

## Super-mini Signal Conditioners Mini-M Series

### FREQUENCY TRANSMITTER

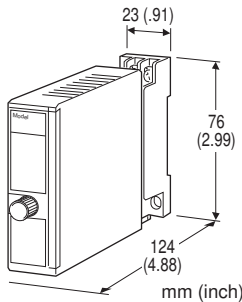
(PC programmable)

#### Functions & Features

- Converts the output from a pulse-type transducer into a standard process signal
- PC programmable
- Sensor excitation
- Direct RS-422 input

#### Typical Applications

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



### MODEL: M2XPA3-[1][2][3]-[4][5]

#### ORDERING INFORMATION

- Code number: M2XPA3-[1][2][3]-[4][5]
- Specify a code from below for each [1] through [5].  
(e.g. M2XPA3-A14Z1-R/CE/Q)
- Input frequency (e.g. 0 - 10 kHz)
  - Output (e.g. 0 - 10 mA)
  - Specify the specification for option code /Q (e.g. /C01/S01)
  - Non-specified orders will be shipped at the default factory settings as shown in below. However, a power suffix code must be specified.
- If you specify a full code number without specific calibration ranges, the input and output ranges are factory set to the default range.
- Use Ordering Information Sheet (No. ESU-5104).

#### [Factory default setting]

##### PARAMETER: DEFAULT

Input type: Open collector  
Input amplitude: ----

Pulse sensing: DC coupled  
Noise filter: None  
Detecting level: 2 V  
Frequency range: 0 - 200 kHz  
Input zero frequency: 0 Hz  
Input span frequency: 100 kHz  
Linearization: No linearization  
Low-end cutout: 0 % (No cutout)  
Moving averaging samples: 1  
Sensor excitation: 12 V DC / 20 mA  
Output type: DC current  
Output 0%: 4mA  
Output 100%: 20mA

#### [1] INPUT

**A1:** Open collector  
**A2:** Mechanical contact  
**B:** Voltage pulse  
**G:** Two-wire current pulse  
**J:** RS-422 line driver pulse

Configurator software is used to change the frequency range. The input type can be switched to other than the one of the selected suffix code by selecting the input type selectors inside the unit before software adjustment.

#### [2] EXCITATION

**2:** 4 V DC / 20 mA  
**3:** 8 V DC / 20 mA  
**4:** 12 V DC / 20 mA

Configurator software is used to change the excitation value.

#### [3] OUTPUT

**Current**  
**Z1:** Range 0 - 20 mA DC

**Voltage**  
**V1:** Range -2.5 - +2.5 V DC  
**V2:** Range -10 - +10 V DC

(Configurator software is used to adjust the output range and to change the output over the described range of the selected suffix code.)

## [4] POWER INPUT

### AC Power

**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  
(Operational voltage range 24 V  $\pm$ 10 %, ripple 10 %p-p max.)  
**P:** 110 V DC  
(Operational voltage range 85 – 150 V, ripple 10 %p-p max.)  
(110 V  $\pm$ 10 % for UL)

## [5] OPTIONS (multiple selections)

### 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)

### 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 (UL not available)

#### TERMINAL SCREW MATERIAL

**/S01:** Stainless steel (UL not available)

## RELATED PRODUCTS

- PC configurator software (model: JXCON)

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:** Plug-in

**Connection:** M3 screw terminals (torque 0.8 N·m)

**Screw terminal:** Chromated steel (standard) or stainless steel

**Housing material:** Flame-resistant resin (black)

**Isolation:** Input to output to power

**Overrange output:** Approx. -15 to +115 % at 1 – 5 V

**Zero adjustment:** -5 to +5 % (front)

**Span adjustment:** 95 to 105 % (front)

**Configuration:** Via PC Configurator Software (model: JXCON) on the Windows PC connected to the front jack.

**Programmable features include:**

- I/O type and range
- Detecting level
- Sensor excitation
- Zero and span adjustments
- Low-end cutout
- Linearization
- Sample number for the moving average

### DIP switch settings:

- Input Type
- Pulse Sensing (Capacitor coupled, DC coupled)
- Noise Filter (High, Low, None)

