

Plug-in Signal Conditioners M-UNIT

DC/FREQUENCY CONVERTER

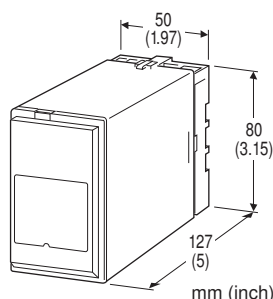
(field-configurable)

Functions & Features

- Providing a pulse rate output in proportion to DC input signal
- Frequency range adjustable with a front-mounted 16-position rotary switch and potentiometer
- Low-end cutout adjustable
- Isolation up to 2000 V AC
- High-density mounting

Typical Applications

- Totalizing applications in combination with a counter



MODEL: APU-[1][2]-[3][4]

ORDERING INFORMATION

- Code number: APU-[1][2]-[3][4]
- Specify a code from below for each of [1] through [4].
(e.g. APU-61-B/Q)
- Special input range (For codes Z & 0)
- Output frequency range (e.g. 0 – 500 Hz)
- Specify the specification for option code /Q
(e.g. /C01/S01)

[1] INPUT

Current

- A: 4 – 20 mA DC (Input resistance 250 Ω)
- A1: 4 – 20 mA DC (Input resistance 50 Ω)
- B: 2 – 10 mA DC (Input resistance 500 Ω)
- C: 1 – 5 mA DC (Input resistance 1000 Ω)
- D: 0 – 20 mA DC (Input resistance 50 Ω)
- E: 0 – 16 mA DC (Input resistance 62.5 Ω)
- F: 0 – 10 mA DC (Input resistance 100 Ω)
- G: 0 – 1 mA DC (Input resistance 1000 Ω)
- H: 10 – 50 mA DC (Input resistance 100 Ω)
- Z: Specify current (See INPUT SPECIFICATIONS)

Voltage

- 1: 0 – 10 mV DC (Input resistance 10 k Ω min.)
- 15: 0 – 50 mV DC (Input resistance 10 k Ω min.)
- 16: 0 – 60 mV DC (Input resistance 10 k Ω min.)
- 2: 0 – 100 mV DC (Input resistance 100 k Ω min.)
- 3: 0 – 1 V DC (Input resistance 1 M Ω min.)
- 4: 0 – 10 V DC (Input resistance 1 M Ω min.)
- 5: 0 – 5 V DC (Input resistance 1 M Ω min.)
- 6: 1 – 5 V DC (Input resistance 1 M Ω min.)
- 4W: -10 – +10 V DC (Input resistance 1 M Ω min.)
- 0: Specify voltage (See INPUT SPECIFICATIONS)

[2] OUTPUT

- 1: Open collector (max. frequency 10 kHz)
- 2: 5 V pulse (max. frequency 10 kHz)
- 3: Relay contact (max. 130 pulses/min.)
- 4: Low frequency open collector (max. 130 pulses/min.)
- 5: Low frequency 5 V pulse (max. 130 pulses/min.)
- 6: 24 V pulse (max. 130 pulses/min.)
- 7: Middle range frequency open collector (max. 312 Hz)
- 8: Middle range frequency 5 V voltage pulse (max. 312 Hz)

[3] POWER INPUT

AC Power

- B: 100 V AC
- C: 110 V AC
- D: 115 V AC
- F: 120 V AC
- G: 200 V AC
- H: 220 V AC
- J: 240 V AC

DC Power

- S: 12 V DC
- R: 24 V DC
- V: 48 V DC

[4] OPTIONS

blank: none

/Q: With options (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

TERMINAL SCREW MATERIAL

/S01: Stainless steel

GENERAL SPECIFICATIONS

Construction: Plug-in
Connection: M3.5 screw terminals
Screw terminal: Chromated steel (standard) or stainless steel
Housing material: Flame-resistant resin (black)
Isolation: Input to output to power
Zero adjustment: 0 – 5 % (front)
Span adjustment: 50 – 100 % of range (front)
Output frequency adjustment: Preselecting range with a rotary switch and fine control with span adjustment (50 – 100 %)
Output pulse width adjustment: Three-turn screwdriver adjustment (front)
Low-end cutout: 0 to 10 % (front); a red LED assists in adjusting the cutout point; turns on during the cutout.

