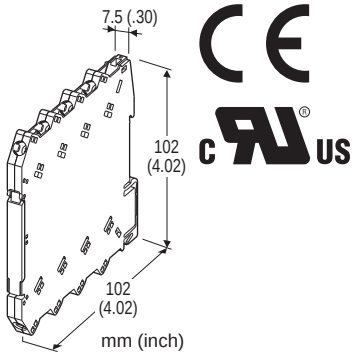
Screw Terminal Ultra-Slim Signal Conditioners M6N Series

FUNCTION MODULE

(PC programmable)

Functions & Features

- Single input filter and function module
- 12 types of functions are PC programmable
- 7.5-mm wide ultra-slim design
- Low profile allows the M6N module mounted in a 120-mm deep panel
- High-density mounting
- Power and status indicator LEDs
- UL approval



MODEL: M6NXF1-[1][2]-R[3]

ORDERING INFORMATION

- Code number: M6NXF1-[1][2]-R[3]
  Specify a code from below for each [1] through [3].
  (e.g. M6NXF1-Z1Z1-R/UL)
- Input range (e.g. 4 – 20 mA DC)
- Output range (e.g. 4 – 20 mA DC)

[1] INPUT

Current

Z1: Range 0 – 50 mA DC (Input resistance 24.9 Ω)

Voltage

S1: Range -1000 – +1000 mV DC (Input resistance 1 MΩ min.)

S2: Range -10 – +10 V DC (Input resistance 1 MΩ min.)

(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

STANDARDS & APPROVALS

blank: CE marking

/UL: UL approval (CE marking)

FUNCTIONS

PC Configurator Software is used to program the function.
Filter, linearization and limiter functions can be combined.

- Filter / Lag
  · Moving average output
  · Dead time computing
  · Delay buffer (first order lag)
  · Lead time computing
  · Ramp buffer
- Linearization
  · User's table linearization
  · Inverted output
  · Square root extraction (orifice, venturi)
  · X^{2} (Palmer-Bowlus flume, Parshall flume)
  · $X^{5/2}$ (triangular or v-notch weir)
  · $X^{3/2}$ (rectangular weir)
- Limiter
  · High / Low limit

Factory default function setting

Filter: Moving average
(H = 0.1, N = 1, U = 0, L = 0)
Linearization: None
Limiter: Low limit = -2 %, High limit = 102 %

RELATED PRODUCTS

- PC configurator software (model: M6CFG)
  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.

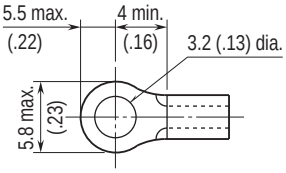
GENERAL SPECIFICATIONS

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.
Applicable wire size 0.2 – 2.5 mm^2
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)
Power LED: Green light turns on when the power is supplied.
Status indicator LED: Orange LED; Flashing patterns indicate different operating status of the transmitter.
Programming: Downloaded from PC; input type and range, output type and range, zero and span, function type and parameters, etc.
For detailed information, refer to the users manual for the PC configurator.
Configurator connection: 2.5 dia. miniature jack; RS-232C level

■Recommended solderless terminal



INPUT SPECIFICATIONS

• **DC Current**: Input resistor incoporated
(If not specified, the input range is 4 – 20 mA DC.)
Input range: 0 – 50 mA DC
Minimum span: 2 mA
Offset: Lower range can be any specific value within the input range provided that the minimum span is maintained.

• **DC Voltage**
Code S1 (narrow spans)
Input range: -1000 – +1000 mV DC
Minimum span: 100 mV
Code S2 (wide spans)
Input range: -10 – +10 V DC
Minimum span: 1 V
Offset: Lower range can be any specific value within the input range provided that the minimum span is maintained.
If not specified, the input range is shown below.
S1: 0 – 100 mV DC
S2: 1 – 5 V DC

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 in percentage of span

Overall accuracy
I/O gain ≤ 1: Input accuracy + Output accuracy
I/O gain > 1: [Input accuracy + Output accuracy] × I/O gain
• **Input accuracy***: (% of max. input range)
-1000 – +1000 mV : ±0.01 %
-10 – +10 V : ±0.01 %
0 – 50 mA : ±0.02 %
• **Output accuracy***: ±0.04 % of max. output range
*Inversely proportional to the span.
See CALCULATION EXAMPLES OF OVERALL ACURACY.
Temp. coefficient: ±0.01 %/°C (±0.006 %/°F) of max. span
Response time: ≤ 0.5 sec. (0 – 90 %) without any function setting
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

