

## Space-saving Signal Conditioners M3-UNIT Series

RS-422 line driver pulse

### FREQUENCY TRANSMITTER

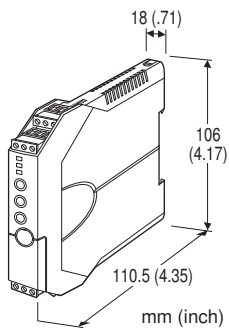
(field- and PC-configurable)

#### Functions & Features

- Converts the output from a pulse-type transducer into a standard process signal
- Sensor excitation
- 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
- Front control button function can be locked

#### Typical Applications

- Positive displacement flowmeters, turbine flowmeters and vortex flowmeters
- Measuring rotation speed of a machine generating dry contact signals



## MODEL: M3LPA2-[1]/[2][3]

### ORDERING INFORMATION

- Code number: M3LPA2-[1]/[2][3]
- Specify a code from below for each [1] through [3]. (e.g. M3LPA2-R4/A/Q)
- Specify the specification for option code /Q (e.g. /C01)
- Factory default setting:  
Input type: Open collector  
Frequency range: 0 - 100 kHz  
Sensor excitation: 12 V DC / 20 mA  
Output range: 4 - 20 mA  
Threshold: 2 V

### INPUT - Field-selectable

- Open collector
- Mechanical contact
- Voltage pulse
- Two-wire current pulse

### EXCITATION SELECTION

- 4 V DC / 20 mA
- 8 V DC / 20 mA
- 12 V DC / 20 mA

### 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

#### Other Options

blank: none

/Q: Option other than the above (specify the specification) (UL not available)

### SPECIFICATIONS OF OPTION: Q

#### COATING (For the detail, refer to M-System's web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

### 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)

**Status indicator LED:** Tri-color (green/amber/red) LED;

Blinking patterns indicate operation status of the transmitter.

**PC configurator:** Programmable features include:

- I/O type and range, threshold
- Zero and span adjustments
- User's linearization table setting (max. 101 points, specified within -15 to +115 % for both input and output)

- Sampling time (0.05 - 100 sec.)

(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**

**Measurable frequencies:** Minimum span 10 % of the frequency range selected in Table 2. (5 % for 0 - 200 kHz range)

See each input type for the maximum span.

**Pulse width time requirement:** Min. 5  $\mu$ sec., max. 10 sec.

**■ Open Collector**

**Maximum frequency:** 0 - 200 kHz

- Excitation: 4 V

**Sensing voltage/current:** Approx. 3V / 0.7 mA

**Input requirements:**

$\leq 200 \Omega / 0.2 \text{ V}$  for ON;  $\geq 2 \text{ k}\Omega / 1 \text{ V}$  for OFF

**Detecting level:** 0.6 V

- Excitation: 8 V

**Sensing voltage/current:** Approx. 6V / 1.5 mA

**Input requirements:**

$\leq 600 \Omega / 1 \text{ V}$  for ON;  $\geq 4 \text{ k}\Omega / 3 \text{ V}$  for OFF

**Detecting level:** 2 V

- Excitation: 12 V

**Sensing voltage/current:** Approx. 9V / 2.3 mA

**Input requirements:**

$\leq 400 \Omega / 1 \text{ V}$  for ON;  $\geq 2 \text{ k}\Omega / 3 \text{ V}$  for OFF

**Detecting level:** 2 V

**■ Mechanical Contact**

**Maximum frequency:** 0 - 10 Hz

- Excitation: 4 V

**Sensing voltage/current:** Approx. 3V / 0.7 mA

**Input requirements:**

$\leq 200 \Omega / 0.2 \text{ V}$  for ON;  $\geq 2 \text{ k}\Omega / 1 \text{ V}$  for OFF

**Detecting level:** 0.6 V

- Excitation: 8 V

**Sensing voltage/current:** Approx. 6V / 1.5 mA

**Input requirements:**

$\leq 600 \Omega / 1 \text{ V}$  for ON;  $\geq 4 \text{ k}\Omega / 3 \text{ V}$  for OFF