INPUT SPECIFICATIONS

■ **DC Current:**
 Shunt resistor attached to the input terminals (0.5 W)
 Specify input resistance value for code Z.
 ■ **DC Voltage:** -300 – +300 V DC
Minimum span: 10 mV
Offset: Max. 1.5 times span
Input resistance
 Span 10 – 100 mV : $\geq 10 \text{ k}\Omega$
 Span 0.1 – 1 V : $\geq 100 \text{ k}\Omega$
 Span $\geq 1 \text{ V}$: $\geq 1 \text{ M}\Omega$

OUTPUT SPECIFICATIONS

Note: For factory setting, maximum frequency of the selected range is used to determine pulse width. Pulse width is adjusted until the duty ratio becomes 50 % of the maximum frequency. If this value lies outside of the adjustable range, either maximum or minimum selectable value will be used.

■ **Open Collector:**
 50 V DC @ 50 mA (resistive load)
Frequency range: 0 – 10 kHz
ON pulse width: 40 μ sec. – 0.8 msec. adjustable
Saturation voltage: 0.6 V DC
 ■ **Low Frequency Open Collector:**
 50 V DC @ 50 mA (resistive load)
Frequency range: 0 – 130 pulses/min.
ON pulse width: 40 msec. – 0.8 sec. adjustable
Saturation voltage: 0.6 V DC
 ■ **Middle Range Frequency Open Collector:**
 50 V DC @ 50 mA (resistive load)
Frequency range: 0 – 312 Hz
ON pulse width: 2 – 35 msec. adjustable
Saturation voltage: 0.6 V DC

■ **Relay Contact:** 120 V AC @ 200 mA ($\cos \theta = 1$)
 240 V AC @ 100 mA ($\cos \theta = 1$)
 24 V DC @ 200 mA (resistive load)
Maximum switching voltage: 380 V AC or 125V DC
Maximum switching power: 24 VA or 4.8 W
Minimum load: 5 V DC @ 10 mA
Frequency range: 0 – 130 pulses/min.
ON pulse width: 40 msec. – 0.8 sec. adjustable
Relay life:
 $\geq 5 \times 10^7$ cycles (mechanical)
 $\geq 10^5$ cycles (electrical)

■ **5 V Pulse**
Frequency range: 0 – 10 kHz
Low pulse width: 40 μ sec. – 0.8 msec. adjustable
High level: 5 V $\pm 10 \%$
Low level: $\leq 0.5 \text{ V}$
Load resistance: 600 Ω min.
 ■ **Middle Range Frequency 5 V Pulse**
Frequency range: 0 – 312 Hz
Low pulse width: 2 – 35 msec. adjustable
High level: 5 V $\pm 10 \%$
Low level: $\leq 0.5 \text{ V}$
Load resistance: 600 Ω min.
 ■ **Low Frequency 5 V Pulse**
Frequency range: 0 – 130 pulses/min.
Low pulse width: 40 msec. – 0.8 sec. adjustable
High level: 5 V $\pm 10 \%$
Low level: $\leq 0.5 \text{ V}$
Load resistance: 600 Ω min.
 ■ **24 V Pulse**
Frequency range: 0 – 130 pulses/min.
High pulse width: 40 msec. – 0.8 sec. adjustable
High level: 24 V $\pm 10 \%$
Low level: $\leq 0.5 \text{ V}$
Load current: 30 mA max.
Load resistance: 800 Ω min.

• Open Collector, 5V Pulse

SW No.	SPAN RANGE	
	MIN. (50%)	MAX. (100%)
0	0 – 5 kHz	0 – 10 kHz
1	0 – 2.5 kHz	0 – 5 kHz
2	0 – 1.25 kHz	0 – 2.5 kHz
3	0 – 625 Hz	0 – 1.25 kHz
4	0 – 312 Hz	0 – 625 Hz
5	0 – 156 Hz	0 – 312 Hz
6	0 – 78 Hz	0 – 156 Hz
7	0 – 39 Hz	0 – 78 Hz
8	0 – 20 Hz	0 – 39 Hz
9	0 – 10 Hz	0 – 20 Hz
A	0 – 5 Hz	0 – 10 Hz
B	0 – 2.5 Hz	0 – 5 Hz
C	0 – 1.25 Hz	0 – 2.5 Hz
D	0 – 36 pulses/min.	0 – 1.25 Hz
E	0 – 18 pulses/min.	0 – 36 pulses/min.
F	0 – 9 pulses/min.	0 – 18 pulses/min.

