

Space-saving Two-wire Signal Conditioners B3-UNIT

THERMOCOUPLE TRANSMITTER
(field-configurable)

MODEL **B3FT**

MODEL & SUFFIX CODE SELECTION

MODEL _____ **B3FT**-□□

INPUT THERMOCOUPLE _____

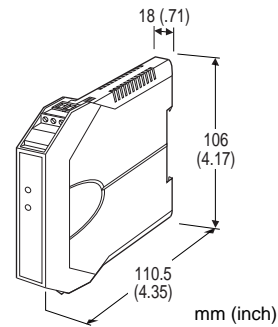
1 : K (CA), J (IC), T (CC)
2 : E (CRC), R, N

OUTPUT
4 – 20mA DC

SUPPLY VOLTAGE
12 – 45V DC

OPTIONS _____

/UL : UL approval



Functions & Features

- Converting a thermocouple input into an isolated, linearized 4 – 20mA DC signal
- DIP switch configurable input range
- Cold junction compensation, linearization and burnout
- Monitor terminals
- High-density mounting
- CE marking
- 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 (K, 0 – 300°C or E, 0 – 250°C).

- **Code number** (e.g. B3FT-1)
- **Input range** (e.g. J, 0 – 400°C)

GENERAL SPECIFICATIONS

Connection: Removable terminal block
Housing material: Flame-resistant resin (grey)
Isolation: Input to output
DIP switches: For input range calibration
Burnout protection: Upscale, downscale or no burnout selectable with DIP SW (default: upscale)
Linearization: Standard
Cold Junction Compensation: CJC sensor attached to the input terminals

INPUT & OUTPUT

■ **INPUT:** Thermocouples
Minimum span: 3mV
Input resistance: 20kΩ minimum
Burnout sensing: 0.1μA
Temperature range

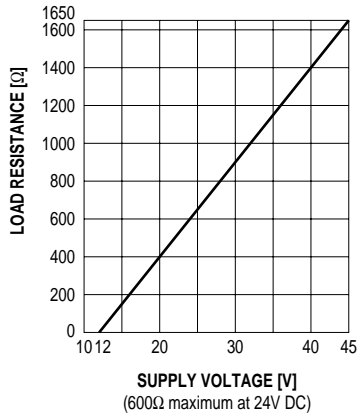
| T/C | MAX. RANGE | LOWER RANGE | MIN. SPAN |
|---------|----------------|----------------|-----------|
| K (CA) | -18 to +300°C | -18 to +190°C | 75°C |
| | -18 to +1370°C | -18 to +850°C | 300°C |
| J (IC) | -18 to +300°C | -18 to +190°C | 70°C |
| | -18 to +1200°C | -18 to +750°C | 300°C |
| T (CC) | -18 to +150°C | -18 to +75°C | 75°C |
| | -18 to +400°C | -18 to +250°C | 150°C |
| E (CRC) | -18 to +250°C | -18 to +120°C | 60°C |
| | -18 to +1000°C | -18 to +600°C | 250°C |
| R | -18 to +700°C | -18 to +340°C | 360°C |
| | -18 to +1760°C | -18 to +1060°C | 700°C |
| N | -18 to +400°C | -18 to +250°C | 110°C |
| | -18 to +1300°C | -18 to +800°C | 400°C |
| T/C | MAX. RANGE | LOWER RANGE | MIN. SPAN |
| K (CA) | 0 to 572°F | 0 to 374°F | 135°F |
| | 0 to 2498°F | 0 to 1562°F | 540°F |
| J (IC) | 0 to 572°F | 0 to 374°F | 126°F |
| | 0 to 2192°F | 0 to 1382°F | 540°F |
| T (CC) | 0 to 302°F | 0 to 167°F | 135°F |
| | 0 to 752°F | 0 to 482°F | 270°F |
| E (CRC) | 0 to 482°F | 0 to 248°F | 108°F |
| | 0 to 1832°F | 0 to 1112°F | 450°F |
| R | 0 to 1292°F | 0 to 644°F | 648°F |
| | 0 to 3200°F | 0 to 1940°F | 1260°F |
| N | 0 to 752°F | 0 to 482°F | 198°F |
| | 0 to 2372°F | 0 to 1472°F | 720°F |

■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-2.