**Status indicator LED:** Blinking patterns indicate different operating status of the transmitter.

**Excitation adjustment:** 4 V, 8 V or 12 V DC

**Configurator connection:** 2.5 dia. miniature jack; RS-232-C level

**Low-end cutout:** 0 – 115 % programmable;

No cutout with 0 % setting; hysteresis fixed at 1 % (factory set to: No cutout)

## INPUT SPECIFICATIONS

**Excitation:** Shortcircuit protection; 30 mA max. at shortcircuit

**Frequency ranges:**

0 - 10 mHz, 0 - 100 mHz, 0 - 1 Hz, 0 - 10 Hz, 0 - 100 Hz, 0 - 1 kHz, 0 - 10 kHz, 0 - 200 kHz

(up to 10 Hz for mechanical contact)

If not specified, Input frequency factory default will be 0 - 100 kHz.

(0 - 10 Hz for mechanical contact)

**Minimum pulse width time requirement:** 2.5  $\mu$ sec. for both ON and OFF. (50 msec. for mechanical contact)

**Minimum span:** 10 % of the selected frequency range (5 % of the selected frequency range when the range is 0 - 200 kHz.)

**Noise filter:** See Table 2

Choose the noise filter type appropriate for the selected frequency range to ensure the described accuracy.

■ **Open Collector & Mechanical Contact**

**Input requirements**

EXC	SENSING	OFF	ON
4V	Approx. 3V/0.7mA	$\geq 2k\Omega/1V$	$\leq 200\Omega/0.2V$
8V	Approx. 6V/1.5mA	$\geq 4k\Omega/3V$	$\leq 600\Omega/1V$
12V	Approx. 9V/2.3mA	$\geq 2k\Omega/3V$	$\leq 400\Omega/1V$

**Detecting level (detecting voltage in the internal circuit)**

**factory default:** 0.6 V (4 V excitation)  
2 V (8 V / 12 V excitation)

■ **Voltage Pulse**

**Waveform:** Square or sine

**Input impedance:**  $\geq 10\ k\Omega$

**Input amplitude:** Min. 0.1 Vp-p, max. 100 Vp-p

**Max. voltage between input terminals:** See table 1.

**Detecting level (detecting voltage in the internal circuit):**

-2 - +4 V

■ **Two-wire Current Pulse**

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

**Input range:** 0 - 25 mA

**Input amplitude:** Min. 10 mAp-p, max. 25 mAp-p

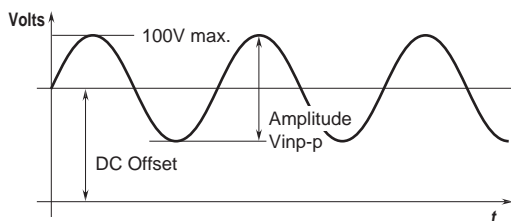
**Detecting level (detecting voltage in the internal circuit):**

-2 - +4 V

■ **RS-422 Line Driver Pulse**

**Receiver:** Conforms to RS-422

■ **VOLTAGE PULSE**



[Table 1]

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

\*Limited to  $\leq 70V$  for CE conformance or UL approval.

\*\*Input frequency  $\leq 50\ kHz$

A specific sensitivity scale is applied according to the pulse amplitude by setting up the DIP switch and PC Configurator Software (model: JXCON). The scaled input voltage is then compared to the detecting level at -2.00 through +4.00V. 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 2]

FREQUENCY RANGE	NOISE FILTER
0 - 10 mHz	High
0 - 100 mHz	High
0 - 1 Hz	Low
0 - 10 Hz	Low
0 - 100 Hz	Low
0 - 1 kHz	Low
0 - 10 kHz	None
0 - 200 kHz	None

Choose the noise filter type appropriate for the selected frequency range to ensure the described accuracy.

## OUTPUT SPECIFICATIONS

### ■ DC Current

**Output range:** 0 - 20 mA DC

**Conformance range:** 0 - 24 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 12 V max.

(e.g. 4 - 20 mA: 600 Ω [12 V ÷ 20 mA])

If not specified, the output range is 4 - 20 mA DC.

