

Space-saving Two-wire Signal Conditioners B3-UNIT

SIGNAL TRANSMITTER
(field-configurable)

MODEL **B3FV**

MODEL & SUFFIX CODE SELECTION

MODEL _____ **B3FV** □
 OUTPUT _____
 4 – 20mA DC
 SUPPLY VOLTAGE _____
 12 – 45V DC
 OPTIONS _____
 /UL : UL approval

ORDERING INFORMATION

Specify code number. If you need the transmitter to be calibrated to a specific range, please specify when ordering. Non-specified orders will be shipped at default factory setting (4 – 20mA input).

- **Code number** (e.g. B3FV)
- **Input range** (e.g. 0 – 10V DC)

GENERAL SPECIFICATIONS

Connection: Removable terminal block
Housing material: Flame-resistant resin (grey)
Isolation: Input to output
DIP switches: For input range calibration

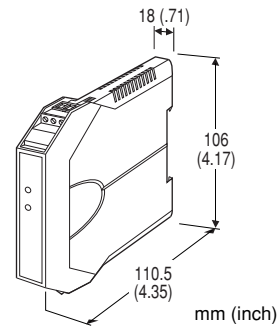
INPUT & OUTPUT

■ **INPUT**

- **DC Current:** -30 – +30mA DC;
input resistor incorporated (0.25W)
- Min. span:** 16µA
- Offset:** -100 – +80% of the maximum voltage as selected with DIP switches (See Table 2)
- Input resistance:** 250Ω (4 – 20mA)
- **DC Voltage:** -100 – +100V DC
(Max. voltage across the input terminals: 70V for CE conformity; 60V for UL approval)
- Spans:** Min. 4mV, max. 100V
- Offset:** -100 – +80% of the maximum voltage as selected with DIP switches (See Table 2)

Input resistance

Input Span	Input Resistance
4mV – 3V	: 1M (Ω minimum) (≥40kΩ with no supply voltage)
≥3V	: 1M



Functions & Features

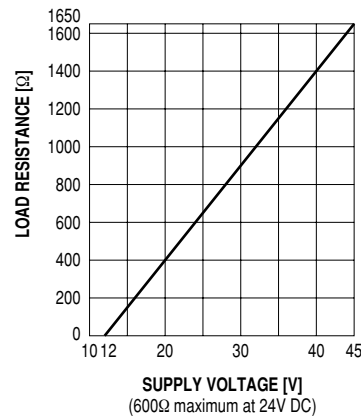
- Converting a DC input into an isolated 4 – 20mA DC signal
- DIP switch configurable input range
- Monitor terminals
- High-density mounting
- CE marking
- UL approval

■ **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

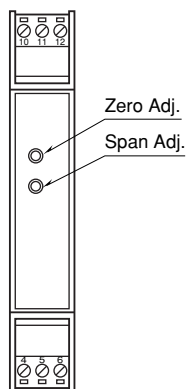
Accuracy: ±0.1%
Temp. coefficient: ±0.02%/°C (±0.01%/°F)
Response time: ≤0.5 seconds (0 – 90%)
Insulation resistance: ≥100MΩ with 500V DC
Dielectric strength: 2000V AC @1 minute
 (input to output to ground)

STANDARDS & APPROVALS

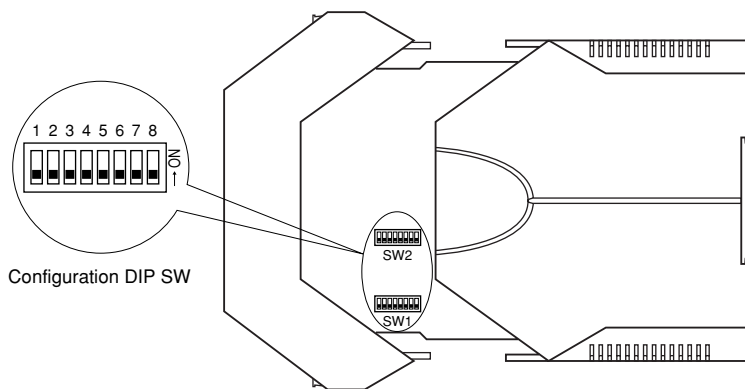
CE conformity: EMC Directive (89/336/EEC)
 EMI EN61000-6-4
 EMS EN61000-6-2
Approval: UL/C-UL general safety requirements
 (UL 61010-1, CAN/CSA-C22.2 No.1010-1)

RANGE CONFIGURATION

■ FRONT VIEW



■ SIDE VIEW



■ GENERAL PROCEDURE

First select a coarse range using the internal DIP switches (SW1 and SW2) according to Tables 1 through 4, and then fine-tune the range using the front zero and span adjustments.

