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

RTD TRANSMITTER
(field-configurable)

MODEL **B3FR**

MODEL & SUFFIX CODE SELECTION

B3FR❑

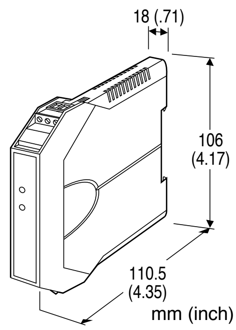
MODEL

INPUT RTD
Pt 100 (JIS ’97, IEC)
Ni 120
Cu 10 (@25°C)

OUTPUT
4 – 20mA DC

SUPPLY VOLTAGE
12 – 45V DC

OPTIONS
/UL : UL approval



Functions & Features
- Converts a RTD input into an isolated, linearized 4 – 20mA DC signal
- DIP switch configurable input range
- 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 (Pt 100, 0 – 100°C).
- Code number (e.g. B3FR)
- Input range (e.g. Pt 100, 0 – 200°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

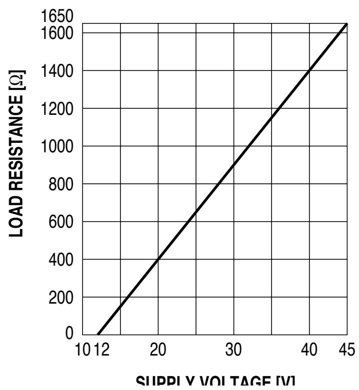
INPUT & OUTPUT

■ **INPUT**: 2- or 3-wire RTDs
Maximum leadwire resistance: 20Ω per wire (3-wire)
Sensing current: 1mA
Temperature range: See Table 1.

■ **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.

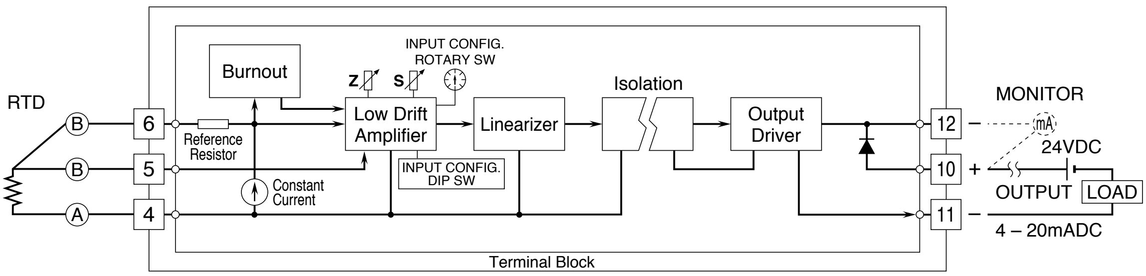
PERFORMANCE in percentage of span

Accuracy
Pt 100, Cu 10: ±0.2%
Ni 120: ±0.3%
Temp. coefficient: ±0.02%/°C (±0.01%/°F),
±0.03%/°C (±0.02%/°F) for Cu 10
Response time: ≤0.5 second (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

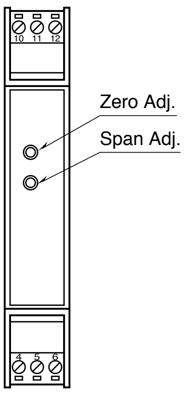
CE conformity: EMC Directive (2004/108/EC)
EN 61000-6-4 (EMI)
EN 61000-6-2 (EMS)
Approval: UL/C-UL general safety requirements
(UL 61010-1, CAN/CSA-C22.2 No.1010-1)

