

**Space-saving Two-wire Signal Conditioners B3-UNIT**

**FREQUENCY TRANSMITTER**  
(field-configurable)

MODEL **B3FP**

**MODEL & SUFFIX CODE SELECTION**

MODEL \_\_\_\_\_ **B3FP**

**INPUT SELECTION**  
 Open Collector  
 Voltage Pulse  
 Two-wire Current Pulse

**OUTPUT**  
 4 – 20mA DC

**SUPPLY VOLTAGE**  
 12 – 45V DC

**OPTIONS**  
 /UL : UL approval

**ORDERING INFORMATION**

Specify code number. Orders will be shipped at default factory settings as shown in the table below.

Ordering example:

- Code number (e.g. B3FP)

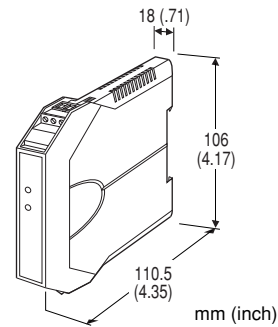
ITEM	DEFAULT
Input type	Voltage pulse
Frequency range	0 – 1000 Hz
Pulse amplitude	5V p-p
DC offset	2.5V
Pulse sensing	DC coupled
Noise filter	None
Detecting level	High (2V)

**GENERAL SPECIFICATIONS**

- Connection:** Removable terminal block
- Housing material:** Flame-resistant resin
- Isolation:** Input to output
- Pulse sensing:** Capacitor or DC coupled selectable with DIP switches
- DIP/rotary switches:** For input range calibration
- Noise filter:** Chattering protection filter selectable with DIP switches (time constant 1 msec.)

**INPUT & OUTPUT**

- Measurable frequencies:** 0 – 0.01 Hz through 100 kHz; Since waves with frequencies lower than 0.1 Hz cannot be detected with capacitor coupling.
- Pulse width time requirement:** Min. 4  $\mu$ sec. for both H and L levels



**Functions & Features**

- Converts the output from a pulse-type transducer into a 4 – 20mA DC signal
- DIP switch configurable input range
- Monitor terminals
- High-density mounting
- CE marking
- UL approval

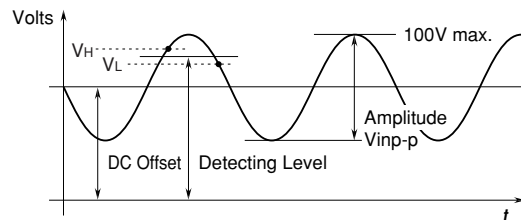
- DC offset:** Selectable within the maximum voltage for respective input amplitude setting specified in Table 3. (e.g. For the input amplitude 2V p-p with the maximum voltage 10V, DC offset can be as low as -9V and as high as +9V.)
- Frequency offset:** Selectable up to 50% of the full-scale frequency.

**OPEN COLLECTOR**

- Sensing voltage/current:** Approx. 2.5V DC @1mA
- Detecting levels:**  $\geq 3.0k\Omega$  for OFF;  $\leq 750\Omega$  for ON

**VOLTAGE PULSE**

- Waveform:** Square or sine
- Input impedance:** 10k $\Omega$  minimum
- Input amplitude:** Min. 0.1V p-p, max. 200V p-p
- Max. voltage between input terminals:** 100V (Max. voltage across the input terminals: 70V for CE conformity; 30V rms, 42.4V peak or 60V DC for UL approval)
- Detecting level:** See Table 5.



**■TWO-WIRE CURRENT PULSE**

**Input resistance:** Receiving resistor 200Ω

**Input range:** 0 – 25mA

**Detecting level:** See Table 5.

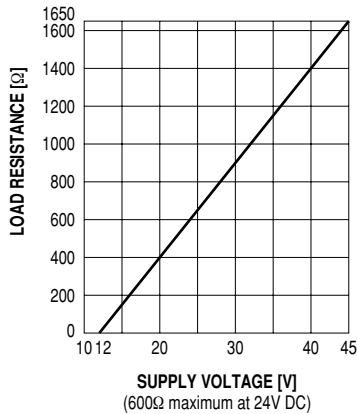
(Convert current into voltage using the receiving resistor value.)

**■OUTPUT: 4 – 20mA DC**

**Load resistance vs. supply voltage:**

$$\text{Load Resistance } (\Omega) = \frac{\text{Supply Voltage (V)} - 12 \text{ (V)}}{0.02 \text{ (A)}}$$

(including leadwire resistance)



**INSTALLATION**

**Supply voltage:** 12 – 45V DC

**Operating temperature:** -40 to +85°C (-40 to +185°F)  
Max. 55°C (131°F) for UL approval

**Operating humidity:** 0 to 95% RH (non-condensing)

**Mounting:** DIN rail

**Dimensions:** W18×H106×D110.5 mm  
(0.71"×4.17"×4.35")

See General Spec. Sheet Figure A-1.