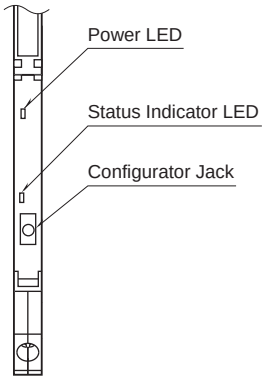
[Example] Input Type -10 – +10 V, Input Range 1 – 5 V,
Output Type -5 – +5 V, Output Range 1 – 5 V
• Input accuracy = Max. Input Range (20 V) / Span (4 V) × 0.01 % = 0.05 %
• Output accuracy = Max. Output Range (10 V) / Span (4 V) × 0.04 % = 0.1 %
Accuracy= ±0.15 %

STANDARDS & APPROVALS

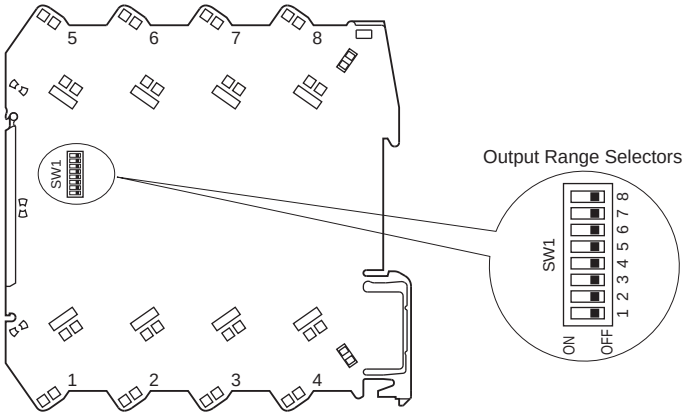
CE conformity:
EMC Directive (2004/108/EC)
EN 61000-6-4 (EMI)
EN 61000-6-2 (EMS)
Approval:
UL/C-UL nonincendive Class I, Division 2,
Groups A, B, C, and D hazardous locations
(ANSI/ISA-12.12.01, CAN/CSA-C22.2 No.213)
UL/C-UL general safety requirements
(UL 61010-1, CAN/CSA-C22.2 No.61010-1)

