

## CURRENT SENSORS, CURRENT SHUNTS

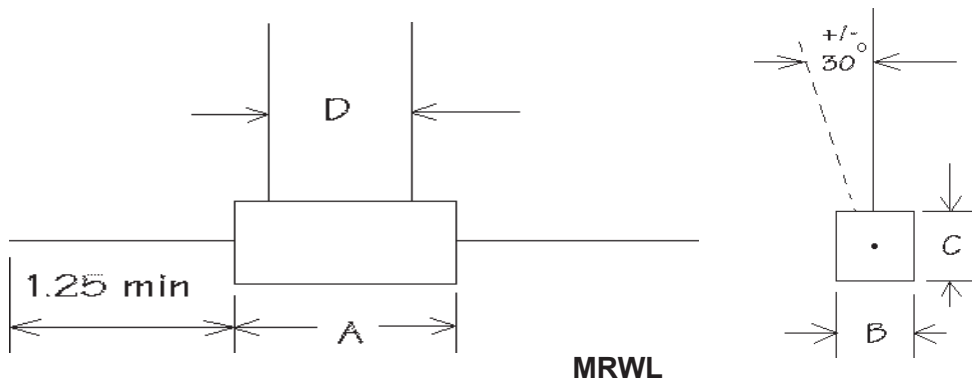
Mills Resistor manufactures many different styles of these products. Some terms must be defined before we can present some of our more popular styles.

**SHUNT:** Any resistance device capable of diverting the current in an electrical circuit. It is normally a two leaded unit with very low resistance ( $< 0.10\Omega$ ). It also readily handles the current associated with its low resistance value.

**CURRENT SENSOR:** A resistor employed to sense levels of current. This resistor is configured in the "Kelvin" style (four leads). It is used wherever the emphasis is on accuracy and repeatability under all conditions. The current sensor does not normally carry a high current rating. Please refer to the section on Ultra-Precision resistors and talk with our engineering staff with any specific needs.

**CURRENT SHUNT:** A four leaded shunt. In addition to being able to withstand significant current, it is able to perform as a current sensor.

### LOW-OHM CERAMIC ENCASED RESISTOR SHUNT



Mills P/N	Watts	Max Current	A	B	C	D	E	F	Std Range $\Omega$
MRWL02	2	10 Amps	0.688	0.250	0.250	0.350	0.032	1.250	0.005 - 0.10
MRWL03	3	10 Amps	0.875	0.312	0.312	0.563	0.032	1.250	0.005 - 0.10
MRWL05	5	20 Amps	0.875	0.375	0.375	0.563	0.032	1.250	0.005 - 0.10
MRWL07	7	20 Amps	1.375	0.375	0.375	1.013	0.032	1.250	0.01 - 0.10
MRWL10	10	20 Amps	1.875	0.375	0.375	1.388	0.032	1.250	0.01 - 0.10
MRWL15	15	20 Amps	1.875	0.500	0.500	1.388	0.032	1.250	0.01 - 0.10
MRWL22	22	20 Amps	2.500	0.500	0.500	2.000	0.032	1.250	0.01 - 0.10