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

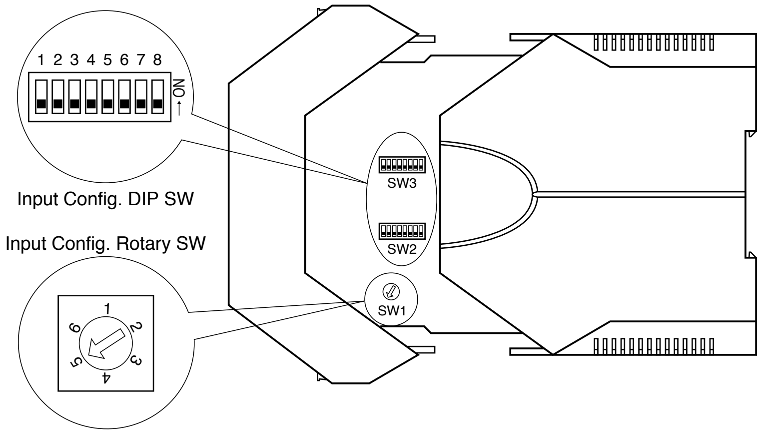


EXTERNAL VIEWS

■ **FRONT VIEW**



■ **SIDE VIEW**



RANGE CONFIGURATION

■ GENERAL PROCEDURE

First select a coarse range using the internal DIP switches (SW1, SW2 and SW3) according to Tables 1 through 4 below. Then apply simulated 0% and 100% inputs and fine-tune the output range to 4mA and 20mA using the front zero and span adjustments.

DIP SW setting can be changed while the power is applied to the transmitter. Linearization and zero/span adjustments will not perform correctly with inaccurate switch configuration but it will not damage the unit in anyway.

■ SELECTING DIP SW (coarse adjustment)

INPUT TYPE & RANGE

Choose the desired range (usable range = highest span selectable) according to Table 1. The minimum span requirements in the table must be met when choosing the desired range.

Table 1 ■ = ON

RTD	USABLE RANGE		MIN. SPAN		SW1	SW2							
						1	2	3	4	5	6	7	8
Pt 100 (JIS '97, IEC)	-50 to +750°C	-58 to +1382°F	300°C	540°F	1	■				■			
	-50 to +350°C	-58 to +662°F	100°C	180°F	2	■					■		
	-50 to +150°C	-58 to +302°F	50°C	90°F	3	■					■		
Ni 120	-50 to +200°C	-58 to +392°F	100°C	180°F	4		■					■	
	-50 to +100°C	-58 to +212°F	50°C	90°F	5		■					■	
Cu 10 (@25°C)	-50 to +250°C	-58 to +482°F	100°C	180°F	6			■			■		

BURNOUT

See Table 2.

Table 2 ■ = ON

BURNOUT	SW3			
	5	6	7	8
Upscale	■		■	
Downscale		■		■
No burnout				

GAIN

See Table 3.

The gain is defined by the following equation:

$$\text{Gain} = \frac{[\text{Span of usable range}]}{[\text{Span of calibration range}]} \times 100\ (\%)$$

where

[Span of usable range] (°C)
= [Max. value of usable range] – (-50*1)

[Span of calibration range] (°C)
= [100% input temp.] – [0% input temp.]

*1. -58 for °F

Table 3 ■ = ON

GAIN	SW3		
	1	2	3
267% ≤ Gain ≤ 400%			■
167% ≤ Gain < 267%		■	
100% ≤ Gain < 167%	■		

OFFSET

See Table 4.

The offset is defined by the following equation:

$$\text{Offset} = \frac{[0\%\ \text{input temp.}] - (-50^{*1})}{[\text{Span of calibration range}]} \times 100\ (\%)$$

*1. -58 for °F

Table 4 ■ = ON

OFFSET	SW3-4
Factory default setting	
Offset ≥ 26%*2 and when 0% output cannot be calibrated with zero adjustment. *2. 28% for Ni 120.	■

EXAMPLE

Pt 100, 0 – 90°C, Upscale burnout

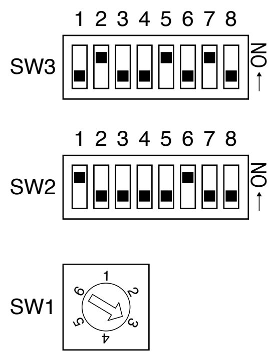
1) Sensor type and Range: According to Table 1, choose 'Pt 100, -50 – +150°C' range.
   ➠ Set SW1 to '3,' SW2-1 and SW2-6 to ON.
2) Burnout: According to Table 2, choose 'Upscale.'
   ➠ Set SW3-5 and SW3-7 to ON.
3) Gain

$$\frac{[150 - (-50)]}{[90 - 0]} \times 100 = 222\ (\%)$$

   ➠ According to Table 3, set SW3-2 to ON.
4) Offset

$$\frac{[0 - (-50)]}{[150 - (-50)]} \times 100 = 25\ (\%)$$

   ➠ According to Table 4, SW3-4 remains OFF.



■ ZERO & SPAN ADJUSTMENTS (fine adjustments)

Referring to the instruction manual, apply 0% and 100% input signals and adjust the Zero to have 4mA output and Span to have 20mA output respectively.