GUILDLINE INSTRUMENTS

9230A Series

Precision DC Current Shunts

Excellent as a Precision Current Shunt or Standard Resistor

9230A Series Features

- Extremely Low Self-Heating Effects
- Low Temperature Coefficients
- Low Thermal EMF's
- Wide Dynamic Range
- Controlled Current Distribution Through The Element
- < 10 ppm Long Term Stability
- Air or Oil Cooled Applications
- Special Values Available On Request
- Forced Convection Option Available Improves Power Dissipation

SHOWN WITH OPTIONAL
92310 FORCED AIR UNIT

GUILDLINE INSTRUMENTS 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. The design of the 9230A includes special features to reduce the effects of power dissipation and associated self heating errors. These shunts are designed to operate in air at full power.

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 or temperature baths.

The terminations of the shunts have been selected to give low thermal emf's and in the case of the higher current values (i.e. 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 9230A Series of Precision DC Current Shunts are true 4-terminal devices capable of the most demanding measurements of precise DC current.

The care and attention to the design of the 9230A's has produced a series of shunts with a very wide dynamic range, virtually from zero to full rated current. The 9230A shunts are also heat treated for excellent long term stability. Operated below 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 50 μΩ's are available on request. Guildline can also produce custom value shunts to meet special customer requirements.

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. Our best seller is the NEW 30 Amp model that has the same ohmic value as the old series 9230-15 but can handle twice the current (up to 30 Amps (with the optional 92310 Forced Air Unit)!

9230A Series of Precision DC Current Shunts

9230A Series Specifications

Model (Amps)	Nominal [1] Resistance Value (Ω's)	Initial [2] Tolerance (± ppm)	Maximum Current (A) [3]		12 Month Stability (± ppm)		Temperature Coefficient [5] ± ppm/°C
			92310 Option	Ambient Air	Stability	Accuracy [4]	
9230A-10	1.0	100	10	5	10	20	4
9230A-15	0.5	100	15	7	10	20	4
9230A-15R [6]	0.1	100	NA	15	10	20	4
9230A-30	0.1	100	30	15	10	20	4
9230A-50	0.05	100	50	25	10	20	4
9230A-100	0.01	100	100	50	10	20	4
9230A-150	0.005	100	150	75	10	20	4
9230A-300	0.001	100	300	150	10	20	4
9230A-500	0.5m	100	500	250	10	20	4
9230A-1000	0.1m	200	1000	500	25	50	25
9230A-1500	0.05m	200	1500	750	25	100	25
9230A-3000	0.1µ	500	na*[11]	3000	100	300	50

Model (Amps)	Full Rated [7] Power Accuracy (± ppm) @ 23 °C ± 1 °C	Power Coefficient [8] (ppm/W)			Time Constant (Minutes) [9]		Size (W x L x H)		Weight	
		92310 Option	Ambient Air	Flowing Oil	92310 Option	Ambient Air	mm	inches	kg	lbs
9230A-10	100	2	8	0.5	1.5	3	114 x 356 x 85	4.5 x 14 x 3.4	1.4	3.1
9230A-15	100	2	8	0.5	1.5	3	114 x 356 x 85	4.5 x 14 x 3.4	1.4	3.1
9230A-15R [7]	100	2	8	0.5	1.5	3	114 x 356 x 85	4.5 x 14 x 3.4	1.4	3.1
9230A-30	100	2	8	0.5	1.5	3	114 x 356 x 85	4.5 x 14 x 3.4	1.4	3.1
9230A-50	100	2	8	0.5	1.5	3	114 x 356 x 85	4.5 x 14 x 3.4	2.1	4,6
9230A-100	100	2	8	0.5	2	5.5	114 x 356 x 139	4.5 x 14 x 5.5	2.2	4.9
9230A-150	100	2	8	0.5	2	6.5	114 x 356 x 139	4.5 x 14 x 5.5	2.5	5.5
9230A-300	100	2	8	0.5	2	7	114 x 406 x 96	4.5 x 16x 3.8	5.0	11.2
9230A-500	100	3	10	0.8	2	7.5	114 x 406 x 96	4.5 x 16 x 3.8	5.8	12.9
9230A-1000	250	8	20	2	4	15	114 x 530 x 145	4.5 x 20.9 x 5.7	7.2	15.8
9230A-1500	250	10	30	3	5	20	114 x 530 x 145	4.5 x 20.9 x 5.7	7.8	17.2
9230A-3000*[10]	600	na	na	na	na	30	133 x 870 x 100	5.2 x 34.2 x 4.0	19	41.8
92310 Option							121 x 242 x 69	4.75 x 9.5 x 2.7	1.0	2.2
Environmental	Operating: 18°C to 28°C <70% RH non-condensing						Storage Operating: -30°C to 70°C <90% RH non-condensing			

Note 1: Custom values (Customer specified) of nominal resistance from 10 µΩ to 1 Ω are available by special order.
Note 2: Defined as maximum variation of resistance value as initially adjusted at time of sale.
Note 3: Maximum current for ambient air usage without damage to the unit is the same as the maximum current when used with 92310. Use the power coefficient to determine accuracy when using applied currents above this rating
Note 4: When used as a standard resistor at 1-Watt Level. Use power coefficient to determine specification above 1 Watt.
Note 5: Temperature Coefficient must be added to the uncertainty when working at temperatures outside 23° ± 1° C.
Note 6: The 9230A-15R is the direct replacement for the 9230/15 version shunt. The 9230A-30 has the same ohmic value as the 9230-15R and can dissipate 2X the current.
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 flowing oil.
Note 10: This model at max current load of 3000 amps produces 0.9 Watts of power, therefore, no cooling (air or oil) is required. Non-Accredited Calibration only for this value.
Note: Expressed as a total uncertainty with a coverage factor of k = 2. Calibrated in air at 5W, 10W, 25W (ambient air) or 10W, 25W and 100W (92310). Maximum test current of 150A. Report of calibration stating measured values and uncertainty provided. Calibration at 1 Watt levels, special points in air or flowing oil available upon request.

Ordering Information

9230A-Model	DC Current Shunt (List Amperage Value For Model)
9230A-X	Customer Specified Value (State Amps and Ohm Value)
/TM9230A	Technical Manual included at no charge.
92310	Forced Air Convection Unit (fits all standard models)
92301	20A, 1 Meter Lead Set (Current and Sense)
92302	100A, 1 Meter Lead Set (Current and Sense)
92303	300A, 1 Meter Lead Set (Current and Sense)
Many Other Precision Leads Sets Are Available – Please Contact Guildline	
Optional Calibration Services (ISO 17025 Service Available)	
/Temp	Additional Customer Specified Temp Cal Point (Charge)
/Current	Additional Customer Specified Current Point (Charge)

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