLATION

Power consumption: Approx. 0.5 W
Operating temperature: -20 to +55°C (-4 to +131°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Mounting: Installation Base (model: M6NBS) or DIN rail
Weight: 65 g (2.3 oz)

PERFORMANCE

Overall accuracy: Input accuracy + output accuracy + cold junction compensation error

- **Input accuracy**:
  When input signal code is not 0:
  Refer to the table 1.
  When input signal code is 0:
  ±0.1% of the absolute value of emf at 0% or 100%, whichever greater, or ±0.02mV, whichever greater. (for how to calculate the overall accuracy, refer to overall accuracy

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calculation example [Example 2])

• **Output accuracy**: ±0.04 % of max. output range

• **Cold junction compensation error**:

±3°C at 25 ±10°C

±5.4°F at 77 ±18°F

Temp. coefficient: ±0.01 %/°C (±0.006 %/°F) of max. span

Response time: ≤ 0.5 sec. (0 – 90 %)

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 to power to ground)

CALCULATION EXAMPLES OF OVERALL ACCURACY

■ [Example 1] When input signal code is not 0

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

Absolute value accuracy (Table 1): 0.25°C

• Input accuracy = 0.25°C ÷ 1000°C × 100 = 0.025 %

• Output range: 20 mA (20 – 0)

• Output span: 16 mA (20 – 4)

Output accuracy = 20 mA ÷ 16 mA × 0.04 = 0.05 %

• CJC error (3°C)

CJC error = 3°C ÷ 1000°C × 100 = 0.30 %

Overall accuracy = 0.025 + 0.05 + 0.30 = ±0.38 %

■ [Example 2] When input signal code is 0

Thermocouple input 0 – 1000°C (-30 - +20 mV),

4 – 20 mA DC output

• Custom TC table

Custom TC start 0 °C

Custom TC step 50 °C

Custom TC points 21

Custom TC emf table -30 - +20 mV

Minimum emf difference in custom TC table 2 mV

• Input accuracy

The absolute value of emf is 30 mV because input 0 %:

30 mV is greater than input 100 %: 20 mV

30 mV x 0.1 ÷ 100 = 0.03 mV

Since this is greater than 0.02 mV, the input accuracy is ±0.03 mV

• Actual value of input accuracy

Minimum emf difference per 1 °C in custom TC table

= Minimum emf difference in custom TC table ÷ temperature step

= 2 mV ÷ 50 ℃ = 0.04 mV/℃

• Actual value of input accuracy

= 0.03 mV ÷ 0.04 mV /℃ = ±0.75 ℃

Input accuracy = 0.75 ℃ ÷ 1000 ℃ × 100 = ± 0.075 %

Output accuracy and CJC error are same as [example 1].

Overall accuracy = 0.075 + 0.05 + 0.30 = ± 0.43 %

Table 1.

THERMOCOUPLE	˚C			
	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY
(PR)	20	0 to 1760	0 to 1760	±1.00
K (CA)	20	-270 to +1370	-150 to +1370	±0.25
E (CRC)	20	-270 to +1000	-170 to +1000	±0.20
J (IC)	20	-210 to +1200	-180 to +1200	±0.25
T (CC)	20	-270 to +400	-170 to +400	±0.25
B (RH)	20	100 to 1820	400 to 1760	±0.75
R	20	-50 to +1760	200 to 1760	±0.50
S	20	-50 to +1760	0 to 1760	±0.50
N	20	-270 to +1300	-130 to +1300	±0.30
THERMOCOUPLE	˚F			
	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY
(PR)	36	32 to 3200	32 to 3200	±1.80
K (CA)	36	-454 to +2498	-238 to +2498	±0.45
E (CRC)	36	-454 to +1832	-274 to +1832	±0.36
J (IC)	36	-346 to +2192	-292 to +2192	±0.45
T (CC)	36	-454 to +752	-274 to +752	±0.45
B (RH)	36	212 to 3308	752 to 3200	±1.35
R	36	-58 to +3200	392 to 3200	±0.90
S	36	-58 to +3200	32 to 3200	±0.90
N	36	-454 to +2372	-202 to +2372	±0.54

STANDARDS & APPROVALS

EU conformity:

EMC Directive

EMI EN 61000-6-4

EMS EN 61000-6-2

RoHS Directive

Approval:

UL/C-UL nonincendive Class I, Division 2, Groups A, B, C, and D (ANSI/ISA-12.12.01, CAN/CSA-C22.2 No.213)

