

# PRELIMINARY



## Features

- Formerly a Riedon™ product
- Current rating: 1 to 500 A
- Standard tolerance  $\pm 0.1\%$
- Non-inductive metal element
- Manganin resistive element
- RoHS compliant\*

## Applications

- Power supplies
- Power converters
- Current measurements

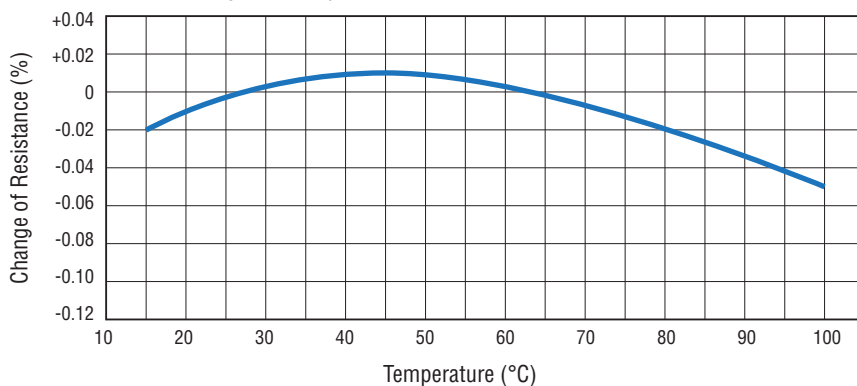
## RSN Series – Riedon™ DC Ammeter Shunts / Busbar Shunts by Bourns

### Electrical Characteristics

Model	Rated Current (A)	Operating Current (A)	Resistance (mΩ)	
			50 mV Output	100 mV Output
RSN-1	1	0.667	50	100
RSN-2	2	1.33	25	50
RSN-5	5	3.33	10	20
RSN-10	10	6.67	5.0	10
RSN-20	20	13.33	2.5	5.0
RSN-50	50	33.33	1.0	2.0
RSN-100	100	66.67	0.5	1.0
RSN-150	150	100	0.333	0.667
RSN-200	200	133.33	0.25	0.50
RSN-250	250	166.67	0.20	0.40
RSN-300	300	200	0.167	0.333
RSN-400	400	266.67	0.125	0.25
RSN-500	500	333.33	0.10	0.20

### TCR Curve

Manganin™ Temperature Coefficient of Resistance  $\pm 15$  PPM/°C



Note: Applies to resistance element only

### Additional Information

Click these links for more information:



### General Specifications

Rated Output .... 50 mV, 100 mV, Custom  
 Voltage Tolerance .....  $\pm 0.1\%$  Standard  
 Operating Temperature  
 ..... -30 °C to +70 °C  
 Storage Temperature  
 ..... -55 °C to +80 °C

### Materials

Base ..... Flame resistant Bakelite  
 Resistance Element ..... Manganin  
 Terminal Block ..... Brass

### How to Order

Model RSN - 1 - 50 B  
 Rated Current (see table) \_\_\_\_\_  
 1 = 1 A  
 Voltage Output (mV) \_\_\_\_\_  
 50 = 50 mV  
 100 = 100 mV  
 Tolerance  
 B = 0.1 %

### Operating Current Derating

For continuous operation, it is recommended that shunts are not operated at more than two thirds (2/3) the rated current under normal conditions per IEEE standards for DC instrument shunts. At ambient temperatures above 40 °C, the current must be further derated to prevent damage.