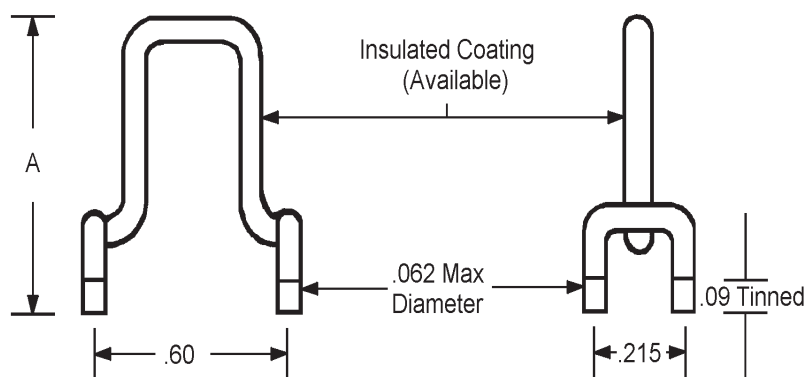


## CURRENT SENSING SHUNTS

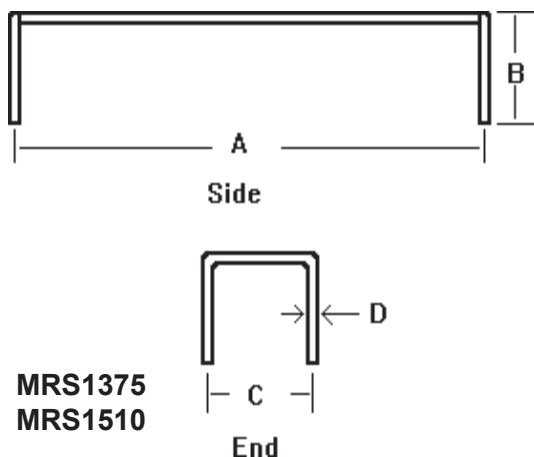
MRS1298	$\Omega$	A (max)	Amps
01	.010	.700	25
02	.005	.700	25
03	.003	.580	25
04	.001	.400	25
05	.050	.700	10
06	.010	.350	15
07	.005	.350	15
08	.002	.400	15
09	.00382	.350	15
10	.013	1.00	15
11	.033	.600	15
12	.025	.400	15
13	.033	.875	15
14	.008	.685	15
15	.020	.300	10
16	.050	.600	15
17	.004	.500	25
18	.010	.350	15

Providing both current sensing and current shunting utility, this style shunt is the best combination of size and performance.

The values at left are examples of the more commonly ordered values. Please contact the factory for your specific custom value, if it is not on the list.



**MRS1298**



**MRS1375  
MRS1510**

MRS1375	$\Omega$	A	B (max)	C	D	Amps
01	.001	.750	.500	.500	.080	30
02	.002	1.700	.500	.500	.080	40
03	.003	1.700	.500	.500	.080	40
04	.001	1.700	.500	.500	.080	40
05	.002	1.250	.750	.500	.080	30
06	.004	1.250	.750	.500	.080	30
07	.00166	1.600	.500	.500	.080	35
09	.005	2.865	.750	.500	.080	40
10	.010	1.400	.750	.500	.080	20
11	.004	1.200	.400	.500	.080	30
13	.001	1.250	.750	.500	.080	40

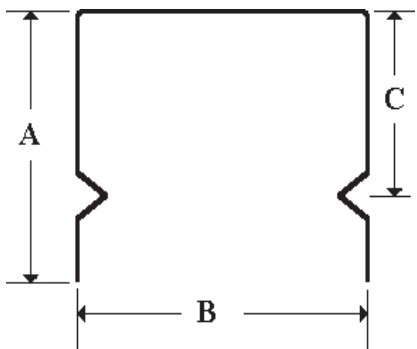
MRS1510	$\Omega$	A	B (max)	C	D	Amps
01	.050	1.00	.400	.215	.057	15
02	.003	1.10	.355	.200	.040	25
03	.0015	1.10	.380	.270	.081	40
04	.001	1.00	.500	.300	.081	40
05	.002	1.25	.750	.375	.080	30
06	.001	2.19	.625	.625	.128	80

For heavier duty, our MRS1375 and MRS1510 series current-sensing shunts should meet most needs. Should you require specific dimensions or load handling capability, our engineering department is willing to assist—just call us.

## WIRE SHUNTS

MRS1367	Ω	A (max)	B	C (max)	Amps
03	.050	.750	1.500	.500	10
04	.010	.750	.900	.625	15
05	.020	.500	.750	.375	10
06	.025	.625	.750	.500	10
07	.040	.800	.812	.675	10
08	.050	.500	.960	.375	8
09	.070	.650	1.300	.525	8
10	.070	.800	1.600	.675	10
11	.005	.750	.750	.550	15
12	.033	.500	.400	.325	8
13	.025	.475	.960	.350	10
14	.015	.750	1.500	.625	10
15	.050	.625	1.080	.500	10
16	.100	.620	.625	.400	6.5
17	.020	.500	.600	.375	12.5
18	.025	.540	.800	.415	15
21	.030	.725	.750	.525	10

**Need Parts Quickly?**  
 Ask about our **FastLane Program**.  
 Many of our resistors can be made  
 to order in as little as 10 days.



The MRS1367 is the cost effective solution for many low ohm applications. The values shown above are examples of the many different configurations possible. Our engineering department will be very happy to design a shunt to your requirements.

The MRS1367 is made from material that is readily solderable so does not require tinning. Tinning or a protective silicone coating can be provided upon request.

**Other sizes up to 125 amps are readily available— call the factory.**

### Pulse Handling

One short pulse (<100 milliseconds) is assumed to never have time to heat more than the wire element. Therefore the calculation is based upon the total mass of the wire only being heated to the maximum internal hot-spot temperature. An example calculation based upon an element mass of 5 grams with a specific heat of 0.1 heated from 25°C to a maximum internal hot spot temperature of 275°C requires:

$$\frac{5 * 0.1}{860} * (275 - 25) = .145 \text{ watt-hours}$$

If the pulse width is 10 milliseconds the pulse power could be:

$$\frac{0.145 * 3600 * 1000}{10} = 52,200 \text{ watts max.}$$

Repeated short pulses may allow for a higher power rating during the pulses. Longer pulses are treated under the guidelines of the short time overload specification. Our engineers will be glad to assist in these calculations.