



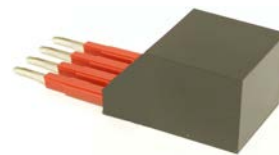
**Texas  
Components  
Corporation**

USA Manufacturer of Precision Measurement Devices  
(featuring Bulk Metal® Foil\* Technology)

# TXBCMTB01

**Bulk Metal® Foil  
Bridge Completion Module**

for Stress/Strain Measurement Applications



**Terminal Block Compatible**

## Precision Bulk Metal® Foil Bridge Completion Module

for Stress/Strain Measurement Applications

Ultra Low TCR; Ultra High Precision, Accuracy, and Stability

Resistors featuring Bulk Metal® Foil are renowned for their unique combination of unmatched performance in all major technical areas, including:

Temperature Coefficient of Resistance (TCR)	Voltage Coefficient of Resistance (VCR)	Electrostatic Discharge (ESD)	Thermal Stabilization	Response Time
Power Coefficient of Resistance (PCR)	Thermal Electromotive Force (EMF)	Tolerance	Load Life Stability	Noise

Strain gage instrumentation is often available with built-in bridge completion resistors and “dummy” gages to accept quarter-bridge and half-bridge strain gage input circuits. However, if such instrumentation does not have these components, or if the measurement application does not permit their use, an external bridge completion module is needed. The TXBCM series Bridge Completion Modules employ metal-foil resistance elements, bonded to a ceramic substrate, then packaged in a special environmental protection system to ensure long-term stability and facilitate field use (i.e. for most applications no additional environmental protection is required).

The resistance elements are processed to match the thermal expansion coefficient of the ceramic, and to match each other, resulting in a very low resistance temperature coefficient that, in the model TXBCMTB01, is equivalent to as low as  $< \pm 0.50 \mu\epsilon/^{\circ}\text{C}$  ( $< \pm 0.25 \mu\epsilon/^{\circ}\text{F}$ ) or even better over the full operating temperature range. R1 and R2, the half-bridge, are matched even tighter – such that the combined tolerance and TCR are within the individual specifications.

Completing the bridge circuit at the strain gage site provides for a symmetrical, balanced leadwire system between the strain gage circuit and the instrumentation. This can also reduce the effects of noise pickup in the leadwire system in some environments. Also, where switch contacts, slip rings, or other mechanical connections are employed between the strain gages and measuring instrumentation, or when leadwires will be periodically disconnected from the measuring instrument, accuracy can be improved by completing the bridge at the measurement site.

**TXBCM series** Bridge Completion Modules can be customized to meet your special requirements - contact our Applications Engineering Department about your specific needs or wishes.

### TXBCMTB01 FORM & FUNCTION

Provides a precision half bridge and a dummy gage. Recommended for use with half-bridge strain gage circuits of any resistance value, or with a specific value three-wire quarter-bridge circuit. Customized higher values can extend battery life in battery-powered instrumentation, reduce strain gage self-heating, and permit higher bridge excitation voltage to improve signal-to-noise ratio. The **advantages** of this module include:

- **Easy to use** (just plug into compatible terminal block)
- **Very rugged** (encased and protected).
- **Less required calibration** (modules becomes more stable over time, unlike other resistor technologies).
- **Small, light, and very portable** (approximately 1" x 1" x 1.7")

**Bulk Metal® Foil technology outperforms all other resistor technologies today**, making it the clear choice for applications that require high precision and high stability. This technology allows for the design and production of strain/stress measurement products and accessories that would not be possible otherwise. The TXBCM series of Bulk Metal® Foil based bridge completion modules offers very low TCR, excellent load life stability, tight tolerance, fast response time, low current noise, low thermal EMF, low power coefficient, and low voltage coefficient - all in a convenient, sealed design with easy solder connections. The TXBCM series is virtually insensitive to common destabilizing factors that can completely undermine the accuracy and usefulness of other resistor types. The resistor element used is a solid alloy that is inherently ultra stable which, along with the many other additional Bulk Metal® Foil benefits, guarantees the highest degree of accuracy and stability in fixed-resistor applications. For questions, special applications and/or unique requirements, our Applications Engineering Department is on-site and available to help and advise.