**Detecting level:** 2 V

- Excitation: 12 V

**Sensing voltage/current:** Approx. 9V / 2.3 mA

**Input requirements:**

$\leq 400 \Omega / 1 \text{ V}$  for ON;  $\geq 2 \text{ k}\Omega / 3 \text{ V}$  for OFF

**Detecting level:** 2 V

**■ Voltage Pulse**

**Maximum frequency:** 0 - 200 kHz

**Waveform:** Square or sine

**Input impedance:**  $\geq 10 \text{ k}\Omega$

**Input amplitude:** Min. 0.1 Vp-p, max. 100 V p-p (30 V rms, 42.4 V peak or 60 V DC for UL approval)

**Max. voltage between input terminals:** 100 V (30 V rms, 42.4 V peak or 60 V DC for UL approval)

**Detecting levels:** -2 - +4 V

(Detecting voltage in the internal circuit)

**■ Two-wire Current Pulse**

**Maximum frequency:** 0 - 200 kHz

**Input resistance:** Receiving resistor 100  $\Omega$

**Input range:** 0 - 25 mA

**Input amplitude:** Min. 4 mA, max. 20 mA

**Detecting levels:** -2 - +4 V

(Detecting voltage in the internal circuit)

**■ RS-422 Line Driver Pulse**

**Maximum frequency:** 0 - 200 kHz

**Receiver:** Conforms to RS-422

**OUTPUT SPECIFICATIONS****■ 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 12 V maximum

**■ DC Voltage****Narrow Spans**

**Maximum range:** -2.5 - +2.5 V DC

**Minimum span:** 250 mV

**Conformance range:** -3 - +3 V DC

**Wide Spans**

**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 1 mA maximum

## INSTALLATION

### Power Consumption

**•AC:**

Approx. 3 VA at 100 V

Approx. 4 VA at 200 V

Approx. 5 VA at 264 V

**•DC:** Approx. 3 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)

EN 61010-1

Installation Category II

Pollution Degree 2

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

Input to output: Basic insulation (300 V)

RoHS Directive

EN 50581

**Approval:**

UL/C-UL general safety requirements

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

## PERFORMANCE

**Accuracy:** Input accuracy + output accuracy

**Input accuracy:**  $\pm 0.03$  % of input range (Table 2)

**Output accuracy:**  $\pm 0.03$  % of output range (When the output span is not more than 2 mA, add 0.1 % to the accuracy)

The input accuracy is inversely proportional to the input span; while the output accuracy is likewise inversely proportional to the output span.

**Temp. coefficient:**  $\pm 0.015$  %/°C ( $\pm 0.008$  %/°F) of I/O range at -5 to +55°C [23 to 131°F]

**Response time:** 0.5 sec. + one pulse cycle or sampling time, whichever is larger (0 - 90 %)

**Line voltage effect:**  $\pm 0.1$  % over voltage range

**Insulation resistance:**  $\geq 100$  M $\Omega$  with 500 V DC

**Dielectric strength:** 1500 V AC @1 minute (input to output to power to ground)

## CALCULATION EXAMPLES OF OVERALL ACCURACY

[Example] Open collector input, 0 - 50 kHz; 1 - 5 V output.

Selected freq. range (100 kHz)  $\div$  Input span (50 kHz)  $\times$

Accuracy (0.03 %) = 0.06 % (Input accuracy)

Selected output range (20 V)  $\div$  Output span (4 V)  $\times$

Accuracy (0.03 %) = 0.15 % (Output accuracy)