### ■ DC Voltage

**Code V1 (narrow spans)**

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

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

**Minimum span:** 250 mV

**Code V2 (wide spans)**

**Conformance range:** -11.5 - +11.5 V DC

**Output range:** -10 - +10 V DC

**Minimum span:** 1 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.

V1: 0 - 1 V DC

V2: 1 - 5 V DC

## INSTALLATION

### Power Consumption

#### •AC:

Approx. 4 VA at 100 V

Approx. 5 VA at 200 V

Approx. 6 VA at 264 V

#### •DC: Approx. 2 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 lb)

## PERFORMANCE

**Accuracy:** Input accuracy + output accuracy

Inversely proportional to the span.

**Input accuracy:** ±0.03 % of the selected freq. range

(The input span 100 kHz is used for calculation with 0 - 200

kHz range. The input accuracy is fixed at ±0.03 % when

[Frequency range ÷ Input span] equals 1 or less.)

**Output accuracy:** ±0.03 % of the selected output range

See CALCULATION EXAMPLES OF OVERALL ACCURACY.

**Temp. coefficient:** ±0.015 %/°C (±0.008 %/°F) of I/O range

at -5 to +55°C [23 to 131°F]

**Response time:** 0.5 sec. + 1 pulse cycle (0 - 90 %)

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

Selected freq. range (100 kHz) ÷ Input span (50 kHz) ×

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

Selected output range (20 V) ÷ Output span (4 V) ×

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

Overall accuracy = 0.06 + 0.15 = ±0.21 %

## STANDARDS & APPROVALS

### EU conformity:

EMC Directive

EMI EN 61000-6-4

EMS EN 61000-6-2

Low Voltage Directive

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 nonincendive Class I, Division 2,

Groups A, B, C, and D

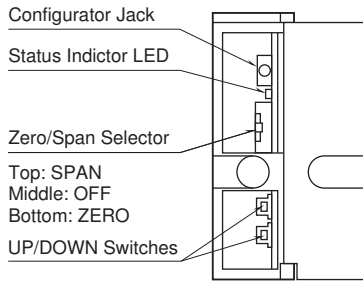
(ANSI/ISA-12.12.01, CAN/CSA-C22.2 No.213)

UL/C-UL general safety requirements

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

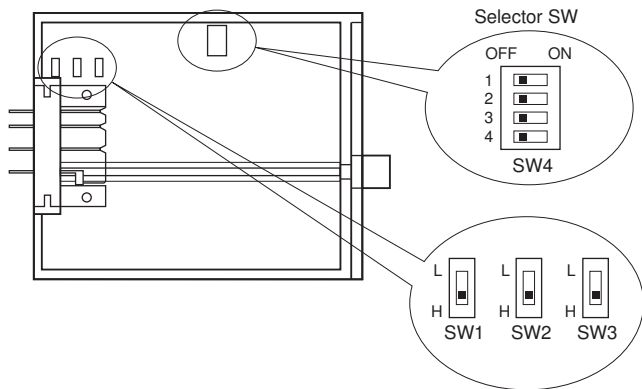
## EXTERNAL VIEW

FRONT VIEW (with cover open)



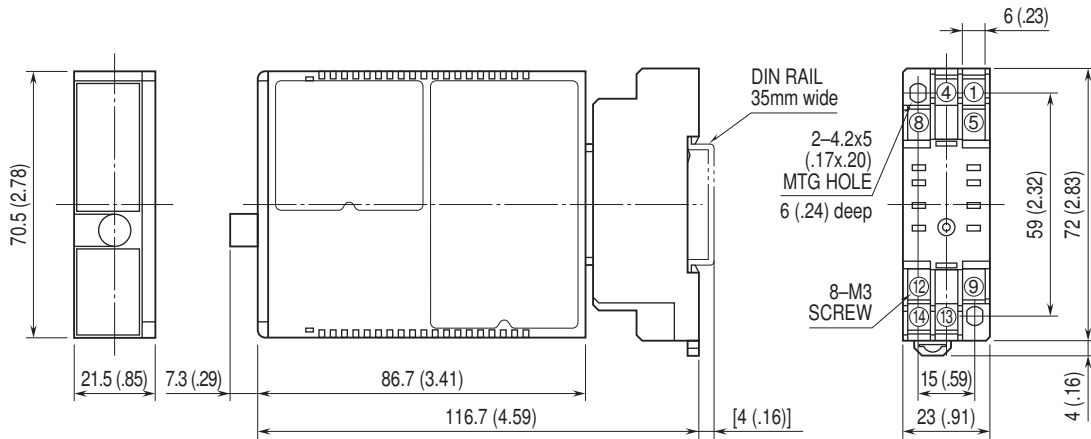
The front cover cannot be opened to 180 deg. when flush with neighboring units.