• Middle Range Frequency Open Collector & 5V Pulse

SW No.	SPAN RANGE	
	MIN. (50%)	MAX. (100%)
0	Not Used	Not Used
1	Not Used	Not Used
2	Not Used	Not Used
3	Not Used	Not Used
4	Not Used	Not Used
5	0 – 156 Hz	0 – 312 Hz
6	0 – 78 Hz	0 – 156 Hz
7	0 – 39 Hz	0 – 78 Hz
8	0 – 20 Hz	0 – 39 Hz
9	0 – 10 Hz	0 – 20 Hz
A	0 – 5 Hz	0 – 10 Hz
B	0 – 2.5 Hz	0 – 5 Hz
C	0 – 1.25 Hz	0 – 2.5 Hz
D	0 – 36 pulses/min.	0 – 1.25 Hz
E	0 – 18 pulses/min.	0 – 36 pulses/min.
F	0 – 9 pulses/min.	0 – 18 pulses/min.

Line voltage effect: ± 0.1 % over voltage range

Insulation resistance: ≥ 100 M Ω with 500 V DC

Dielectric strength: 2000 V AC @1 minute (input to output to power to ground)

• Relay Contact, Low-Freq. Open Collector & 5V Pulse, 24V Pulse

SW No.	SPAN RANGE	
	MIN. (50%)	MAX. (100%)
0	0 – 65 pulses/min.	0 – 130 pulses/min.
1	0 – 32 pulses/min.	0 – 65 pulses/min.
2	0 – 16 pulses/min.	0 – 32 pulses/min.
3	0 – 8 pulses/min.	0 – 16 pulses/min.
4	0 – 4 pulses/min.	0 – 8 pulses/min.
5	0 – 2 pulses/min.	0 – 4 pulses/min.
6	0 – 1 pulses/min.	0 – 2 pulses/min.
7	0 – 0.5 pulses/min.	0 – 1 pulses/min.
8	0 – 0.25 pulses/min.	0 – 0.5 pulses/min.
9	0 – 8 pulses/hour	0 – 0.25 pulses/min.
A	0 – 4 pulses/hour	0 – 8 pulses/hour
B	0 – 2 pulses/hour	0 – 4 pulses/hour
C	0 – 1 pulses/hour	0 – 2 pulses/hour
D	0 – 0.5 pulses/hour	0 – 1 pulses/hour
E	0 – 0.24 pulses/hour	0 – 0.5 pulses/hour
F	0 – 0.12 pulses/hour	0 – 0.24 pulses/hour

INSTALLATION

Power input

• **AC:** Operational voltage range: rating ± 10 %, 50/60 ± 2 Hz, approx. 2 VA

• **DC:** operational voltage range: rating ± 10 %

(ripple 10 %p-p max.)
approx. 2 W (70 mA at 24 V)

Operating temperature: -5 to +60°C (23 to 140°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Mounting: Surface or DIN rail

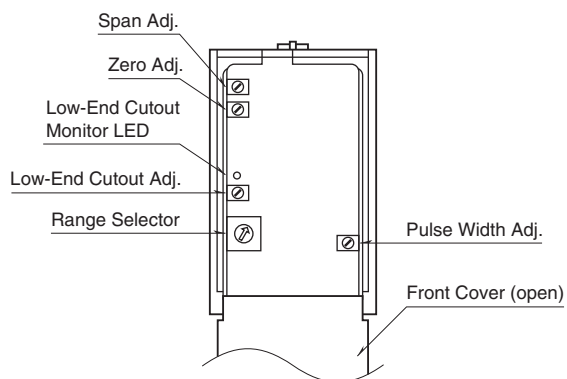
Weight: 350 g (0.77 lb)