**WARNING Cancer and Reproductive Harm**  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

\*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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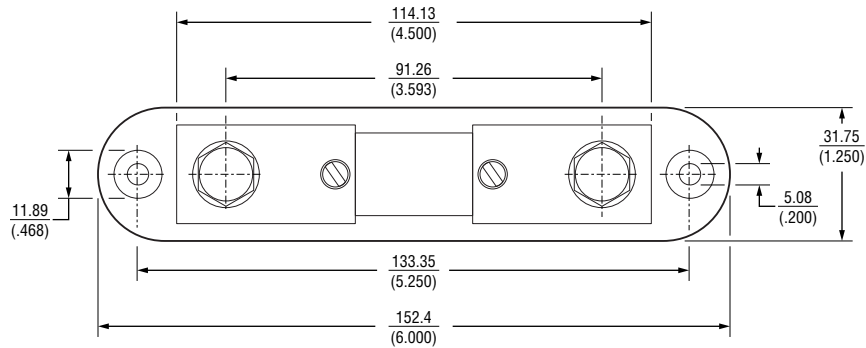
In April 2023, BE Services Company, Inc., a subsidiary of Bourns, Inc., purchased certain assets of Riedon, Inc., including its logo and trademarks and the right to continue to manufacture former Riedon™ products.

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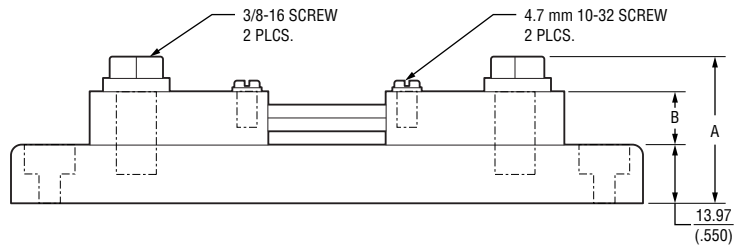
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"Manganin" is a trademark of Isabellenhütte Heusler GmbH & Co.

**Product Dimensions**



DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$

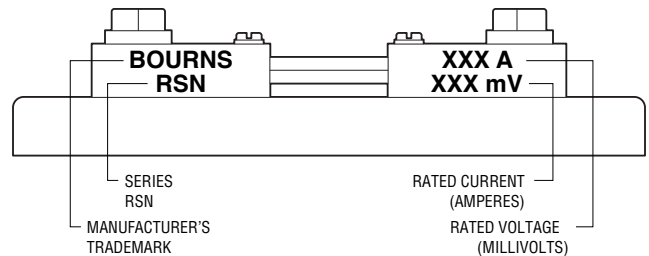


**50 or 100 mV Output Models**

Model	A	B
RSN-1		
RSN-2		
RSN-5		
RSN-10		
RSN-20	$\frac{35.05}{(1.380)}$	$\frac{12.7}{(0.500)}$
RSN-50		
RSN-100		
RSN-150		
RSN-200		
RSN-250		
RSN-300	$\frac{41.40}{(1.630)}$	$\frac{19.05}{(0.750)}$
RSN-400		
RSN-500		

Dimension tolerances:  $\pm 0.381$  mm ( $\pm 0.015$  in.) for hole diameters. All other dimensions have a  $\pm 0.762$  mm ( $\pm 0.030$  in.) tolerance.

**Typical Part Marking**



**Packaging Specifications**

Bulk, packaged in cellulose paper.

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**Technical Notes**

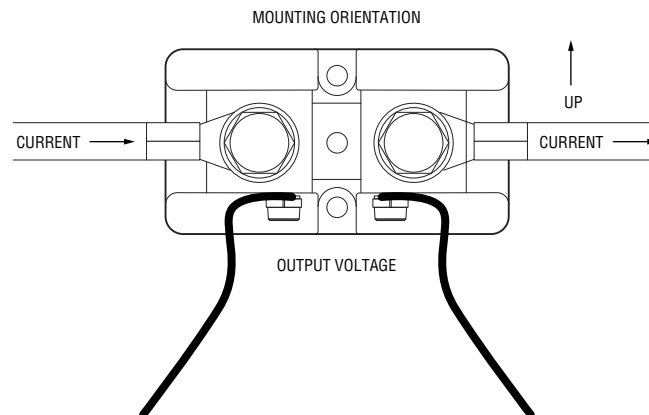
**Mounting:** Shunts should be mounted with manganin resistive blades in a vertical position in order to promote the free convective flow of air. If vertical mounting is not practical, forced air cooling or adding heat sinks to the blocks can reduce the operating temperature. The manganin blades must never exceed +140 °C, otherwise permanent resistance change may occur.