**Weight:** 80 g (2.8 oz.)

**Terminal assignment:** See General Spec. Sheet Figure B-1.

**PERFORMANCE in percentage of span**

**Accuracy:** ±0.1% (±0.3% for frequencies below 10 Hz for sine waves detected with capacitor coupling)

**Temp. coefficient:** ±0.02%/°C (±0.01%/°F)

**Response time:** ≤0.5 seconds + input pulse cycle (0 – 90%)

**Insulation resistance:** ≥100MΩ with 500V DC

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

**STANDARDS & APPROVALS**

**CE conformity:** EMC Directive (89/336/EEC)

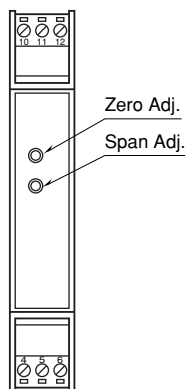
EMI EN61000-6-4

EMS EN61000-6-2

**Approval:** UL/C-UL general safety requirements  
(UL 61010-1, CAN/CSA-C22.2 No.1010-1)

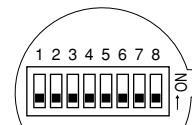
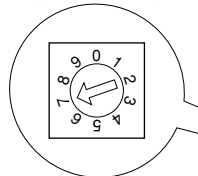
**EXTERNAL & INTERNAL VIEWS**

**■FRONT VIEW**



**■SIDE VIEW**

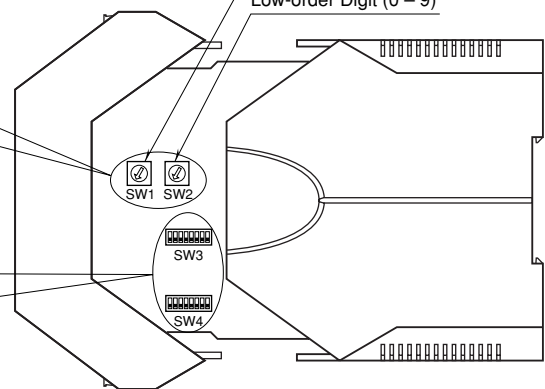
Configuration Rotary SW



Configuration DIP SW

High-order Digit (0 – 9)

Low-order Digit (0 – 9)



## DIP SWITCH SETTINGS

### ■ INPUT TYPE (SW3) Table 1

With the current input configuration (SW3-1 ON), DO NOT apply voltage input.

INPUT	SW3-1	SW3-2
Open Collector		■
Voltage Pulse		
Two-wire Current Pulse	■	

■ = ON

### ■ FREQUENCY RANGE (SW3) Table 2

Choose the maximum required range.

Exact 100% frequency is set with SW1 and SW2 rotary switches. SW settings correspond to the ranges of maximum frequency as shown below. SW1 = High-order digit. SW2 = Low-order digit.

MAX. FREQUENCY	SW1 / SW2	SW3-4	SW3-5	SW3-6
10 – 100 kHz	0 / 1 – 1 / 0	■	■	■
1 – 99 kHz	0 / 1 – 9 / 9	■	■	
0.1 – 9.9 kHz	0 / 1 – 9 / 9	■		■
10 – 990 Hz	0 / 1 – 9 / 9	■		
1 – 99 Hz	0 / 1 – 9 / 9		■	■
0.1 – 9.9 Hz	0 / 1 – 9 / 9		■	
10 – 990 mHz	0 / 1 – 9 / 9			■
10 – 99 mHz	1 / 0 – 9 / 9			

### ■ PULSE AMPLITUDE (SW4) Table 3

Choose '0.1 – 2V p-p' for open collector input.

AMPLITUDE	MAX. VOLT	SW4-1	SW4-2
0.1 – 2V p-p	2V	■	
2 – 10V p-p	10V	■	■
10 – 200V p-p	100V*		■

\*Max. 70V for CE conformance.

### ■ DETECTING LEVEL (SW4) Table 4

Choose 'High Level' for open collector input.

DETECTING LEVEL	SW4			
	5	6	7	8
Zero-Cross			■	
Low Level	■			
Middle Level		■		■
High Level				■

### ■ DETECTING LEVEL v.s. PULSE AMPLITUDE Table 5

DETECTING LEVEL	0.1 – 2V p-p	2 – 10V p-p	10 – 200V p-p	DEADBAND	
Zero-Cross	0V	0V	0V	±15% of Amplitude	≥±45mV**
Low Level	45mV	60mV	300mV		≥±40mV**
Middle Level	200mV	400mV	2V		≥±80mV**
High Level	1V	2V	10V	±40% of Detecting Level	

\*\*Minimum deadband required for the amplitude 0.1 – 2 Vp-p.