### TXBCMTB01 FEATURES & SPECIFICATIONS

- **Accuracy:** Calibrated individual resistance tolerances to  $\pm 0.005\%$  (See Table 1). Tolerance matching is available to further increase overall circuit accuracy.
- **Temperature Coefficient (TCR):** R1, R2, & R3 each individually  $< \pm 0.8 \text{ ppm}/^{\circ}\text{C}$  ( $\pm 0.36 \text{ ppm}/^{\circ}\text{F}$ ). See Table 1 for other resistance and temperature ranges. TCR matching is available to further increase overall circuit accuracy.
- **Operating Temperature Range:**  $-20^{\circ}\text{C}$  to  $+94^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $+201^{\circ}\text{F}$ ).
- **Rated power:** **0.6W** across any/each resistor (at  $+70^{\circ}\text{C}$ ).
- **Resistance range:** **5Ω to 125KΩ** (Any resistance value is available to 6 digits).
- **Exceptional load life stability:**  $\pm 0.005\%$  ( $< 50\text{ppm}$ ) at  $+70^{\circ}\text{C}$ , at 2000 hours, even at 2x rated power!
- **Power coefficient of (PCR) or ΔR** due to self heating:  $\pm 5 \text{ ppm/watt}$
- **Voltage coefficient of resistance (VCR):**  $< 0.1 \text{ ppm/V}$  (essentially zero)
- **Recommended working voltage:** **0.5V to 12V** (300V max but all always subject to  $V \leq \sqrt{0.6 \times R}$ ) for each resistor.)
- **Electrostatic discharge protection (ESD):**  **$> 25 \text{ kV}$**
- **Capacitance:** 0.5 pF typical; 1.0 pF max (non-capacitive design)
- **Inductance:**  $< 0.08 \mu\text{H}$  typical; 0.1 μH max; (non-inductive design)
- **Hot spot free design**
- **Rise time:** 1.0 ns at 1kΩ (effectively no ringing)
- **Current noise:** 0.010 μV<sub>RMS</sub>/Volt of Applied Voltage ( $< -40 \text{ dB}$ )
- **Thermal EMF:** 0.05 μV/°C typical (0.10 μV/°C max) and 1 μV/W (μV/°C relates to EMF due to ΔT wrt to leads and μV/watt due to the applied power)
- **Total accumulated ΔR over life (EOL):** to  $\pm 0.05 \%$  (Better than any other resistor technology!) Pre & Post Manufacturing Operations are available to reduce this even further.
- **Made in the USA!**



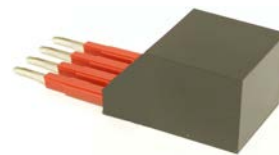
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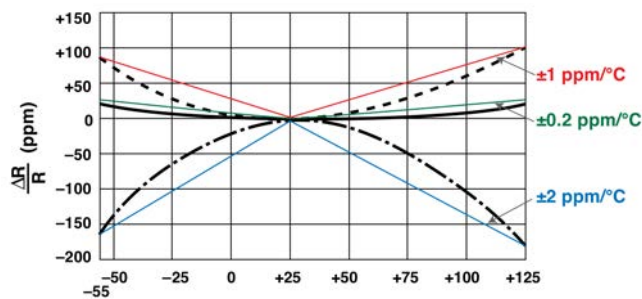
**Terminal Block Compatible**

**TABLE 1 – ACCURACY & TCR BY RESISTANCE RANGE (using Z-Foil)**  
(-55°C to +125°C, +25 °C Reference)

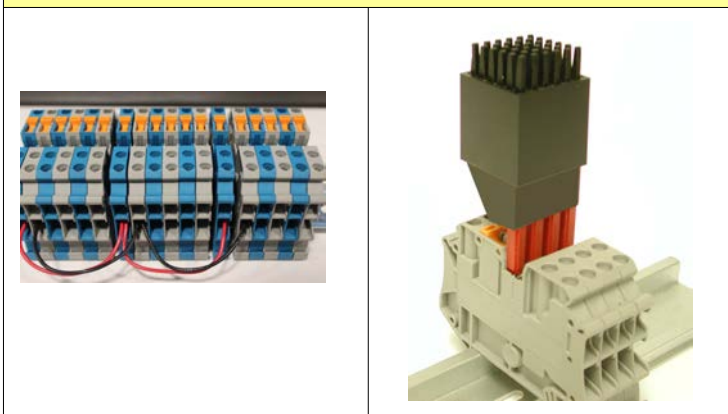
RESISTANCE VALUE (Ω)	CALIBRATED TOLERANCE (Initial Accuracy)	NOMINAL TCR & MAX SPREAD (ppm/°C)	MICRO-STRAIN ACCURACY (maximum spread per resistor) GF=2; 2 ppm/με	
			(με /°C)	(με /°F)
≥ 500	± 0.005%	± 0.2 (± 0.8)	< ± 0.50	< ± 0.25
125 to < 500	± 0.01%	± 0.2 (± 1.0)	< ± 0.60	< ± 0.30
80 to < 125	± 0.02%	± 0.2 (± 1.3)	< ± 0.75	< ± 0.36
50 to < 80	± 0.05%	± 0.2 (± 1.8)	< ± 1.00	< ± 0.50
25 to < 50	± 0.10%	± 0.2 (± 2.3)	< ± 1.25	< ± 0.63
10 to < 25	± 0.25%	± 0.2 (± 2.8)	< ± 1.50	< ± 0.75
5 to < 10	± 0.50%	± 0.2 (± 3.8)	< ± 2.00	< ± 1.00