EXTERNAL VIEW

■ **FRONT VIEW (with the cover open)**

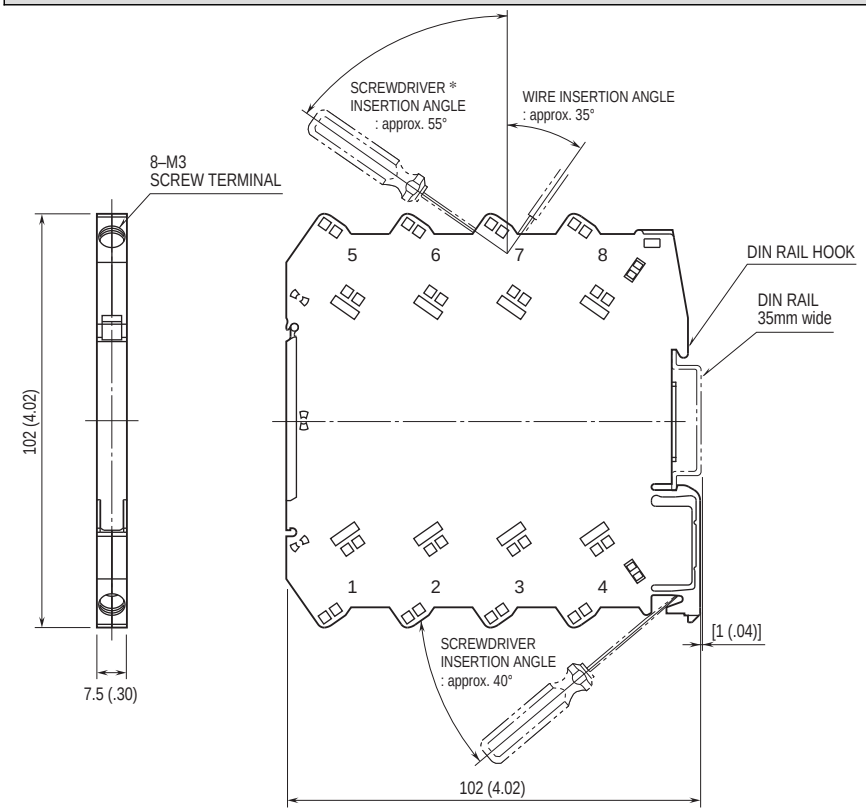


■ **SIDE VIEW**



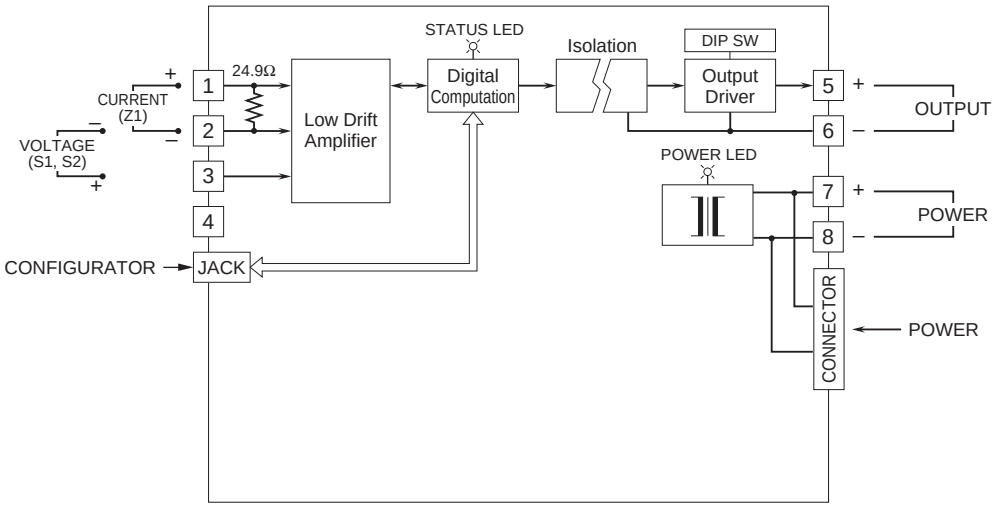
The DIP switch setting is required to select output types before setting a precise output range using PC Configurator Software (model: M6CFG).
Refer to the instruction manual for detailed procedures.

DIMENSIONS unit: mm (inch)



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

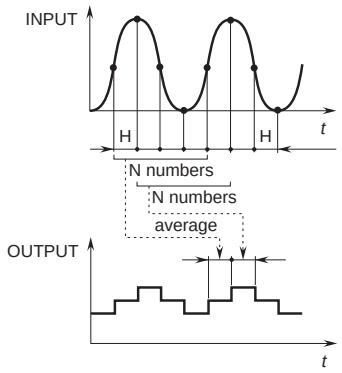
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



FUNCTIONS

■ MOVING AVERAGE OUTPUT

The module samples input signals every H seconds and, excluding U numbers of highest-value samples and L numbers of lowest-value samples, outputs proportionally to the average of the rest [N (U + L)] of sampled data. When a new input is sampled after another H seconds, it gives up the oldest sample and calculates a new average including the latest sample and outputs proportionally.
When the number of samples to be calculated equals 0 or less, it outputs an error.



Parameters
H: Sampling cycle
(0.1000 to 100.0000 seconds)
N: Number of samples to be calculated
(1 to 128)
U: Number of highest-value samples to be cut off
(0 to 127)
L: Number of lowest-value samples to be cut off
(0 to 127)

■ DEAD-TIME COMPUTING

The module does not respond to an input signal for a preset dead-time* duration.
In addition, with adjusting a time constant T, it generates a first order lag output after the dead-time.

$$X_0(s) = \frac{e^{-HNs}}{1 + Ts} X_1(s)$$

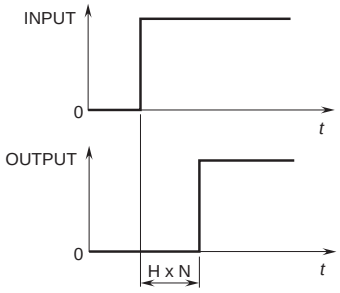
where X_1: Input
X_0: Output

Dead time = H x N (s)