Overall accuracy = 0.06 + 0.15 =  $\pm 0.21$  %

## STANDARDS & APPROVALS

**EU conformity:**

EMC Directive

EMI EN 61000-6-4

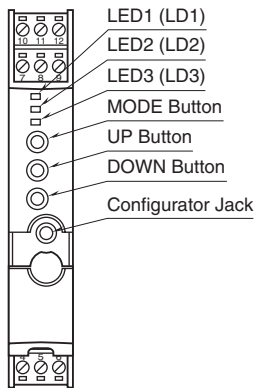
EMS EN 61000-6-2

Low Voltage Directive

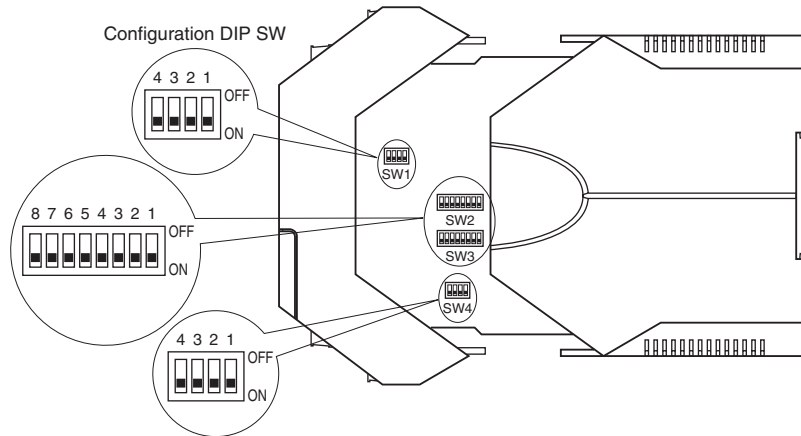


## EXTERNAL VIEW

### FRONT VIEW



### SIDE VIEW



## ADJUSTING DETECTING LEVEL

A specific sensitivity scale is applied according to the pulse amplitude by setting up the DIP switch and PC Configurator Software (model: M3CFG). The scaled input voltage is then compared to the detecting level at -2.00 through +4.00 V. For open collector input, be sure to adjust the voltage to following values if it has been changed for other input types.

Detecting level:

- 0.6 V (4 V excitation)
- 2 V (8 V / 12 V excitation)

With DC coupling, the scaled maximum input voltage level must be higher than and the scaled minimum input voltage level must be lower than the detecting level so that the pulse state is accurately detected.

**Table 1**

PULSE AMPLITUDE	MAX. VOLTAGE AT INPUT TERMINALS	SENSITIVITY SCALE
50 – 100V p-p	100V *1	1/20
25 – 50V p-p	50V *2	1/10
10 – 25V p-p	25V	1/5
5 – 10V p-p	10V	1/2
1 – 5V p-p	5V	1
0.5 – 1V p-p	1V	5
0.1 – 0.5V p-p*3	0.5V	10
Open collector Mechanical contact 2-wire current pulse	----	1

\*1. 30V rms, 42.4V peak or 60V DC for UL approval

\*2. 30V rms, 42.4V peak or 50V DC for UL approval

\*3. Input frequency ≤50 kHz

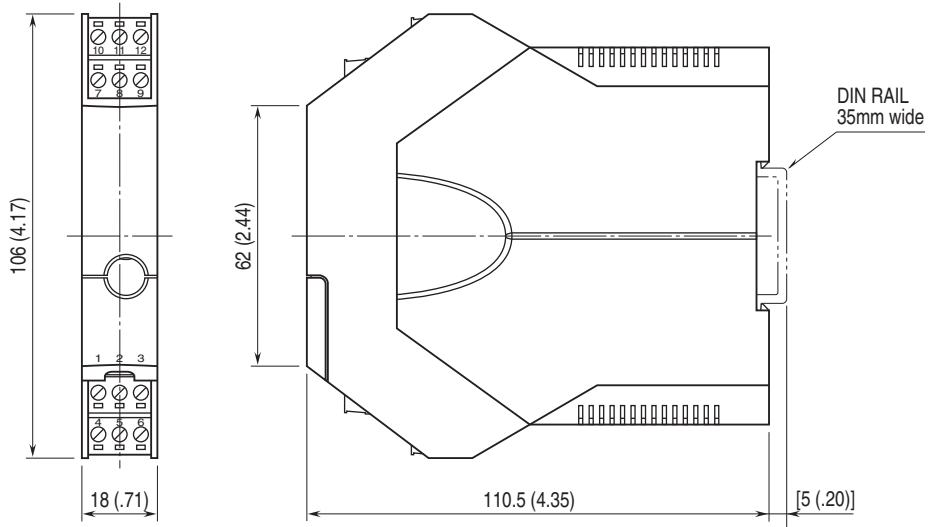
Choose the noise filter type appropriate for the selected frequency range to ensure the described accuracy. Time constant is set to 50 msec. with the 'large' noise filter setting and to 10 msec. with the 'small' noise filter setting.

