**Model 9230A**

**DC Current Shunt**

Use As A Precision Current Shunt Or As A Standard Resistor

Guildline 9230A series of precision DC current shunts are true 4-terminal devices intended for the precise measurement of DC current. They are constructed from specially selected elements supported on an insulating base for mechanical stability and covered with a perforated metal cover to allow proper cooling while providing physical protection for the elements.

In the design of the 9230A special consideration has been given to the effects of power dissipation which introduce self heating errors, beyond the required specification even when at full power and operating in air. The type of material selected for the elements has a very low temperature coefficient and the size and number of elements chosen give the optimum surface area to dissipate the maximum specified power in air for a particular value. The performance of the 9230A shunts can be dramatically improved by operating them immersed in oil such as in Guildline 9730CR or 5010 constant temperature oil baths.

The 9230A Series Precision DC Current Shunts are true 4-terminal devices intended for the precise measurement of d.c. current.

**9230A FEATURES**

- Low self-heating
- Low temperature coefficient
- Controlled current distribution through the element
- Low thermal EMF’s
- Wide dynamic range
- <10 ppm long term stability
- Air or oil cooled
- Special Values available on request
- Forced convection accessory available for improved power dissipation capability

The terminations of the shunts have been selected to give low thermal emf’s and in the case of the higher current values, 300 amperes and above, to ensure that the current applied is distributed in a constant manner, independent of how the connecting leads are arranged.

The care and attention to the design criteria have produced a series of shunts with an extreme usable dynamic range virtually from zero to full rated current. The 9230A shunts are heat treated for excellent long term stability. Operated without stressing beyond 30% of rated current and maintained in a constant temperature oil bath the 9230A’s stability enables it to be used as a standard reference resistor.

Special values in the range of 1 ohm to 10\(\mu\) ohms are available on request.

The 92310 forced convection unit with power supply is made available as an accessory to allow operation on the bench top at up to 100W dissipation with much improved repeatability and power coefficient performance.

The 9230A-15R is made available as a direct replacement for the older version model 9230/15 shunt.
## 9230A DC Current Shunt

### 9230A Series Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum Current (A)</th>
<th>Nominal Resistance Value (Ohms)</th>
<th>Nominal Initial Tolerance (±ppm) (Note 2)</th>
<th>Stability 12 Months (±ppm) Stability</th>
<th>Calibration Uncertainty (±ppm) (Note 5)</th>
<th>Temperature Coefficient (±ppm/ºC) (Note 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9230A-15</td>
<td>15</td>
<td>7</td>
<td>0.5</td>
<td>100</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>9230A-15R (Note 10)</td>
<td>30</td>
<td>15</td>
<td>0.1</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>9230A-30</td>
<td>30</td>
<td>25</td>
<td>0.05</td>
<td>100</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>9230A-50</td>
<td>50</td>
<td>50</td>
<td>0.01</td>
<td>100</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>9230A-100</td>
<td>100</td>
<td>75</td>
<td>0.005</td>
<td>100</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>9230A-150</td>
<td>150</td>
<td>75</td>
<td>0.005</td>
<td>100</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>9230A-300</td>
<td>300</td>
<td>15</td>
<td>0.001</td>
<td>100</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>9230A-500</td>
<td>500</td>
<td>250</td>
<td>0.5m</td>
<td>100</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>9230A-1000</td>
<td>1000</td>
<td>500</td>
<td>0.1m</td>
<td>200</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>9230A-1500</td>
<td>1500</td>
<td>750</td>
<td>0.05m</td>
<td>200</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note 1** - Maximum current for ambient air usage without damage to the unit is the same as the maximum current when used with the Forced Air Convection unit (92310). Use the power coefficient to determine accuracy when using applied currents above this rating.

**Note 2** - Custom values (Customer specified) of nominal resistance from 1Ω to 12Ω are available by special order.

**Note 3** - Defined as maximum variation of resistance values as initially adjusted at time of sale.

**Note 4** - When used as a standard resistor at 1-Watt Level. Use power coefficient to determine specification above 1 Watt.

**Note 5** - Resistance values are expressed as a total uncertainty with a coverage factor of k = 2. Calibrated in air at 5W, 10W, 25W dissipation levels with natural convection cooling or 10W, 25W and 100W dissipation levels with forced convection cooling up to a maximum test current of 150A. Traceable report of calibration stating measured values and uncertainty is provided. Calibration at 1 Watt levels, special points in air or flowing oil are available upon request.

**Note 6** - Temperature Coefficient must be added to the uncertainty when working at temperatures outside 23º ± 1º C.

**Note 7** - When used as a shunt, Full Rated Power is defined as 25W for ambient air and 100W for forced air-cooling or use in flowing oil.

**Note 8** - Power Coefficient must be added to the uncertainty when used as a shunt above 25W for ambient air applications.

**Note 9** - Defined as the time for the resistance value to settle to within 10 ppm of the final value for any change in applied current. The time constant is 1 minute for the 9230A-15R.

**Note 10** - The 9230A-15R is the direct replacement for the 9230/15 older version shunt.

### 9230A Ordering Information

**9230A-Current Value**: DC Current Shunt

**9230A-XX**: DC Special Value Shunt

**92301**: 20A, 1m Lead Set

**92302**: 100A, 1m Lead Set

**92303**: 300A, 1m Lead Set

**92304**: 20A, Xm Lead Set

**92305**: 100A, Xm Lead Set

**92306**: 300A, Xm Lead Set

**92310**: Forced Air Convection Unit

**GCL**: Contact Lubricant

**9230A**: DC Current Shunt

**TM9230A**: Technical Manual (included)

**Certificate of Calibration (included)**

**Report of Calibration (included)**

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