PERFORMANCE in percentage of span

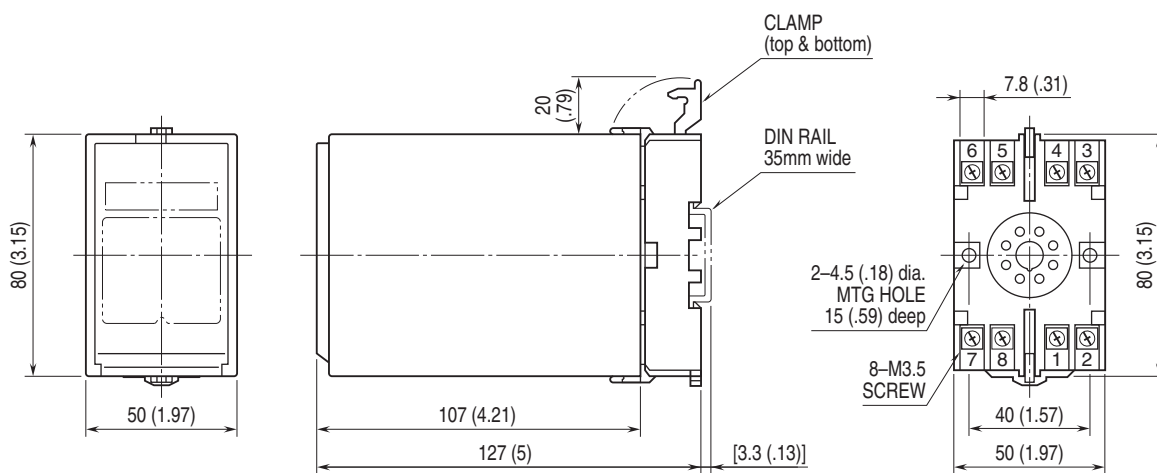
Accuracy: ± 0.25 %

Temp. coefficient: ± 0.05 %/°C (± 0.03 %/°F)

EXTERNAL VIEW

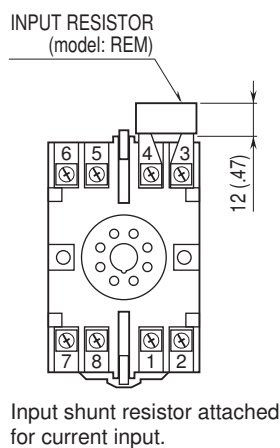


EXTERNAL DIMENSIONS unit: mm (inch)

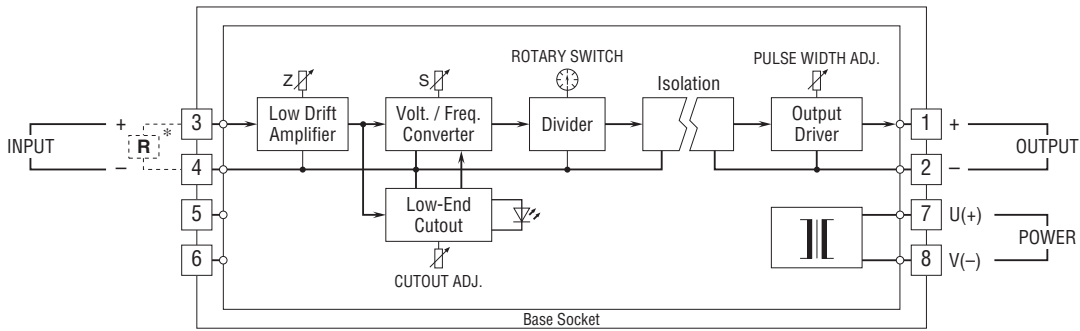


• When mounting, no extra space is needed between units.