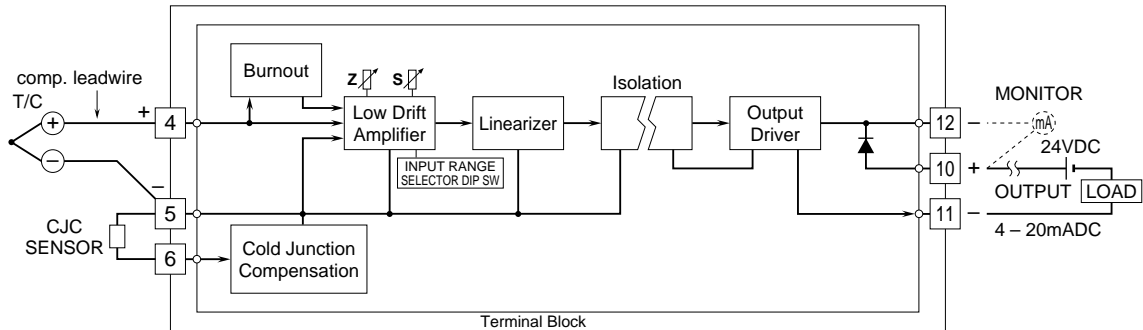
PERFORMANCE in percentage of span

- Accuracy
 - K, J: ±0.2% of FS or ±0.3°C (±0.54°F), whichever is greater.
 - T, E, N: ±0.3% of FS or ±0.4°C (±0.72°F), whichever is greater.
 - R: ±0.4% of FS at ≥400°C or 752°F
- Cold junction compensation error: ±0.5°C or ±0.9°F maximum for 0 – 55°C (32 – 131°F); ±2°C or ±3.6°F maximum for -40 – +85°C (-40 – +185°F)
- Temp. coefficient: ±0.02%/°C (±0.01%/°F)
- Response time: ≤0.5 seconds (0 – 90%)
- Burnout response: ≤10 seconds
- Insulation resistance: ≥100MΩ with 500V DC
- Dielectric strength: 2000V AC @1 minute (input to output to ground)

STANDARDS & APPROVALS

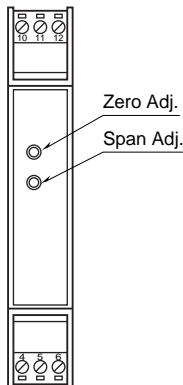
- CE conformity: EMC Directive (89/336/EEC)
 - EMI EN61000-6-4
 - EMS EN61000-6-2
- Approval: UL/C-UL general safety requirements (UL 61010-1, CAN/CSA-C22.2 No.1010-1)

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

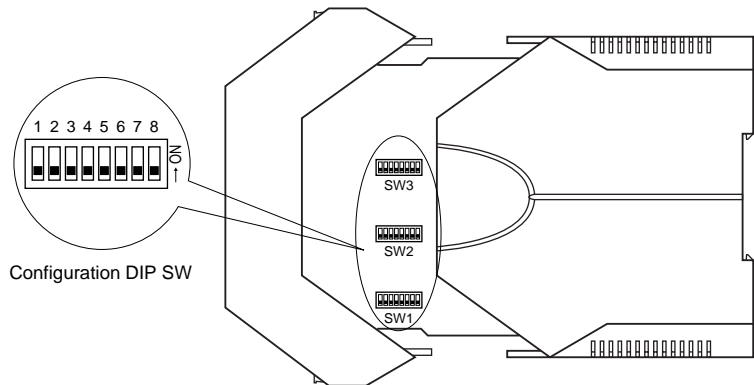


RANGE CONFIGURATION

■FRONT VIEW



■SIDE VIEW



Specifications subject to change without notice.

GENERAL PROCEDURE

First select a coarse range using the internal DIP switches (SW1, SW2, SW3) according to Tables 1 through 4, and then fine tune the range using the front zero and span adjustments.

SELECTING DIP SW

MAXIMUM RANGE

Choose the required range matching the minimum and maximum values according to Table 1 or 2.