LEFT SIDE VIEW (with cover removed)



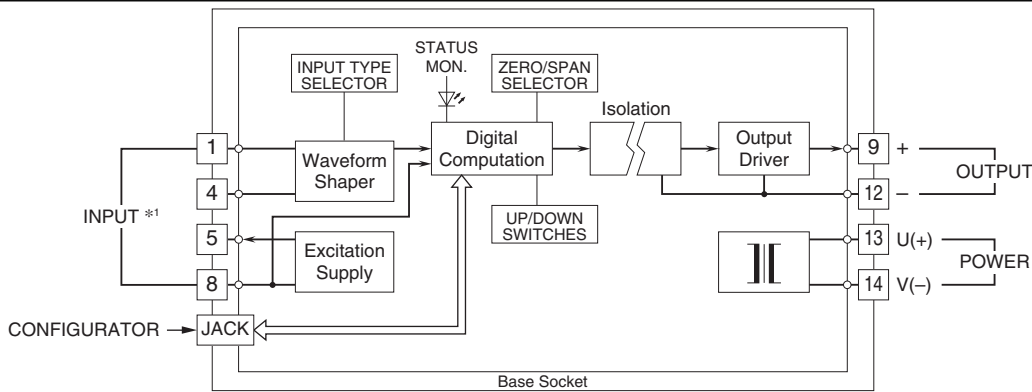
Refer to the instruction manual for detailed procedures.

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



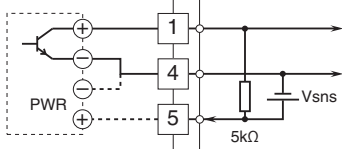
• When mounting, no extra space is needed between units.

## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

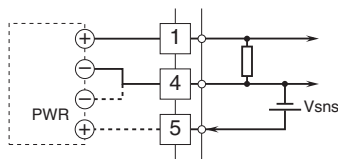


### \*1. Input Connection Examples

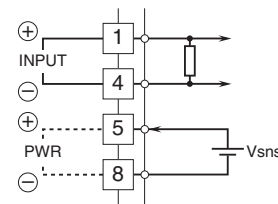
#### ■ Open Collector or Mechanical Contact



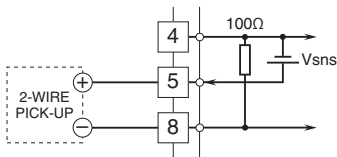
#### ■ Voltage Pulse



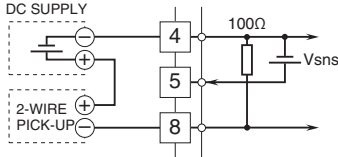
#### ■ RS-422 Line Driver Pulse



#### ■ 2-Wire Current Pulse • Built-in Excitation



#### • External DC Supply



## EXPLANATIONS OF TERMS

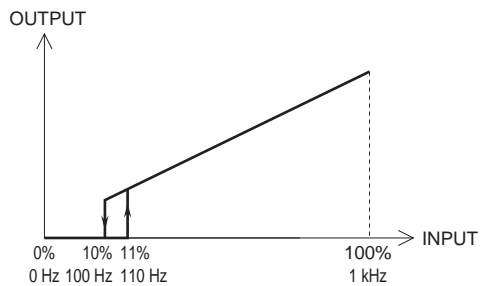
### Low-end cutout:

The function where the output signal is forced to 0% below the setpoint input. Hysteresis is fixed at 1%.

[Example] Input zero frequency 0 Hz

Input span frequency 1 kHz

Low-end cutout 10 %



Specifications are subject to change without notice.