■ SELECTING DIP SW

INPUT TYPE

Choose Current or Voltage according to Table 1. With the current input configuration (SW1-1 ON), DO NOT apply voltage input.

Table 1

INPUT TYPE	■ = ON	
	SW1	
	1	
Current	■	
Voltage		

INPUT RANGE

Choose the required range matching the maximum value and the span according to Table 2.

- For a current input, convert the range to a voltage with the following equation:

$$\text{Voltage} = (100\% \text{ Current} - 0\% \text{ Current}) \times 250\Omega$$
- When the 0% and 100% values have the same polarity, select the absolute greater value as Span.
- When the 0% and 100% values have opposite polarities, select the absolute difference of the two values (100% – 0%) as Span.
- If the Span value is available in two range selections, select the smaller range. (e.g. Set to the 1V range for 0 – 1V, though the maximum value 1V can be selectable both in 2V and 1V range.)

Applying voltage input greater than the maximum value of the selected range may cause failure of the unit. Check the setting before applying the input signal.

Table 2

MAX	SPAN	■ = ON								
		SW1				SW2				
		2	3	4	5	6	7	8	7	8
100V ^{*1}	20V ≤ Span ≤ 100V	■								
20V	4V ≤ Span ≤ 20V		■							
10V	2V ≤ Span ≤ 10V			■						
2V	400mV ≤ Span ≤ 2V								■	■
1V	200mV ≤ Span ≤ 1V				■				■	■
200mV	40mV ≤ Span ≤ 200mV					■			■	■
100mV	20mV ≤ Span ≤ 100mV						■		■	■
20mV	4mV ≤ Span ≤ 20mV							■	■	■

*1. Max. voltage across the input terminals: 70V for CE conformity; 60V for UL approval.

OFFSET

See Table 3.

The offset is defined by the following equation:

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

Table 3

OFFSET	SW2			
	1	2	3	4
$-100\% \leq \text{Offset} < -60\%$			■	■
$-60\% \leq \text{Offset} < -30\%$				■
$-30\% \leq \text{Offset} < -10\%$			■	
$-10\% \leq \text{Offset} \leq +10\%$		■	■	
$+10\% < \text{Offset} \leq +30\%$		■		
$+30\% < \text{Offset} \leq +60\%$	■			
$+60\% < \text{Offset} \leq +80\%$	■	■		

GAIN

See Table 4.

The gain is defined by the following equation:

$$\text{Gain} = \frac{\text{Max. Range}}{100\% \text{ Input} - 0\% \text{ Input}} \times 100 (\%)$$

Table 4

GAIN	SW2	
	5	6
$100\% \leq \text{Gain} \leq 150\%$	■	
$150\% < \text{Gain} \leq 270\%$		■
$270\% < \text{Gain} \leq 500\%$		

ZERO & SPAN ADJUSTMENTS

After setting SW1 and SW2 for the coarse offset and gain, adjust the Zero (offset) and Span (gain).

EXAMPLE

Calibration Range: 1 – 5V

Input Type: Voltage

Range: (2) 1V and 5V: same polarity

(3) $1V < 5V$: 5V is absolute greater value. 10V selected as the next greater Span.

Offset: $1V / 10V \times 100 = 10\%$

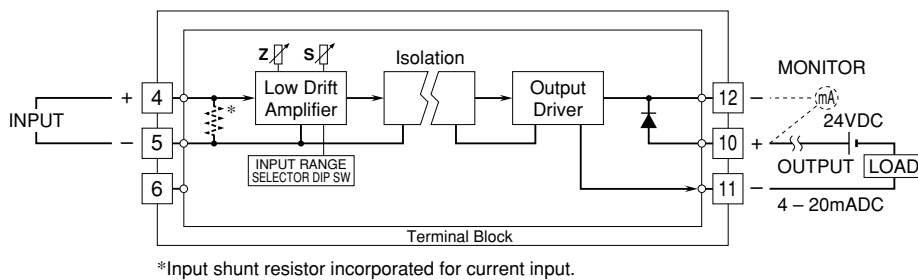
Gain: $10V / (5V - 1V) \times 100 = 250\%$

The SW1 and SW2 are configured as follows for 1 – 5V.



Zero & Span: With the SW1 and SW2 set to the above configuration, 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.