When current of 100 A or greater is passing through the shunt, the major portion of heat generated is dissipated by conduction through the shunt terminal blocks into the connecting buss bar or cable. Therefore, it is necessary to ensure that good contact is made between the shunt terminal blocks and the conductor terminals and that the conductors have adequate cross section to keep the temperature of the shunt from exceeding 140 °C (125 °C recommended).

If the shunt is mounted in an enclosure, care must be taken to ensure adequate cooling. If the power density is greater than 1/4 watt per square inch of the enclosure surface for all enclosed devices, additional cooling must be supplied in the form of air vents or fans.

Shunts also must be installed in a way that protects them from thermal expansion forces produced from buss bar or short-circuit forces. Flexible wiring may be required in high pulse current, high vibration, or high temperature applications.

Where possible, all shunts should be mounted on the ground side of the circuit. For circuits above 750 VDC, RS shunts **must** be mounted on the ground side due to the dielectric strength of the shunt base.



**Operating Current Derating:** For continuous operation, it is recommended that shunts are not operated at more than two thirds (2/3) the rated current under normal conditions per IEEE standards for DC instrument shunts. At ambient temperatures above 40 °C, the current must be further derated to prevent damage.

**Pulse Operation:** Shunts that do not need continuous operation and are only exposed to intermittent pulses can be operated at levels above their rated current for short periods of times. Pulses are limited to the maximum temperature of the blades not exceeding 140 °C (125 °C recommended). Many variables such as ambient temperature, cross section of the current carrying conductors, and pulse duration make calculating exact values difficult. Shunt size will need to be validated by customer for pulse current and duty cycle on a case-by-case basis.

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## Shunt FAQs

**Question: What is a shunt?**

Answer: A shunt is simply a very precise resistor with its general operation adhering to Ohm's law.

**Question: What is a Current Shunt Resistor?**

Answer: Current shunt resistors are a low resistance precision resistor used to measure AC or DC electrical currents by the voltage drop those currents create across the resistance. These are also sometimes called ammeter shunts, which are a type of current sensor.

**Question: What is the best way to mount a shunt?**

Answer: Ideally, shunts should be mounted such that the resistive elements are oriented in a vertical plane to promote better cooling of the elements. This means that our shunts that include a base should be mounted to a panel or wall and not a floor or ceiling.

**Question: What is the current lead time for your shunts?**

Answer: Many of our shunts and fuse blocks are available from stock. If the device you are seeking is not in stock, our current manufacturing lead time for new orders is four to five weeks, often sooner.

**Question: What is the accuracy of Bourns® shunts?**

Answer: We offer a standard tolerance of  $\pm 0.25\%$ , however, we may be able to provide shunts with a tolerance as tight as  $\pm 0.1\%$  on request.

**Question: What voltage output options are offered for your shunts?**

Answer: Our shunts are offered with either 50 mV or 100 mV outputs as standard. However, we can support nearly any voltage output on request including 60 mV and 75 mV.

**Question: Are your shunts MIL spec?**

Answer: The MK series of shunts are built to meet the standards of CID (commercial item description) A-A-55524, which superseded MIL STD 91586.

**Question: What does rated current mean in regards to your shunts?**

Answer: Our shunts are offered in many standard current ratings. This rating, often referred to as full scale, when applied to the shunt will result in the selected voltage output. For continuous use, we recommend that the shunt be operated at no more than 2/3 rated or full-scale current.

**Question: Why do you recommend de-rating your shunts by rated or full-scale current?**

Answer: We recommend not exceeding 2/3 rated or full-scale current in order to limit thermal heating of the resistive element.

**Question: What is the power rating for your shunts?**

Answer: The power rating of a shunt will always adhere to Ohm's law and may be calculated using the formula  $P=I^2R$ , where  $I$  is the rated current and  $V$  is the chosen milli-volt output of the shunt.