TERMINAL ASSIGNMENTS unit: mm (inch)

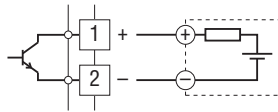


SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

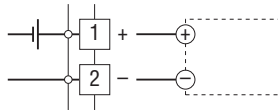


Output Connection Examples

■ Open Collector

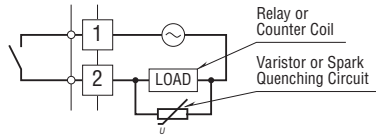


■ Voltage Pulse

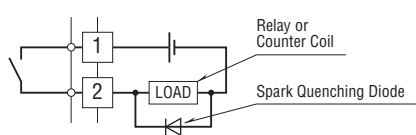


■ Relay Contact

• AC Powered

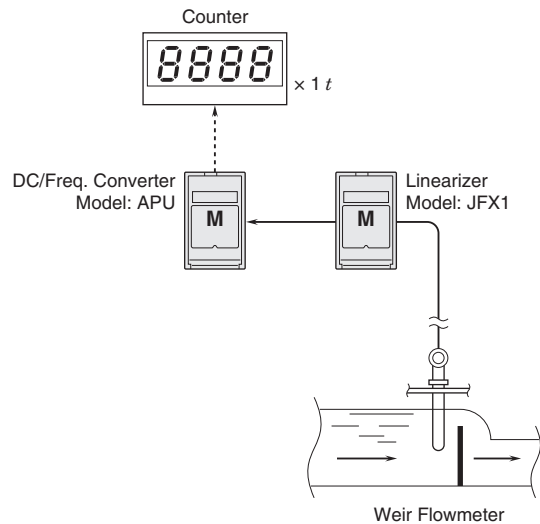
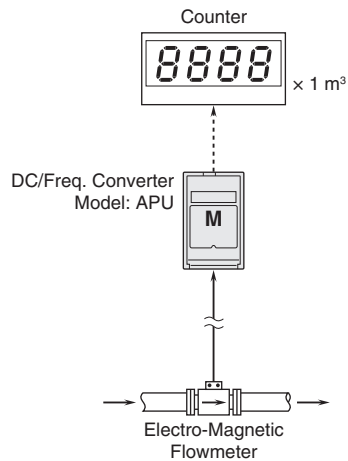


• DC Powered

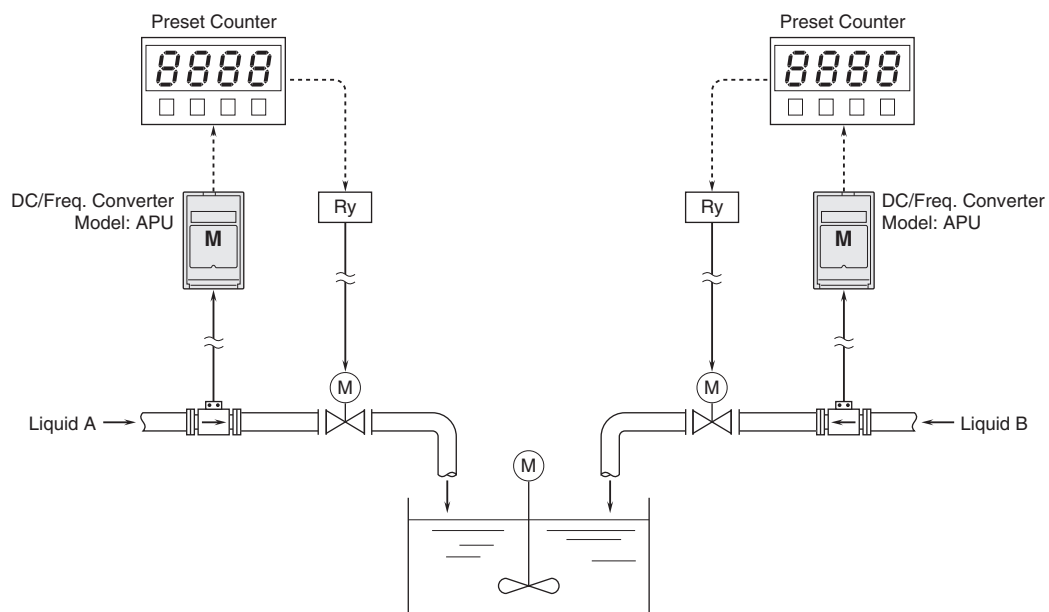


APPLICATION EXAMPLES

■ Integrating Flow Signal



■ Setting Ingredient Volume to be Blended in Actual Engineering Unit



Specifications are subject to change without notice.