### ■ FREQUENCY OFFSET (SW3) Table 6

The offset is defined by the following equation:

$$\text{Offset} = \frac{0\% \text{ Input}}{100\% \text{ Input}} \times 100 (\%)$$

FREQUENCY OFFSET	SW3-7	SW3-8
0 – 20%		
20 – 50%	■	■

### ■ PULSE SENSING (SW3) Table 7

Duty ratio of the input waveform for the capacitor coupling must be lower than 70% with the amplitude 2 – 200 Vp-p, less than 55% with 0.1 – 2 Vp-p. If the pulse cannot be detected with 'Zero-Cross' setting due to a low duty ratio, set the detecting level to 'Low Level.'

COUPLING	SW3-3
Capacitor (AC)	
DC	■

### ■ NOISE FILTER (SW4) Table 8

The filter may be activated for frequencies lower than 100 Hz.

FILTER	SW4-3	SW4-4
OFF		
ON; Amplitude 2 – 10V p-p	■	
ON; Other Amplitude		■

## RANGE CONFIGURATION

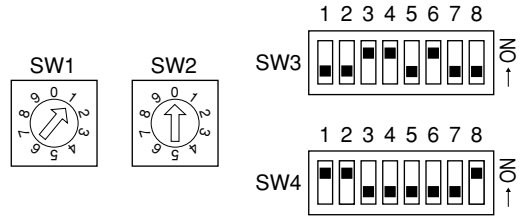
### ■ DIP SWITCH SETTING

First select the internal DIP switches SW1 through SW4 according to Tables 1 through 8.

### ■ EXAMPLE 1: VOLTAGE PULSE with Amplitude 5V, DC Offset 2.5V, Frequency Range 0 – 1 kHz, Duty Ratio 50%

- Input type: Voltage
- Frequency range selected: 0.1 – 9.9 kHz  
(SW1 = 1, SW2 = 0 for 1.0 kHz)
- Pulse amplitude: 2 – 10 Vp-p
- Pulse sensing: DC coupled (Choose AC if necessary.)
- Detecting level: High level (Choose the most appropriate.)
- Frequency offset:  $0 / 1 \text{ kHz} \times 100 = 0\%$
- Noise filter: Deactivated (1 kHz = 1 msec. cycle time)

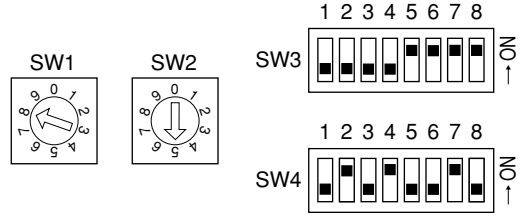
The SW1 through SW4 are configured as shown to the right.



### ■ EXAMPLE 2: VOLTAGE PULSE with Amplitude 20V, DC Offset 90V, Frequency Range 25 – 85 Hz, Duty Ratio 1%

- Input type: Voltage
- Frequency range selected: 1 – 99 Hz  
(SW1 = 8, SW2 = 5 for 85 Hz)
- Pulse amplitude: 10 – 200 Vp-p
- Pulse sensing: Capacitor coupled  
(Detecting level does not match with DC.)
- Detecting level: Zero cross (Set to 'Low level' if the input pulses are undetectable with 'Zero-cross' setting.)
- Frequency offset:  $25 / 85 \text{ Hz} \times 100 = 29.4\%$
- Noise filter: Activated (85 Hz = 11.8 msec. cycle time)

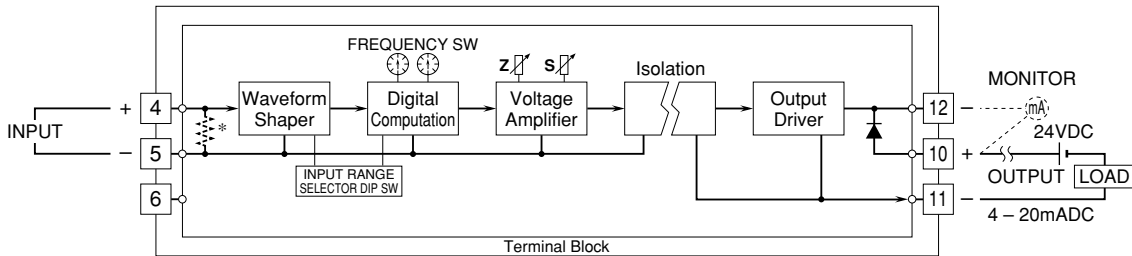
The SW1 through SW4 are configured as shown to the right.



### ■ ZERO & SPAN ADJUSTMENTS

Conduct fine adjustment for the frequency range using the front Zero (offset) and Span (gain) adjustments. Apply 0% and 100% input signals and adjust the Zero to have 4mA output and Span to have 20mA output respectively.

## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



\*Input shunt resistor incorporated for current input.

### Input Connection Examples