**FIGURE 1 – NOMINAL RESISTANCE/TEMPERATURE CURVE(S) and Chord Slopes (Statistically Combined)**

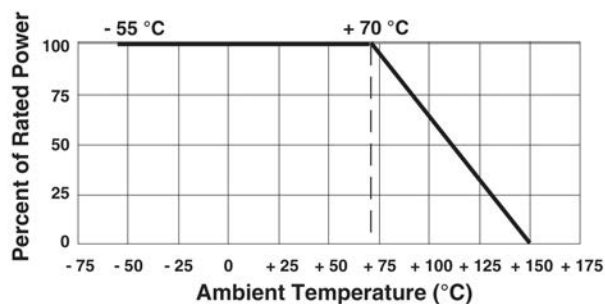
Accurate and Precise in Any Actual Physical Environment  
(The TXBCM series uses Z-Foil by default, shown in green)



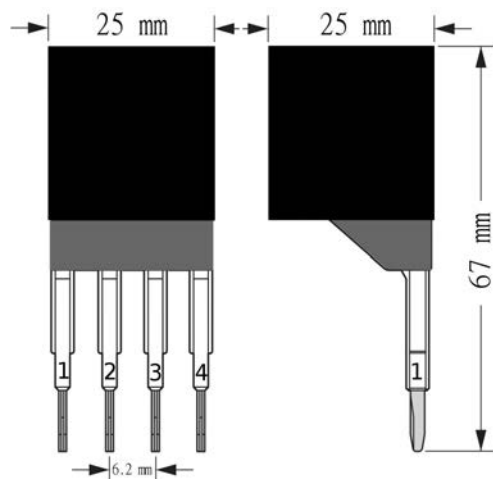
**FIGURE 2 – EXAMPLE TERMINAL BLOCK APPLICATIONS**



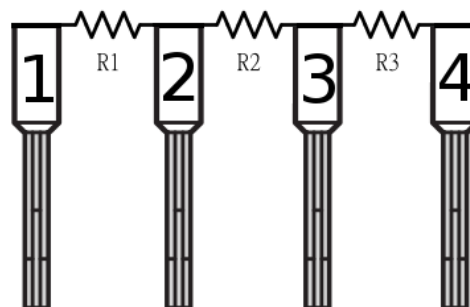
**FIGURE 3 - POWER DERATING CURVE**



**FIGURE 4 – STANDARD IMPRINTING AND DIMENSIONS**



Schematic



Fits 6.2 mm pitch (center to center) terminal block.

Special screening/matching for tolerance and TCR is available – just tell our applications engineer about your specific needs.



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**TABLE 3 – SUMMARY SPECIFICATIONS**

MODEL	RESISTANCES <sup>1</sup> R1/R2/R3	OPERATING TEMPERATURE RANGE <sup>2</sup>	MAX WORKING VOLTAGE (per resistor)	CALIBRATED ACCURACY <sup>3</sup>	AMBIENT POWER RATING	PACKAGING
					at +70 °C	
TXBCMTB01	5Ω to 125KΩ	-20°C to 94°C (-4°F to 201°F)	300 V (but always ≤ √0.6xR)	0.005% to 0.25% (see Table 1)	0.6 W (per resistor)	All modules are provided in bulk pack

- 1) Any precise value is available up to 6 significant digits.
- 2) For extended operating temperatures a heat sink model/modification is available
- 3) Feel free to ask if you need tighter tolerances or TCR specifications

**TABLE 4 – HOW TO ORDER THE CORRECT PART NUMBER**

MODEL	RESISTANCE VALUE(S)	HEATSINK (optional)
TXBCMTB01	5Ω to 125KΩ (R = Ω, K = 1000 Ω) Use up to 7 characters (e.g. 100R001 = 100.001 ohms)	Optional heatsink = H suffix Used to extend operating temperature range (Adds 16mm to overall height and 14g to weight)
A standard 120 ohm module would be ordered as: <b>TXBCMTB01-120R000</b>		
A standard 350 ohm module would be ordered as: <b>TXBCMTB01-350R000</b>		
A standard 1000 ohm module would be ordered as: <b>TXBCMTB01-1K00000</b>		
A mixed value module with, for example, two 10,000 ohm resistors and one 45 ohm resistor with a heatsink could be ordered as: <b>TXBCMTB01-10K/10K/45R-H</b>		



For more information about this subject or this product line, please call us at (+1) **713-468-3882** or email us at [txccsales@texascomponents.com](mailto:txccsales@texascomponents.com).

You can also "Follow" Texas Components and Bulk Metal® Foil Resistors on Twitter [@TexasComponents](https://twitter.com/TexasComponents) and/or "Like" Texas Components on [Facebook](https://www.facebook.com/TexasComponents).

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