**Question: Can shunts be used to measure short duration pulses?**

Answer: Yes, a shunt can be used to measure pulses. There is an important thing to keep in mind, however. It is permissible to exceed the rated current of a shunt for a short period of time. The length of time will depend entirely on thermal concerns. It is important that the resistance element of the shunt not exceed 140 °C or the resistance value will forever be altered and the shunt ruined. In order to provide an additional safety factor, we recommend that the temperature of the resistance element not exceed 125 °C. Keep in mind that the voltage output of the shunt will be proportional to the input current, so it is necessary to ensure that the input of any monitoring equipment not be exceeded.

**Question: Can shunts be used to measure AC currents as well as DC currents?**

Answer: Bourns shunts may be used to measure low frequency AC currents. There is the possibility of electrical noise at higher frequencies, however, experience shows that the shunt will behave very well at frequencies up to about 1 kHz.

**Question: I'd like to monitor a 500-watt source, will your shunts do this?**

Answer: Probably! Remember that the shunt is not measuring the power of the source, only the current it provides to the load. Determine the expected current draw and then divide the expected current draw by 2/3 or 0.666 to determine the full scale or rated current you will need. You will also need to decide if you would prefer a 50 mV or 100 mV output.

**Question: What is the operating temperature range of your shunts?**

Answer: Our shunts will be most accurate when operated at temperatures between 30 °C and 60 °C. Below that temperature the shunt will not sustain any damage, but its accuracy will not be as precise. The absolute maximum temperature of the resistive element is 140 °C. Any temperature above that will permanently damage the shunt. We recommend not exceeding 125 °C to allow for a margin of safety.

**Shunt FAQs (continued)****Question: Do you offer customization services for your shunts?**

Answer: Absolutely! We have helped design and have manufactured a number of application specific models for use in everything from electric vehicles to aerospace. We welcome both customer specific drawings as well as modifications to our standard shunts.

**Question: What are the recommended wiring guidelines for your current sensing shunts?**

Answer: Shunts should be wired into the circuit to be monitored in the ground or return line as close as practical to the power source. This will limit the voltage differential between the terminals of the shunt and ground, thus providing a degree of safety against electrical shock. In addition, placing the shunt near the power source will ensure that all of the loads are accounted for.

**Question: Is  $\pm 0.25$  % the best tolerance you offer for your shunts?**

Answer:  $\pm 0.25$  % is our standard tolerance, however, a large portion of our shunts are available with tolerances as tight as  $\pm 0.1$  %. Please send us an inquiry and we will confirm availability of the tighter tolerance.

**Question: What is the TCR (temperature coefficient of resistance) of your shunts?**

Answer: Our shunts utilize a manganin resistive element that features a very stable TCR of 15 ppm to 20 ppm in a temperature range of 30 °C to 60 °C.

**Question: How do I help to limit the temperature rise of a shunt?**

Answer: Above 100 amps, a vast majority of the heat generated by a shunt is dissipated into the current carrying bus bars or wires. In addition, it will help to mount the shunt in such a way that the resistive elements are vertical. Finally, it can be beneficial to have adequate air flow around the shunt to help remove excess heat.

**Question: Do you offer crosses to Empro Shunts?**

Answer: Yes, we have direct replacements for the following Empro series: HA, MLA, MLB, MLC, Type A, Type B, and Type E. We may be able to offer other alternatives of Empro Shunts as well, please send us an inquiry.

**Question: Do you offer crosses to Canadian Shunts?**

Answer: Yes, we have direct replacements for the following Canadian Shunt series: Type A, Type C, Type G, Type H, Type LA, Type LB, Type LC, and Type V. These Canadian Shunts can be customized to your specific needs to offer other alternatives as well, please send us an inquiry.

**Question: What resistance material do you use for your shunts?**

Answer: We utilize a material called Manganin. Manganin is a precision resistance alloy, with moderate resistivity, low temperature coefficient of resistance and low thermal EMF versus Copper. With high stability of electrical resistance, good working properties and very good weldability, Manganin is specially dedicated to precision resistors, electrical shunts which control and measure the current through devices such as electricity meters or DC ammeters.

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