**Table 2**

FREQUENCY RANGE	NOISE FILTER
0 – 10 Hz	Small
0 – 100 Hz	Small
0 – 1 kHz	Small
0 – 10 kHz	None
0 – 200 kHz	None



**EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)**

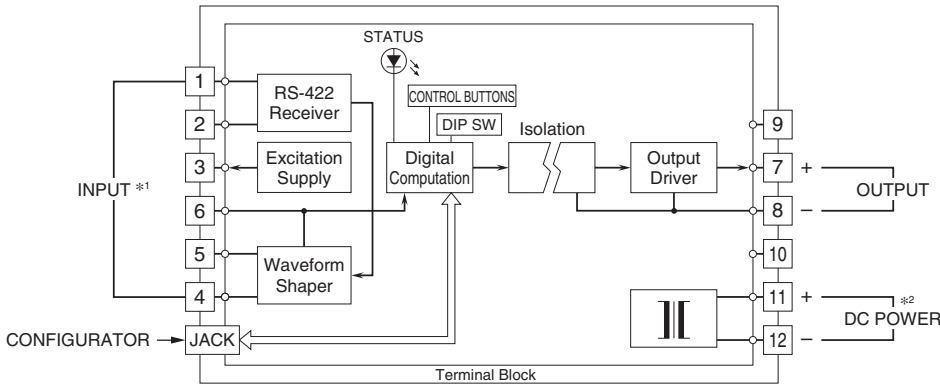


• When mounting, no extra space is needed between units.

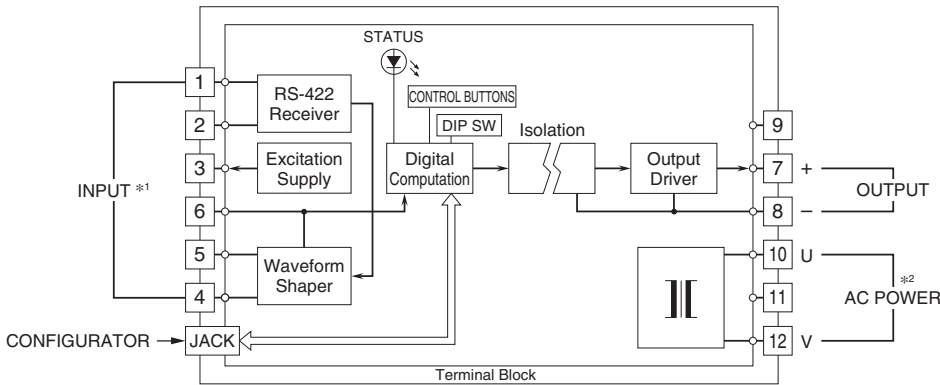


## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

### DC POWERED TYPE



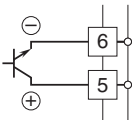
### AC POWERED TYPE



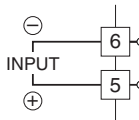
\*2. Be aware that the AC power and DC power connect to different terminals.

\*1. Input Connection Examples

#### Open Collector

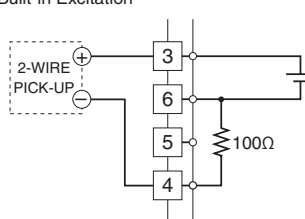


#### Voltage Pulse

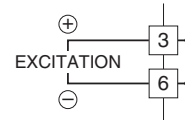


#### Two-wire Current Pulse

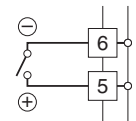
• Built-in Excitation



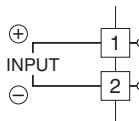
#### Excitation Supply



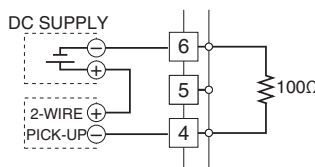
#### Mechanical Contact



#### RS-422 Line Driver Pulse



• External DC Supply



Specifications are subject to change without notice.