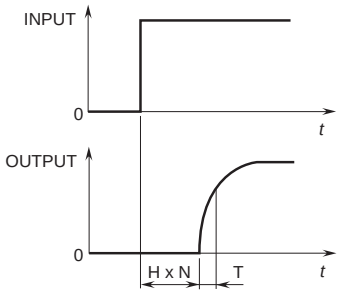
Parameters
H: Sampling cycle (0.1000 to 100.0000 seconds)
N: Numbers of samples to be calculated (1 to 128)
T: Time constant (0.0000 or 0.5000 to 100.0000 seconds)

*Output is refreshed every sampling cycle. The response time may be delayed by 1 cycle at the maximum.

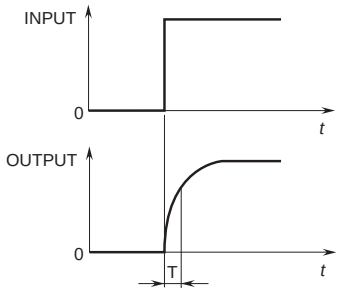
• Step input with dead-time



• Step input with dead-time plus time constant



• Step input with time constant



■ DELAY BUFFER

The module generates a first order lag output.

$$X_0(s) = \frac{1}{1 + Ts} X_1(s)$$

where X_1: Input
X_0: Output

Parameters
T: Time constant (0.5000 to 100.0000 seconds)

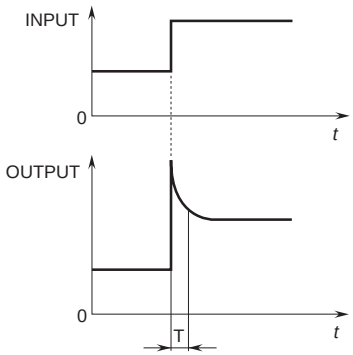
■ LEAD-TIME COMPUTING
The module operates a lead-time equation.

$X_0(s) = (1 + Ts) X_1(s)$

where X_1: Input
X_0: Output

Parameters
T: Lead-time constant (0.5000 to 100.0000 seconds)

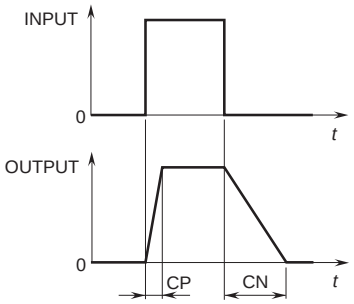
• Step input with lead-time constant



■ RAMP BUFFER
The modules output does not change faster than a preset maximum rate, positive CP and negative CN, no matter how fast its input changes.

CP: Maximum rate of positive output change
(0.0000 to 200.0000%/second)
CN: Maximum rate of negative output change
(0.0000 to 200.0000%/second)

• Step input with rate-of-change limits



■ HIGH / LOW LIMIT
The output does not go above the preset high limit or below the preset low limit.
High and Low limits are independently selectable.

■ X^2 OUTPUT (Palmer-Bowlus flume, Parshall flume)

$X_0 = X_1^2 / 100$

where X_1: Input (%)
X_0: Output (%)

■ USER' S TABLE LINEARIZATION
The input is converted into a linearized output according to the user specified segment data table, defined with pairs of X (input) and Y (output) values.
2 to 101 segment points can be specified.

■ $X^{5/2}$ OUTPUT (triangular or V-notch weir)

$X_0 = X_1^{5/2} / 1000$

where X_1: Input (%)
X_0: Output (%)

■ INVERTED OUTPUT
The output is inversely proportional to the input.

$X_0 = 100 - X_1$

where X_1: Input (%)
X_0: Output (%)

■ $X^{3/2}$ OUTPUT (rectangular weir)

$X_0 = X_1^{3/2} / 10$

where X_1: Input (%)
X_0: Output (%)

■ SQUARE ROOT EXTRACTION (orifice, venturi)
The output is square root of input.

$X_0 = 10 \sqrt{X1}$

where X_1: Input (%)
X_0: Output (%)

■ OTHER FUNCTIONS
The low-end cutout point can be set within 0.0000 – 99.9999% of input signal.

⚠ Specifications are subject to change without notice.