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

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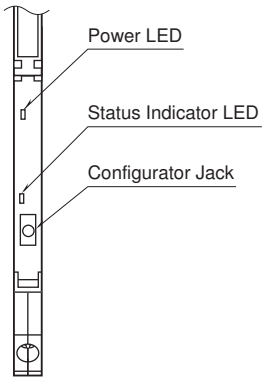
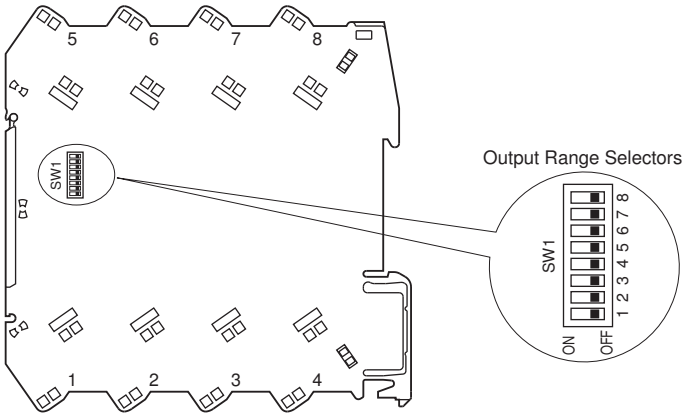
EXTERNAL VIEW

FRONT VIEW (with the cover open)

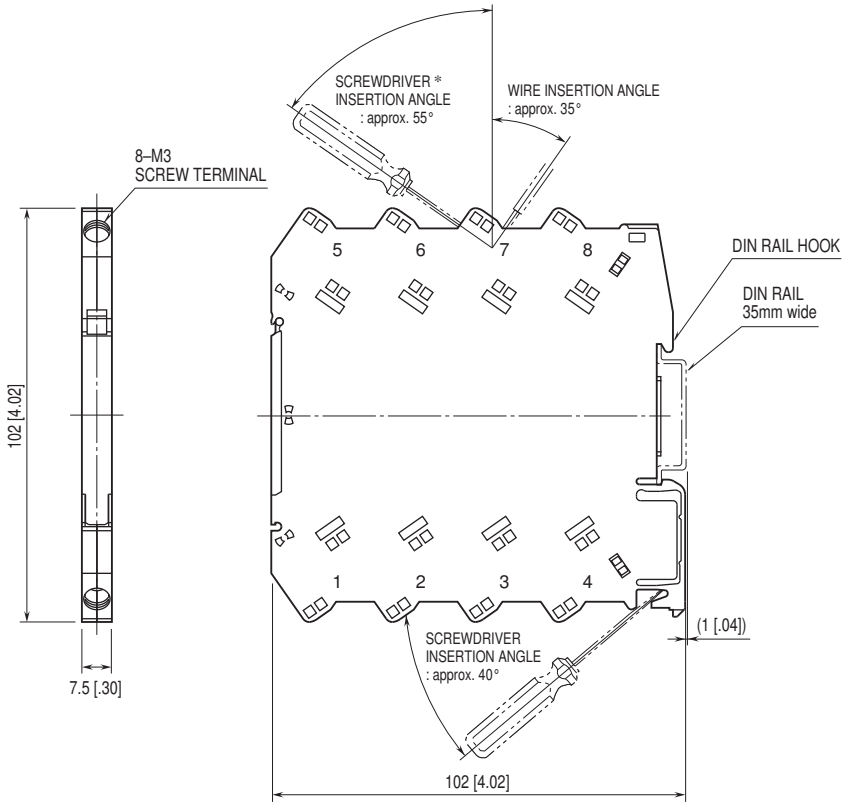


SIDE VIEW



The DIP switch setting is required to select output types before setting a precise output range using PC Configurator Software (model: M6CFG).
Refer to the instruction manual for detailed procedures.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



*Screwdriver stem diameter: 6 mm [.24"] or less • When mounting, no extra space is needed between units.

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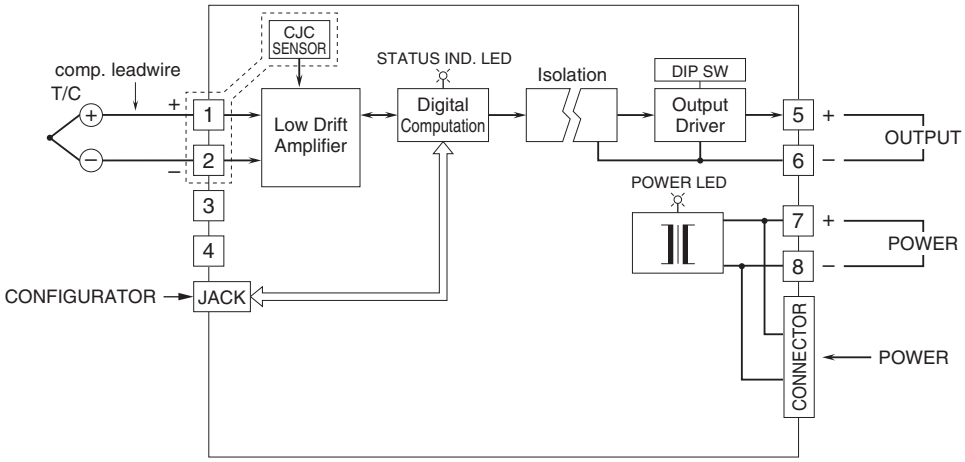
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



⚠ Specifications are subject to change without notice.

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