Table 1. Model B3FT-1

■ = ON

| T/C | MAXIMUM RANGE | | SW1 | | | | | | SW2 | | | | | | SW3 | | | | | | |
|--------|----------------|-------------|-----|---|---|---|---|---|-----|---|---|---|---|---|-----|---|---|---|---|---|---|
| | °C | °F | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | |
| K (CA) | -18 to +300°C | 0 to 572°F | ■ | | | | | | | | | ■ | | | | ■ | ■ | | | | |
| | -18 to +1370°C | 0 to 2498°F | | ■ | | | | | | ■ | | | ■ | | | ■ | ■ | | | | |
| J (IC) | -18 to +300°C | 0 to 572°F | | | ■ | | | | | | ■ | | ■ | | | | | ■ | ■ | | |
| | -18 to +1200°C | 0 to 2192°F | | | | ■ | | | | ■ | ■ | | ■ | | | | | ■ | ■ | | |
| T (CC) | -18 to +150°C | 0 to 302°F | | | | | ■ | | | | | ■ | | ■ | | | | | | ■ | ■ |
| | -18 to +400°C | 0 to 752°F | | | | | | | ■ | ■ | | | ■ | | ■ | | | | | ■ | ■ |

Table 2. Model B3FT-2

■ = ON

| T/C | MAXIMUM RANGE | | SW1 | | | | | | SW2 | | | | | | SW3 | | | | | | |
|---------|----------------|-------------|-----|---|---|---|---|---|-----|---|---|---|---|---|-----|---|---|---|---|---|---|
| | °C | °F | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | |
| E (CRC) | -18 to +250°C | 0 to 482°F | ■ | | | | | | | | | | ■ | | | ■ | ■ | | | | |
| | -18 to +1000°C | 0 to 1832°F | | ■ | | | | | | ■ | | | ■ | | | ■ | ■ | | | | |
| R | -18 to +700°C | 0 to 1292°F | | | ■ | | | | | | ■ | | | | ■ | | | ■ | ■ | | |
| | -18 to +1760°C | 0 to 3200°F | | | | ■ | | | | ■ | ■ | | | | ■ | | | ■ | ■ | | |
| N | -18 to +400°C | 0 to 752°F | | | | | ■ | | | | | ■ | | ■ | | | | | | ■ | ■ |
| | -18 to +1300°C | 0 to 2372°F | | | | | | | ■ | ■ | | | ■ | | ■ | | | | | ■ | ■ |

GAIN

See Table 3.

The gain is defined by the following equation:

$$\text{Gain} = \frac{[\text{Max. Range} - (-18^{*1})] (\text{°C})}{[100\% \text{ Input} - 0\% \text{ Input}] (\text{°C})} \times 100 (\%)$$

*1. 0 for °F

Table 3

■ = ON

| T/C | GAIN | SW2 | |
|---------|--------------------|-----|---|
| | | 7 | 8 |
| K (CA) | 260% < Gain ≤ 480% | | ■ |
| J (IC) | 150% < Gain ≤ 260% | ■ | |
| E (CRC) | 100% ≤ Gain ≤ 150% | | |
| T (CC) | 240% < Gain ≤ 480% | | ■ |
| R | 140% < Gain ≤ 240% | ■ | |
| N | 100% ≤ Gain ≤ 140% | | |

OFFSET

The offset is defined by the following equation:

$$\text{Offset} = \frac{[0\% \text{ Input} - (-18^{*1})] (\text{°C})}{[\text{Max. Range} - (-18^{*1})] (\text{°C})} \times 100 (\%)$$

*1. 0 for °F

Offset setting SW1-7 is set to ON at default. When the desired offset is 25% or greater and out of adjustable range with the front potentiometer, turn the SW1-7 OFF.

BURNOUT

Table 4

■ = ON

| BURNOUT | SW3 | |
|------------|-----|---|
| | 7 | 8 |
| Upscale | ■ | |
| Downscale | | ■ |
| No Burnout | | |

ZERO & SPAN ADJUSTMENTS

After setting SW1 through SW3 for the coarse offset and gain, adjust the Zero (offset) and Span (gain).

EXAMPLE

T/C Type: K
 Calibration Range: 0 – 90°C
 Maximum Range Selected: 300°C
 Burnout: Upscale
 Gain: $[300 - (-18) / 90 - 0] \times 100 = 353\%$
 Offset: $[0 - (-18) / (300 - (-18))] \times 100 = 5.7\%$

The SW1, SW2 and SW3 are configured as follows:

