

ELECTRIC VEHICLES, INDUSTRIAL MOTOR DRIVES, RAPID TRANSIT TRAINS, SNUBBER CIRCUITS, LOAD BANKS



DYNAMIC BRAKING HIGH POWER METAL CLAD RESISTORS

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Founded in 1989, ISOTEK has built a solid reputation for quality products, engineering support and superior customer service. In this catalog you will find data sheets for a broad range of standard products. However, ISOTEK welcomes all inquiries for technically demanding custom product development. With more than 30 years of engineering experience, ISOTEK has the resources to provide you with your design solution.

ISOTEK is the sole North American agent for RARA ELECTRONICS CORPORATION (Korea). RARA has been recognized for engineering excellence and innovative power resistor design.

WELCOME TO ISOTEK

Product Information

This series of Metal-Clad, High Power Resistors are manufactured by RARA Electronics Corporation (Korea). They are designed for industrial and commercial applications where rugged construction and excellent thermal management are required. They are available in horizontal, vertical and flat configurations to accommodate a variety of mounting requirements.

Primarily designed for Dynamic Braking in motor drives, these wire wound resistors are also ideal for use in Load Banks and in Snubber Circuits. Typical applications are found in Industrial Motor Drives, Electric Vehicles, Rapid Transit Trains, Test Racks for Power Supplies, etc.

The resistor windings can be user specified as inductive or non-inductive. The windings are isolated from the extruded aluminum housing, which is then filled with silica sand and encapsulated with a proprietary cement compound. Standard terminations are metal tabs or silicone wire leads. Most resistors are available with optional internally mounted (UL listed) thermal protection circuits.

Custom configurations, including special marking, logos, etc., are always welcome. Contact our application engineering department by phone or email: 800-569-6467 or tekinfo@isotekcorp.com.

Dynamic Braking 60 W to 500 W (UL® Recognized)

The ULV (V=vertical) & ULH (H=horizontal) models are UL® recognized metal-clad, high power resistors designed for industrial drives and other applications. The rugged extruded aluminum housing provides electrical isolation and simple two-screw mounting. These models are available with flying leads or tab terminals and can be ordered with inductive or non-inductive windings. Packages 200W and larger are also available with internally mounted, UL listed, thermal protection circuits.

General Specifications

Model	Power Rating on Heat Sink	Resistance Range (ohms)				Resistance Tolerance
		Inductive		Non-Inductive		
		Tab Terminals	Flying Leads	Tab Terminals	Flying Leads	
ULH/ULV60	60	0.1-375	0.1-400	0.1-180	0.1-180	±2.0 (G) ±5.0 (J) ±10 (K)
ULH/ULV80	80	0.1-281	0.1-910	0.1-110	0.1-110	
ULH/ULV100	100	0.1-225	0.1-1.1K	0.1-225	0.1-240	
ULH/ULV120	120	0.1-187	0.1-1.3K	0.1-187	0.1-300	
ULH/ULV150	150	0.1-150	0.1-1.6K	0.1-150	0.1-390	
*ULH/ULV200	200	0.1-450	0.1-2.2K	0.1-450	0.1-1K	
*ULH/ULV300	300	0.1-300	0.1-2.7K	0.1-300	0.1-1.5K	
*ULH/ULV400	400	0.1-225	0.1-4.3K	0.1-225	0.1-2.2K	
*ULH/ULV500	500	0.1-180	0.1-6.8K	0.1-180	0.1-3K	

* Available with thermostat circuit. Consult Isotek Technical Support for calibration temperatures.



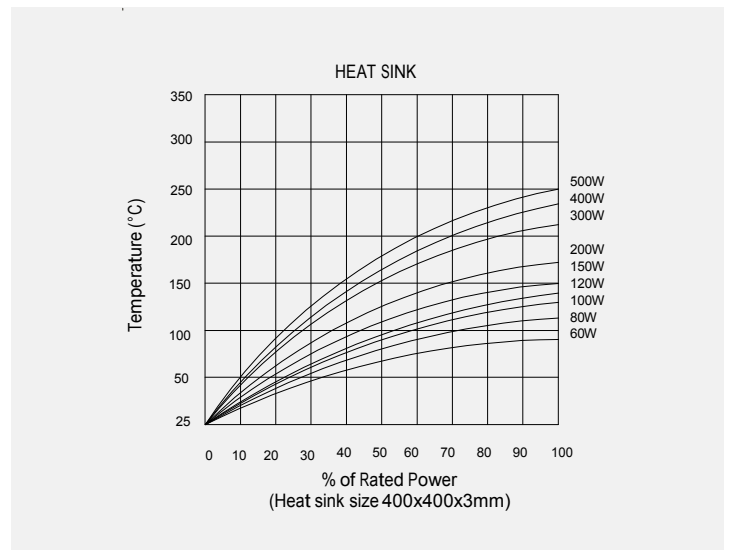
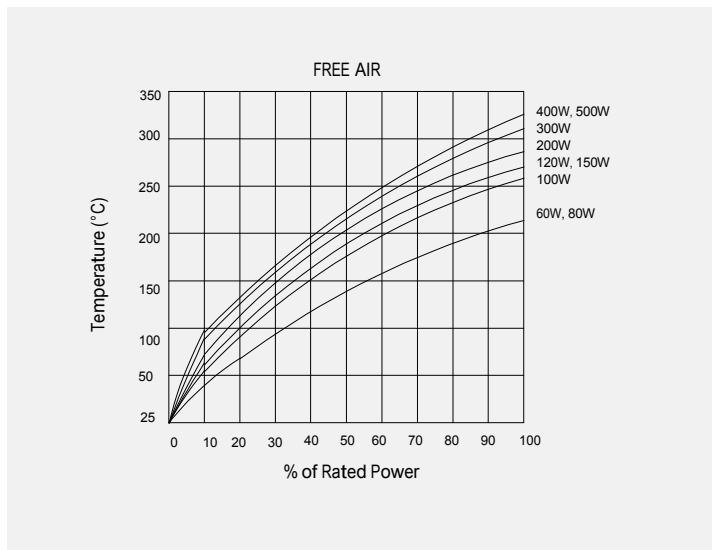
Characteristics

Values in [] indicate change in Ω after test

Temperature Range	-55°C to 200°C
Insulation Resistance	20MΩ minimum
Dielectric Strength	[1000V + (rated voltage x 2)] minimum
Temperature Coefficient	±260 ppm/°C maximum
Short Time Overload	± [2% + 0.05 Ω] 60W:5x power rating (5 sec.); 80 to 500W:10x power rating (5 sec.)
Moisture Resistance	± [3% + 0.05 Ω] 40°C, 95% RH, DC100V case to terminal (500 hours)
Thermal Shock	± [2% + 0.05 Ω] power rating 30 minutes, -25°C, 15 minutes
Vibration	± [1% + 0.05 Ω] 10Hz-55Hz-10Hz (1 minute) 2 hours each direction
Moisture Load Life	± [3% + 0.05 Ω] 40°C, 95% Rh, 0.1x power rating, 1.5 hours on, 30 minutes off, 500 hours
Load Life	± [5% + 0.05 Ω] power rating, 1.5 hours on, 30 minutes off, 500 hours

Applied voltage: AC RMS

Surface Temperature Increase Versus Power Load

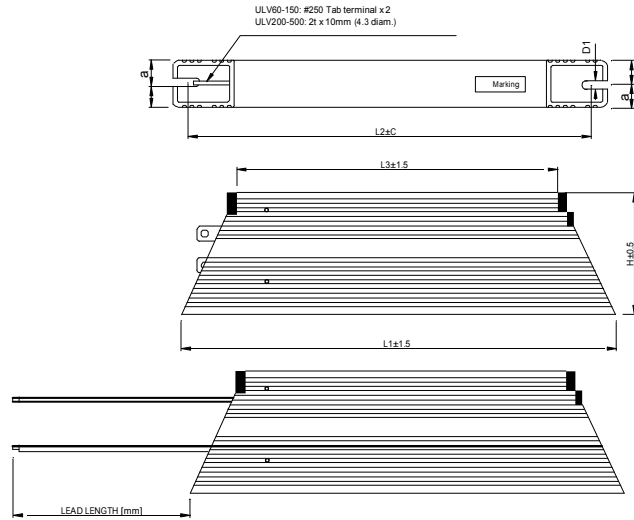
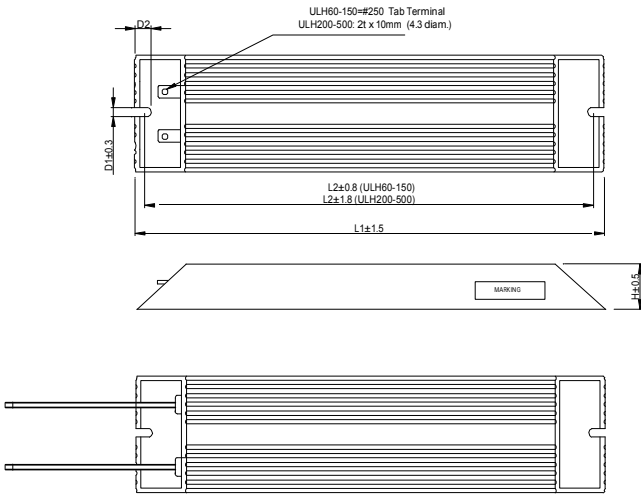


A mid-point bracket is required for 150, 300-500W models to ensure sufficient contact with the heat sink.

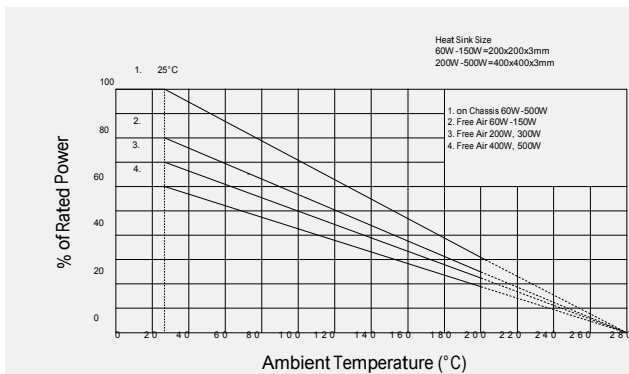
Dynamic Braking 60 W to 500 W (UL® Recognized)

Dimensions

Model	Dimensions [mm]									Weight [g]		Flying Leads UL E120271 (AWM), No. 3512	
	L1	L2	L3	W	H	D1±0.3	D2±0.3	a	b	ULH	ULV	AWG 10	AWG 14
ULH 60	100	87	60	41	22	4.3	8.65	10	12	110	113	NA	0.10 Ω & up
ULV 60	100	87	60	22	41	4.3	8.65	20	21	110	113	NA	
ULH 80	150	137	110	41	22	4.3	8.65	10	12	195	189	NA	
ULV 80	150	137	110	22	41	4.3	8.65	20	21	195	189	NA	
ULH 100	165	152	125	41	22	4.3	8.65	10	12	216	215	NA	
ULV 100	165	152	125	22	41	4.3	8.65	20	21	216	215	NA	
ULH 120	182	169	142	41	22	4.3	8.65	10	12	245	241	NA	0.11 Ω & up
ULV 120	182	169	142	22	41	4.3	8.65	20	21	245	241	NA	
ULH 150	210	197	170	41	22	4.3	8.65	10	12	283	290	NA	0.1-0.15 Ω
ULV 150	210	197	170	22	41	4.3	8.65	20	21	283	290	NA	
ULH 200	165	146	125	60	30	5.3	12	13	17	485	447	0.1-0.22 Ω	0.16 Ω & up
ULV 200	165	146	125	30	60	5.3	12	29	31	485	447		
ULH 300	215	196	175	60	30	5.3	12	13	17	600	600	0.1-0.30 Ω	0.23 Ω & up
ULV 300	215	196	175	30	60	5.3	12	29	31	600	600		
ULH 400	265	246	225	60	30	5.3	12	13	17	770	780	0.1-0.37 Ω	0.31 Ω & up
ULV 400	265	246	225	30	60	5.3	12	29	31	770	780		
ULH 500	335	316	295	60	30	5.3	12	13	17	990	980	0.1-0.37 Ω	0.38 Ω & up
ULV 500	335	316	295	30	60	5.3	12	29	31	990	980		



Derating Curve and Ordering Procedure Example



ULV Model 300 Wattage N Non-Ind. 5Ω Resistance J Tolerance FL500 Lead Length(mm)

ULV 600 - 1200

Dynamic Braking 600 W to 1200 W (UL® Recognized)

Designed for larger electrical loads, the 600-1200 watt models are UL® recognized metal-clad, wire-wound, high power resistors for use in industrial drives and other applications. The rugged, extruded aluminum housing provides electrical isolation and simple two-screw mounting. These models are available with flying leads or tab terminals and can be ordered with inductive or non-inductive windings. All four package sizes are available with internally mounted, UL listed, thermostat circuits.

General Specifications

Model	Power Rating on Heat Sink	Resistance Range (ohms)						Resistance Tolerance
		Inductive			Non-Inductive			
		Tab TP*	Tab TS*	Flying Leads	Tab TP*	Tab TS*	Flying Leads	
ULV600	600	0.1-9	9.1-94	0.1-94	0.1-5.3	5.4-21.2	0.1-21.2	±2.0(G) ±5.0(J) ±10(K)
ULV800	800	0.1-11	11.1-112	0.14-112	0.1-7.2	7.3-28.8	0.14-28.8	
ULV1000	1000	0.1-18	18.1-90	0.17-140	0.1-9	9.1-36	0.17-36	
ULV1200	1200	0.1-25	25.1-75	0.21-160	0.1-12	12.1-48	0.21-48	

NOTE: Tab TP: Tab Terminal Parallel Connection
Tab TS: Tab Terminal Series Connection

All models available with thermostat circuit. Contact Isotek Technical Support for calibration temperatures.

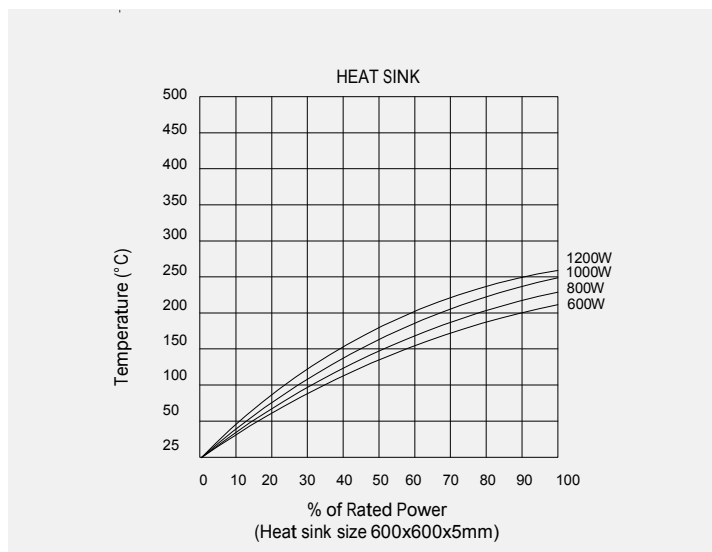
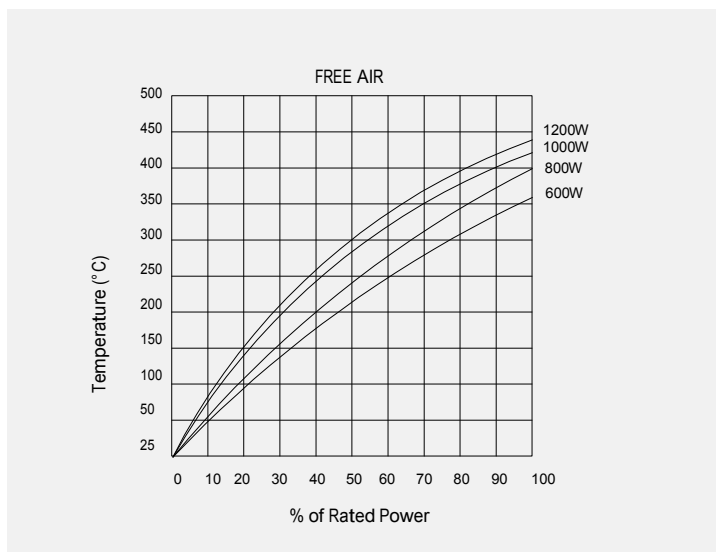


Characteristics

Temperature Range	-55°C to 200°C	Values in [] indicate change in Ω after test
Insulation Resistance	20MΩ minimum	
Dielectric Strength	[1000V + (rated voltage x 2)] minimum	
Temperature Coefficient	±260 ppm/°C maximum	
Short Time Overload	± [2% + 0.05 Ω] 10 x power rating - 5 seconds	
Moisture Resistance	± [3% + 0.05 Ω] 40°C, 95% Rh, DC100V case to terminal (500 hours)	
Thermal Shock	± [2% + 0.05 Ω] Power rating - 30 minutes, -25°C - 15 minutes	
Vibration	± [1% + 0.05 Ω] 10Hz - 55Hz - 10Hz (1 minute) 2 hours each direction	
Moisture Load Life	± [3% + 0.05 Ω] 40°C, 95% Rh, 0.1 x power rating, 1.5 hours on, 30 minutes off, 500 hours	
Load Life	± [5% + 0.05 Ω] Power rating 1.5 hours on, 30 minutes off, 500 hours	

Applied voltage: AC RMS

Surface Temperature Increase Versus Power Load



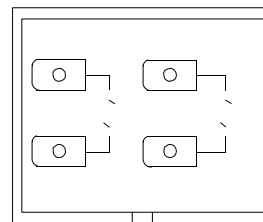
A mid-point bracket is required for 600~1200W models to ensure sufficient contact with the heat sink.

ULV 600 - 1200

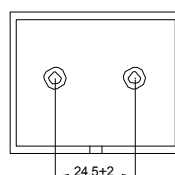
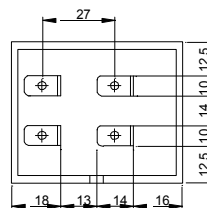
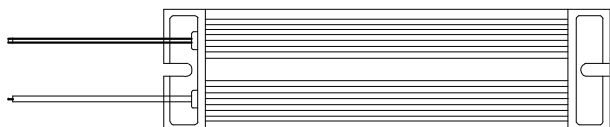
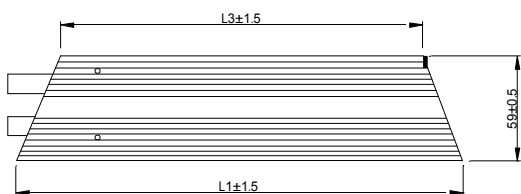
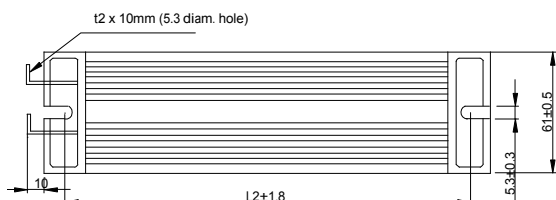
Dynamic Braking 600 W to 1200 W (UL® Recognized)

Dimensions

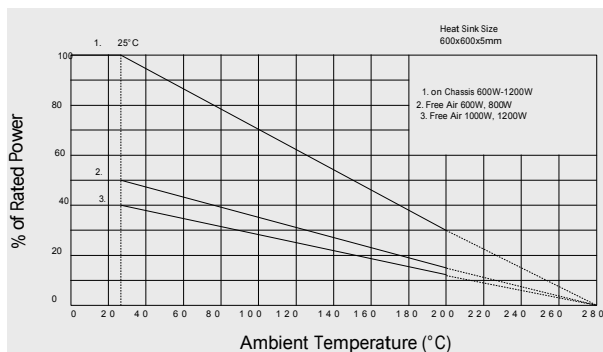
Model	Dimensions [mm]			Weight [g]	Flying Leads UL E120271(AWM), No. 3512 AWG10
	L1	L2	L3		
ULV600	235	216	195	1165	0.11 Ω ~
ULV800	285	266	245	1500	0.14 Ω ~
ULV1000	335	316	295	1835	0.17 Ω ~
ULV1200	405	386	365	2304	0.21 Ω ~



The ULV600-1200 series contain two identical, isolated elements, each with a set of terminals as shown. The two elements are connected in series or parallel with metal jumpers as requested (indicated by "S" or "P" in the part number). These connections must remain intact as the final resistance value, coupled with the configuration, determine the resistance of each element. The elements are internally configured when ordered with flying leads.



Derating Curve and Ordering Procedure Example



Ordering example with leads

ULV 1200 N 25Ω J FL500
Model Wattage Non-Ind. Resistance Tolerance Lead Length

Ordering example with terminals

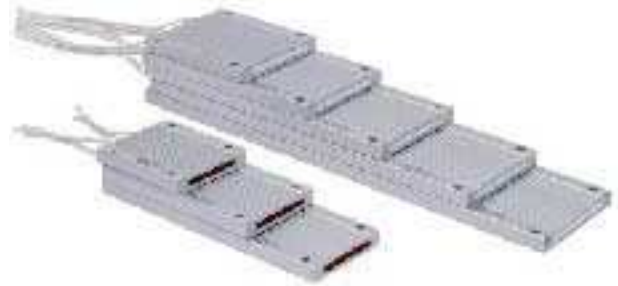
ULV 1000 P 20Ω J
Model Wattage Non-Ind. Resistance Tolerance

Dynamic Braking 50 W to 500 W (UL® Recognized)

The ULN and ULF models are wire-wound, high-power, metal-clad low inductance resistors designed for industrial and other applications where space is at a premium and performance is a must. The extruded aluminum housing provides rugged and strong protection while the flat design allows for excellent heat dissipation. These models are supplied with flying leads. The most common applications for these models are motor drives, dynamic braking, snubber circuits and power sources for industrial equipment. Both models are recognized UL508 components.

General Specifications

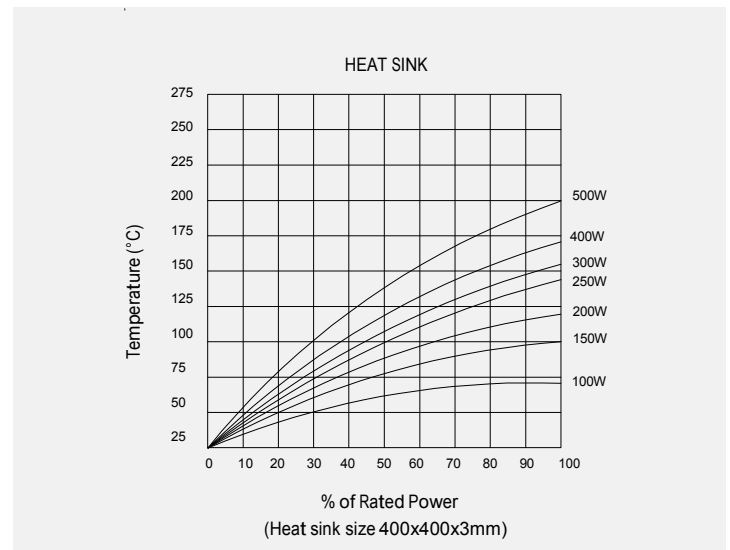
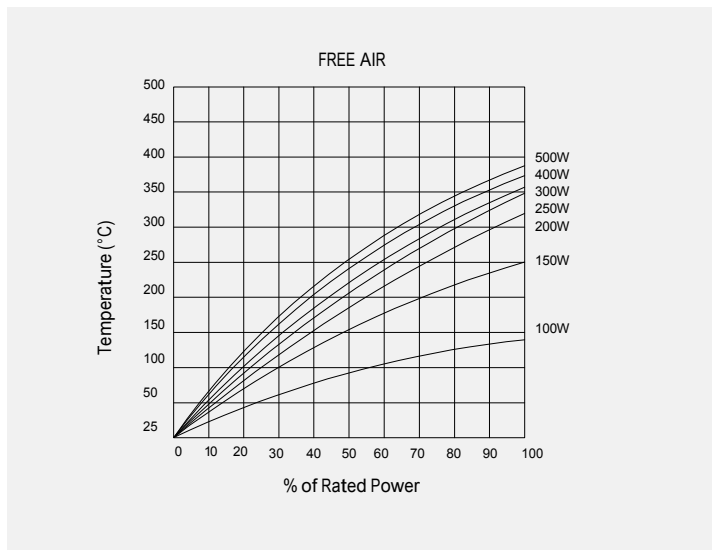
Model	Wattage Rating On Heat Sink	Resistance Range (Ω)	Tolerance
ULN50	50	1-420	±0.5 (D) ±1.0 (F) ±2.0 (G) ±5.0 (J) ±10.0 (K)
ULN100	100	1-1.1K	
ULN150	150	1-1.75K	
ULF100	100	1-1.1K	
ULF150	150	1-1.75K	
ULF200	200	1-2.2K	
ULF250	250	1-2.79K	
ULF300	300	1-3.5K	
ULF400	400	1-3.08K	
ULF500	500	1-2.46K	



Characteristics

Values in [] indicate change in Ω after test	
Temperature Range	Cement: -55°C to 200°C, Silicone: -55°C to 150°C
Insulation Resistance	20MΩ minimum
Dielectric Strength	Available Options: AC 1500V (Standard), 2500V, 3000V, 4500V (Max. leakage current: 2mA)
Temperature Coefficient	±260 ppm/°C maximum
Short Time Overload	± [1% + 0.05 Ω] 50W:5x power rating (5 sec.); 100 to 500W:10x power rating (5 sec.)
Moisture Resistance	± [2% + 0.05 Ω] 40°C, 95% Rh, DC 100V case to terminal (500 hours)
Thermal Shock	± [1% + 0.05 Ω] power rating 30 minutes, -25°C, 15 minutes
Vibration	± [1% + 0.05 Ω] 10Hz-55Hz-10Hz (1 minute) 2 hours each direction
Moisture Load Life	± [2% + 0.05 Ω] 40°C, 95% Rh, 0.1x power rating, 1.5 hours on, 30 minutes off, 500 hours
Load Life	± [3% + 0.05 Ω] power rating, 1.5 hours on, 30 minutes off, 500 hours

Surface Temperature Increase Versus Power Load



Dynamic Braking 50 W to 500 W (UL® Recognized)

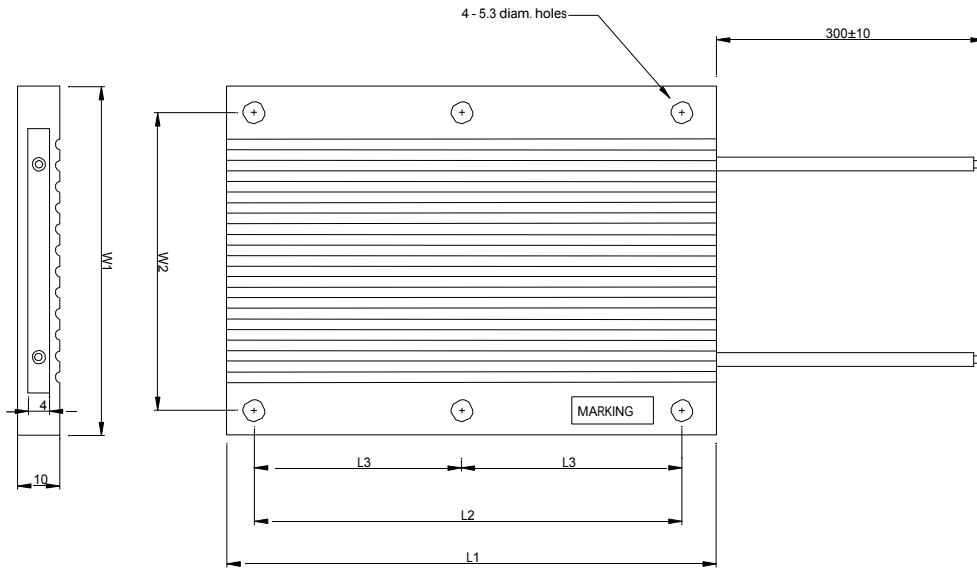
Dimensions

Model	Dimensions [mm]				Weight [g]	* Lead Wire	
	L1 ±1	L2 ±0.3	W1 ±0.3	W2 ±0.3		1.25 mm ²	2 mm ²
ULN50	70	50	60	50	100	1Ω -	NA
ULN100	120	100	60	50	160	1Ω -	NA
ULN150	170	150	60	50	220	1Ω -	NA
ULF100	90	70	80	70	155	1Ω -	NA
ULF150	120	100	80	70	200	1Ω -	NA
ULF200	150	130	80	70	245	4.1Ω -	1Ω - 4Ω
ULF250	180	160	80	70	290	5.1Ω -	1Ω - 5Ω
ULF300	210	190	80	70	335	6.1Ω -	1Ω - 6Ω
ULF400	270	250	80	70	430	8.1Ω -	1Ω - 8Ω
ULF500	330	310	80	70	525	10.1Ω -	1Ω - 10Ω

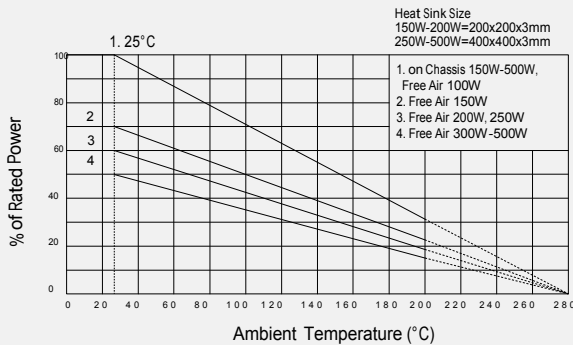
* ULN and ULF models utilize glass braided, silicone rubber lead wire.

1.25mm² (AWG #16)
2.00mm² (AWG #14)

ULF300, 400 and 500 have 6 mounting holes. Exact locations for the additional holes are shown in between the corner mounting holes. L3 = L2/2



Derating Curve and Ordering Procedure Example



ULF Model 500 Wattage S Potting Compound 100Ω Resistance J Tolerance

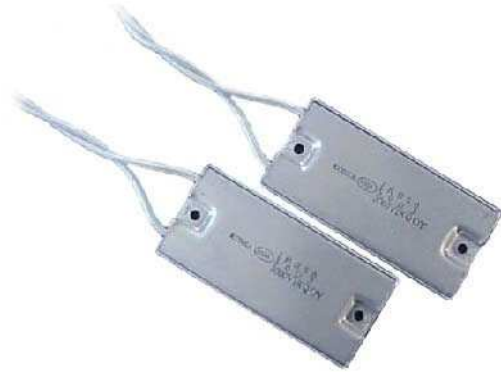
S-Silicone
C-Cement

Dynamic Braking 30 W to 50 W

The IRS30 and IRS50 are low profile, economical resistors. These models are ideal for higher volume applications where cost and space savings are crucial. Applications for these resistors include dynamic braking in motor drives, snubber circuits and power sources for industrial equipment.

General Specifications

Model	Rated Wattage On Heat Sink	Resistance Range (Ω)	Resistance Tolerance (%)
IRS30	30W	1-420	± 0.5 (D) ± 1.0 (F) ± 5.0 (J) ± 10 (K)
IRS50	50W	1-500	

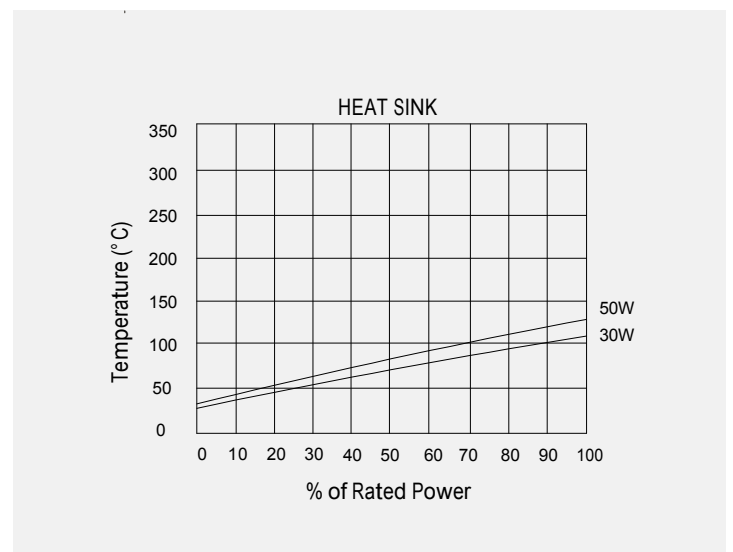
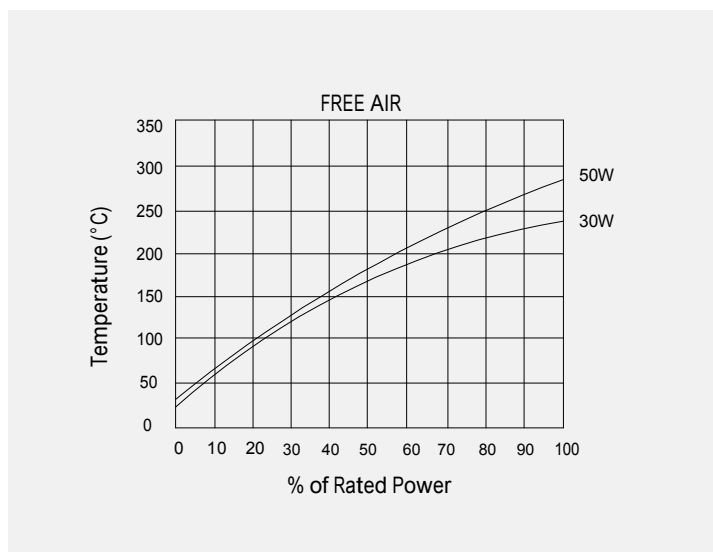


Characteristics

Values in [] indicate change after test

Temperature Range	-55 to 200°C	
Insulation Resistance	20M Ω	
Dielectric Strength	1500VAC is std.; 2500VAC available, Max. leakage current: 2mA	
Temp. Coefficient	± 260 ppm/°C	
Short Time Overload	$\pm [2\% + 0.05\Omega]$ 5 x power rating-5 seconds	
Thermal Shock	$\pm [2\% + 0.05\Omega]$ Power rating-30 min., -25°C-15 min.	
Load Life	$\pm [5\% + 0.05\Omega]$ Power rating 1.5 hours on, 30 minutes off, 500 hours	

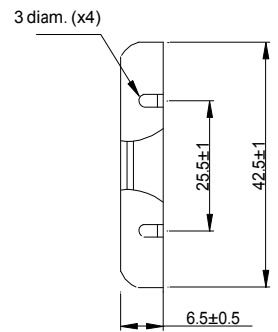
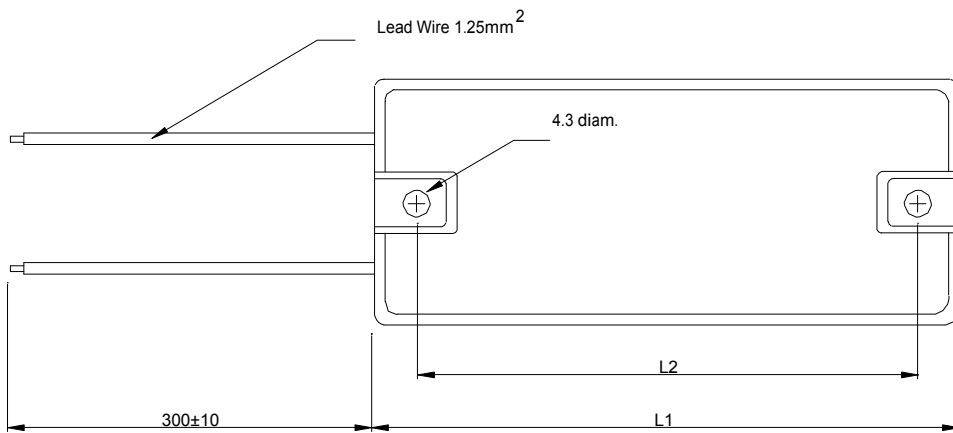
Surface Temperature Increase Versus Power Load



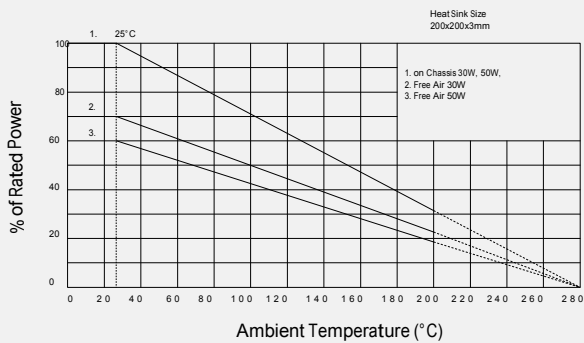
Dynamic Braking 30 W to 50 W

Dimensions

Model	Dimensions [mm]		Weight [g]
	L1±1	L2±1	
IRS30	65	57	65
IRS50	90	78	50



Derating Curve and Ordering Procedure Example



IRS
Model

50
Wattage

5Ω
Resistance

J
Tolerance

Dynamic Braking 80 W to 400 W

The RA series of resistor assemblies are designed for use in power inverters and motor drives. These assemblies are based on our standard metal clad resistor technology. The resistors are enclosed in a powder coated steel case, which conforms to international safety specifications.

General Specifications

Model	Power Rating in Free Air	Resistance Range (Ω)		Resistance Tolerance
		Inductive	Non-Inductive	
RA080	80	0.1-910	0.1-110	±0.5 (D) ±1.0 (F) ±2.0 (G) ±5.0 (J) ±10.0 (K)
RA100	90	0.1-1.1K	0.1-240	
RA200	140	0.1-2.2K	0.1-1K	
RA300	210	0.1-2.7K	0.1-1.5K	
RA400	240	0.1-4.3K	0.1-2.2K	
RA500	300	0.1-6.8K	0.1-3K	
RA600	320	0.1-94	0.1-23	
RA800	360	0.1-112	0.1-28	
RA1000	400	0.1-140	0.1-36	

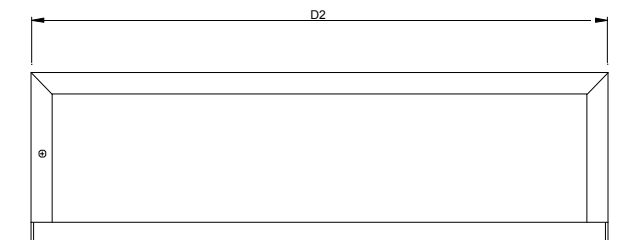
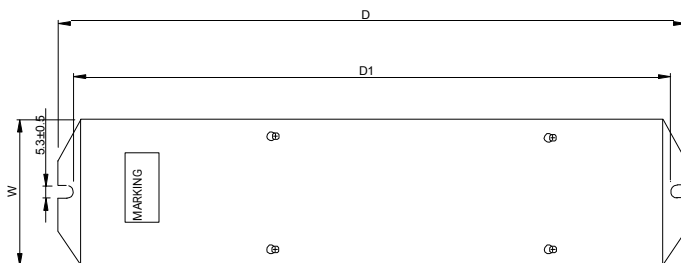
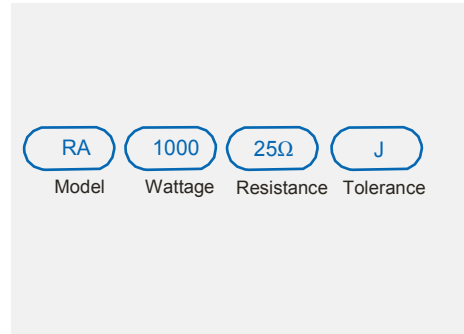


Characteristics

Temperature Range	-55°C to 200°C
Insulation Resistance	20M Ω minimum
Dielectric Strength	1500VAC is standard; available options: 2500, 3500, 4500, 5000 (VAC)
Temp. Coefficient	±260 ppm/°C maximum
Short Time Overload	±[2% + 0.05 Ω] 10 X power rating (5 sec.)
Moisture Resistance	±[3% + 0.05 Ω] 40°C, 95% RH, DC100V case to terminal (500 hours)
Thermal Shock	±[2% + 0.05 Ω] Power rating 30 minutes, -25°C 15 minutes

Dimensions

Model	Dimensions [mm]					Weight [g]
	W±1.5	H±1.5	D±2	D1±1.5	D2±2	
RA080	75	65	254	240	224	980
RA100	75	65	254	240	224	1000
RA200	90	105	440	426	410	2415
RA300	90	105	440	426	410	2530
RA400	90	105	440	426	410	2700
RA500	90	105	440	426	410	2920
RA600	90	105	440	426	410	3095
RA800	90	105	440	426	410	3430
RA1000	90	105	440	426	410	3725



Dynamic Braking 640 W to 3100 W

The HRA series of high power, metal clad, wire wound resistors are designed for use in high power inverters. These assemblies are based on our standard metal clad resistor technology. The resistors are enclosed in a powder coated steel case, which conforms to international safety specifications.

General Specifications

Model	Power Rating in Free Air	Resistance Range (Ω)		Resistance Tolerance
		Inductive	Non-Inductive	
HRA1.6K	640	0.1-224	0.1-56	±0.5 (D) ±1.0 (F) ±2.0 (G) ±5.0 (J) ±10 (K)
HRA2.0K	800	0.1-280	0.1-72	
HRA2.4K	960	0.1-320	0.1-96	
HRA3.0K	1100	0.1-420	0.1-108	
HRA3.6K	1250	0.1-480	0.1-144	
HRA4.0K	1400	0.1-560	0.1-144	
HRA4.8K	1500	0.1-640	0.1-192	
HRA5.0K	1600	0.1-700	0.1-180	
HRA6.0K	1800	0.1-840	0.1-216	
HRA7.2K	2000	0.1-960	0.1-280	
HRA8.4K	2200	0.1-1120	0.1-366	
HRA9.6K	2600	0.1-1280	0.1-384	
HRA10.8K	2900	0.1-1440	0.1-432	
HRA12K	3100	0.1-1600	0.1-480	



Characteristics

Values in [] indicate change after test

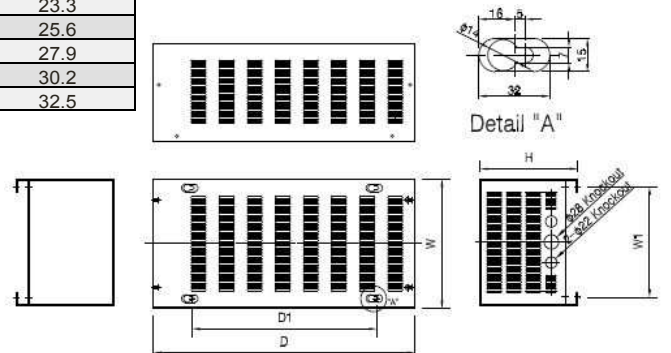
Temperature Range	-55°C to +275°C
Insulation Resistance	20M Ω minimum
Dielectric Strength	Available options: 1500VAC, 3500VAC, leakage current 2mA
Temp. Coefficient	±260 ppm/°C maximum
Short Time Overload	±(2% + 0.05 Ω) 10 X power rating (5 sec.)
Moisture Resistance	±(3% + 0.05 Ω) 40°C, 95% RH, DC100V case to terminal (500 hours)
Thermal Shock	±(2% + 0.05 Ω) Power rating 30 minutes, -25°C 15 minutes

Dimensions

Model	Dimensions [mm]						Weight [kg]
	W±5	D±5	H±3	W1±3	D1±3		
HRA1.6K	250	510	110	215	360	7.8	
HRA2.0K	250	510	110	215	360	8.5	
HRA2.4K	252	580	110	215	430	14.1	
HRA3.0K	250	510	110	215	360	10.5	
HRA3.6K	252	580	110	215	430	16.4	
HRA4.0K	250	510	190	215	360	15.0	
HRA4.8K	252	580	190	215	430	18.7	
HRA5.0K	250	510	190	215	360	16.6	
HRA6.0K	250	510	190	215	360	21.0	
HRA7.2K	252	580	190	215	430	23.3	
HRA8.4K	393	580	190	355	360	25.6	
HRA9.6K	393	580	190	355	360	27.9	
HRA10.8K	393	580	190	355	360	30.2	
HRA12K	393	580	190	355	360	32.5	

HRA 5000 7 Ω J

Model Wattage Resistance Tolerance



Precision Metal Clad Shunt

The IRHF is a four terminal metal clad shunt able to handle a high load capacity without effecting accuracy. Isolated voltage and current connection make this resistor suitable for very precise current measurements. The simple Kelvin design ensures easy installation on large current bus bars. Applications include battery manufacturing test stations, current detection in precise power sources, constant current sources, industrial power conversion circuits, HEV's, fuel cells and constant electronic loads.

General Specifications

Model	Rated Current [A]	Rated Voltage [V]	Resistance Value [Ω]	Weight [g]	Resistance Tolerance
IRHF 300	500	100 mV	0.2000 m	1300	±0.1 (B) ±0.5 (D) ±1.0 (F)
	400	100 mV/50mV	0.2500m/0.1250m	1180	
	300		0.3333m/0.1666m	1100	
IRHF 200	250	100 mV	0.4000m	680	
	200		0.5000m		
	150		0.6666m		
	100		1.0000m		
IRHF 100	75		1.3333m	310	
IRHF 80	50/75		2.0000m/1.3333m	200	

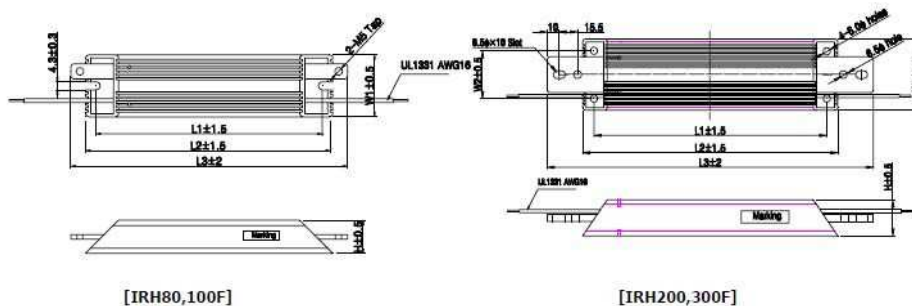
Characteristics

Temperature Range	-55°C to +110°C
Insulation Resistance	100M Ω minimum
Dielectric Withstanding Volt.	AC 500V for 1 minute
Temp. Coefficient	Max. 15ppm/°C [20°C and 60°C] / Max. 30ppm/°C [20°C and 60°C]
Short Time Overload	±(0.3%) 5 X power rating (5 sec.)
Moisture Resistance	±(0.5%) 40°C, 95% RH, DC100V case to terminal (500 hours)
Thermal Shock	±(0.2%) 65°C 30 minutes, ±90°C 30 minutes 25 cycles
Vibration	±(0.2%) 10Hz-55Hz-10Hz (1 minute), 2 hours each direction
Moisture Load Life	±(0.5%) 40°C, 95% RH, 0.1X Power rating 1.5 hours on, 30 minutes off (500 hours)
Load Life	±(0.5%) Power rating 1.5 hours on, 30 minutes off (500 hours)
Stability	±(0.1%) Battery testing time, 1 hour



Dimensions

Model	Dimensions [mm]					
	L1±1.5	L2±1.5	L3±2	W1±0.5	W2±0.5	H±0.5
IRHF 300	196	215	275	60	40	30
IRHF 200	146	165	225	60	40	30
IRHF 100	152	165	185	41		22
IRHF 80	137	150	170	41		22



Low Cost Resistor Assembly

These economical and powerful components are comprised of two, three or four high power resistors housed in partial steel covers at each end. These rugged, powder coated covers ensure an excellent seal. The internal resistors use aluminum plates at each end instead of our standard cement molding. This innovation reduces construction time and cost without reducing performance. The major application of this exciting new model is high power inverter braking units.

General Specifications

Model	Power Rating in Free Air	Resistance Range (Ω)		Resistance Tolerance
		Inductive	Non-Inductive	
LCAH3200	1.0k	2.3-160	0.6-46	±5.0 (J) ±10.0 (K)
LCAH4000	1.2k	3.0-220	0.9-61	
LCAH4800	1.3k	4.0-280	1.0-74	
LCAH5600	1.4k	4.5-270	1.0-67	
LCAH4800	1.3k	.75-265	0.9-69	
LCAH6000	1.4k	1.0-330	1.2-91	
LCAH7200	1.5k	1.5-420	1.5-111	
LCAH8400	1.6k	1.5-390	1.5-100	
LCAH6400	1.7k	0.5-340	1.2-92	
LCAH8000	1.9k	0.75-440	1.8-122	
LCAH9600	2.1k	1.0-560	2.0-148	
LCAH11200	2.3k	1.1-520	2.0-134	
LCAV9600	3.0k	0.25-528	0.1-138	
LCAV12000	3.6k	0.33-678	0.1-183	
LCAV14400	3.9k	0.41-864	0.1-222	
LCAV16800	4.2k	0.5-810	0.12-201	



Characteristics

Temperature Range	-55°C to 275°C
Insulation Resistance	20M Ω minimum
Dielectric Strength	Available options: 1500, 3500 (VAC) (Max. leakage current 2mA)
Temp. Coefficient	±260 ppm/°C maximum
Short Time Overload	±[2% + 0.05 Ω] 10 X power rating (5 sec.)
Moisture Resistance	±[3% + 0.05 Ω] 40°C, 95% RH, DC 100V case to terminal (500 hours)
Thermal Shock	±[2% + 0.05 Ω] Power rating 30 minutes, -25°C 15 minutes
Vibration	±[2% + 0.05 Ω] 10Hz-55Hz-10Hz (1 min), 2 hours each direction
Load Life	±[5% + 0.05 Ω] Power rating 1.5 hours on, 30 minutes off, 500 hours

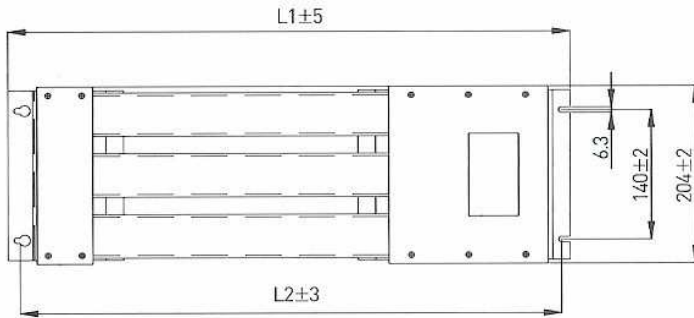
Dimensions

Model	L1±5	L2±3	W1±2	W2±2	Weight [Kg]
LCA3200	484	463	134	79	6.5
LCA4000	554	533			7.5
LCA4800	634	613			8.5
LCA5600	704	683			10
LCA4800	484	463	204	140	9
LCA6000	554	533			11
LCA7200	634	613			13
LCA8400	704	683			15
LCA6400	484	463	274	140	12
LCA8000	554	533			14
LCA9600	634	613			16
LCA11200	704	683			19
LCA9600	539	519	125	79	16.5
LCA12000	609	589			20
LCA14400	689	669			23.5
LCA16800	759	739			27.5

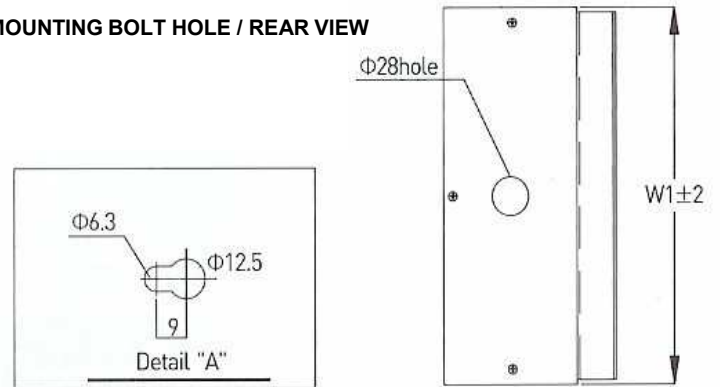
LCAH/LCAV

Low Cost Resistor Assembly

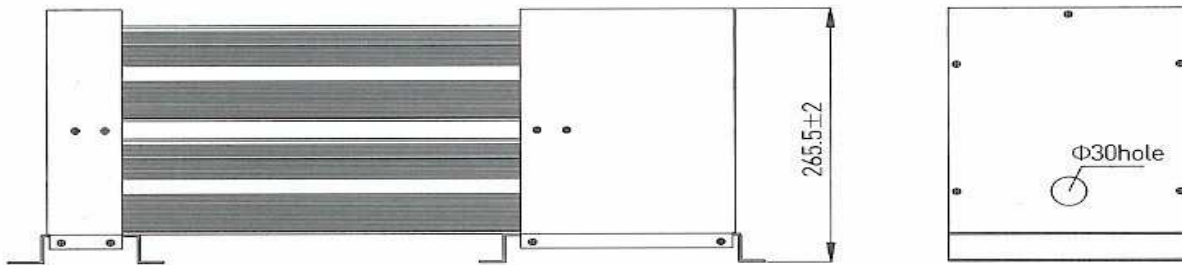
TOP VIEW



MOUNTING BOLT HOLE / REAR VIEW



SIDE / END VIEW



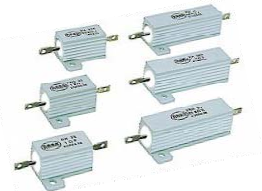
SIDE VIEW



RH25C and RH50C are aluminum housed, metal clad resistors. These models come in standard RH25, 50C or non-inductive RH25, 50 C N windings. The cement molding construction conforms to RoHS guidelines. Construction is completely welded. These models also mount on chassis to utilize heat sink cooling. RH25/50C exhibit high stability at conventional power.

General Specifications

Model	Element Type	Rated Power		Resistance Range		Temperature coefficient [ppm/C] (-55C,25C,250C)				Resistance Tol.	Min Ohmic Value	
		With Heat Sink	In Free Air	Inductive	Non-Inductive	-15C, 25C, 105C	Measuring Temp. -55, 25C, 250C					
							+200	+100	+50			+30
RH25 C	Wire Wound	20W	8W	.022Ω-25KΩ	0.1Ω-10KΩ	+200	0.022Ω-0.09Ω	0.1Ω-0.976Ω	1Ω-19.6Ω	20Ω-	+0.1(B) +0.25(C) +0.5(D) +1(F) +2(G) +5(J)	1Ω-0.4Ω-0.2Ω-0.1Ω-0.05Ω-0.02Ω-
RH50 C	Wire wound	30, 50W*	10W	.048Ω-50KΩ	0.2Ω-20KΩ	/	0.048Ω-0.09Ω	0.1Ω-0.976Ω	1Ω-19.6Ω	20Ω-		
FRH25 C	Thick Film	15W	5W	/	2Ω-2MΩ	20-	/	/	/	/		
FRH50 C	Thick Film	25W	8W	/	2Ω-2MΩ	20-	/	/	/	/		

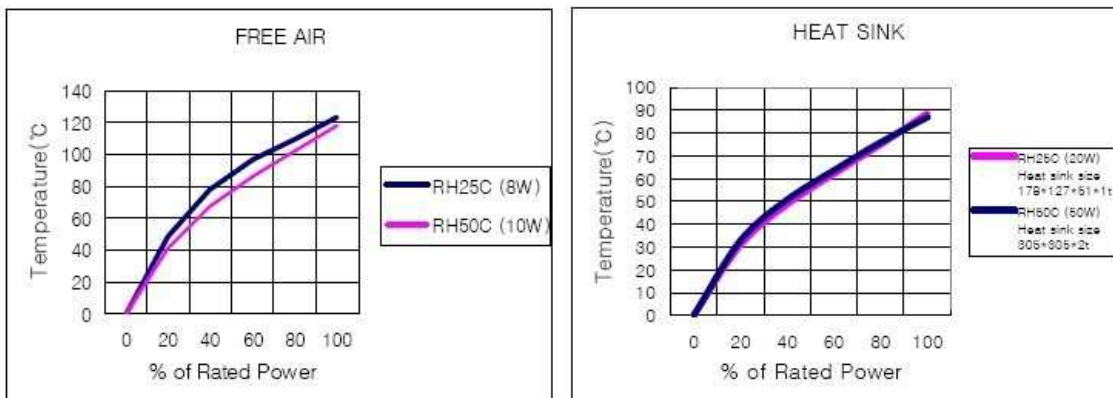


*30W on heat sink size : AL 178 X 127 X 51 X 1t, 50W on heat sink size : AL 305 X 305X X 2t

Characteristics

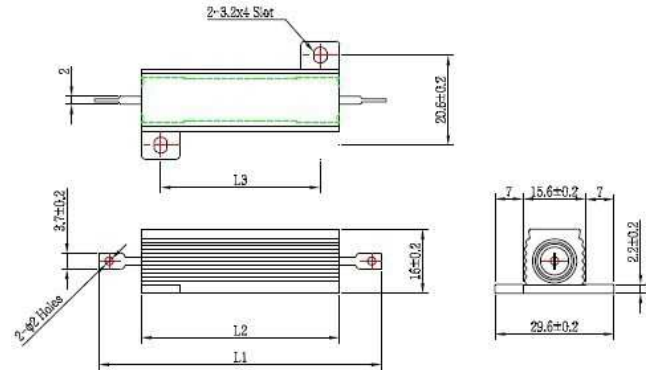
Temperature Range	-55C to 250C
Insulation Resistance	10MΩ minimum (at more than 100Ω)
Dielectric Strength	+[-0.2%+0.05Ω] AC2000V for 1 min, Max leakage current : 2mA
Short Time Overload	+[-0.5%+0.05Ω] Rated power X 5 for 5 secs
Thermal Shock	+[-0.5%+0.05Ω] Power rating 30 min, -55C 15 to 30 min
Moisture Resistance	+[-0.5%+0.05 Ω] 40C, 95% RH, DC100V case to terminal (500hrs.)
Load Life	+[-1%+0.05 Ω] Power rating 90 min on, 30 min off, 1000 hours

Surface Temperature Rise vs Power Rating

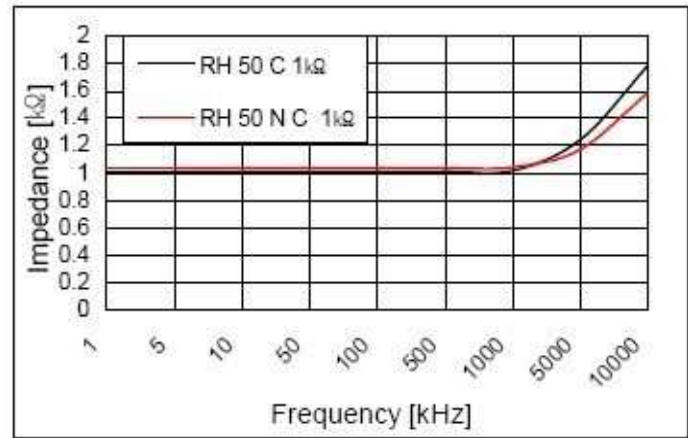
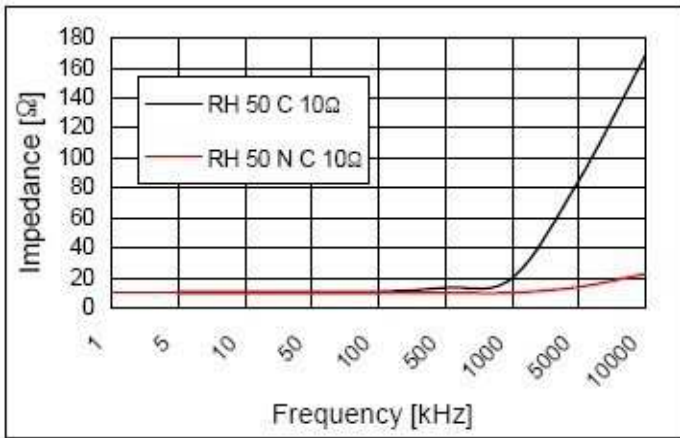


Technical Information

Model	Dimensions(mm)		
	L1	L2	L3
RH 25 C	49.4	27.1	18.3
RHC 50 C	70.8	49.3	39.7

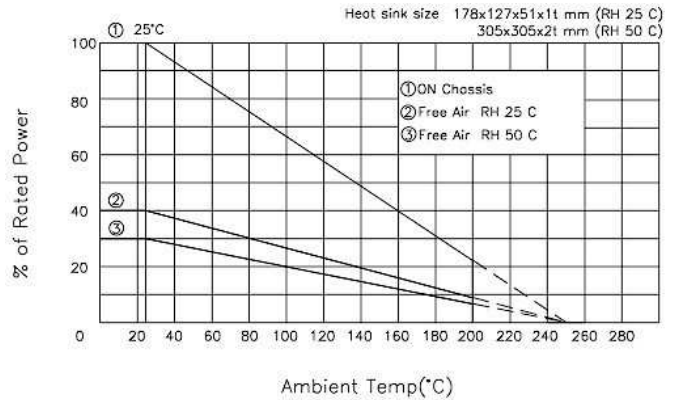


Frequency Characteristic Curves

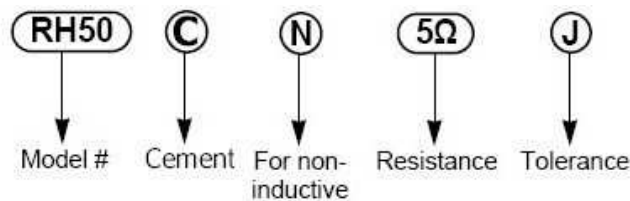


RHC resistors have an operating temperature range of -55C to 250C. Derating is required for reduced chassis mounting area and for high ambient temperatures. The following curves apply to operation of unmounted resistors.

Heat sink size [mm]:
 178 X 127 X 51 X 1t (RH 25 C)
 305 X 305 X 2 (RH 50 C)



Ordering Example



High Power Metal Clad Resistors (UL® Recognized)

The ULM 1600 – 2800 models are our highest power, wire wound, metal clad resistors. These models have an extruded aluminum housing providing strong and rugged protection. Options include flying leads or tab terminals and inductive or non-inductive windings. The most common applications are motor drives, braking and snubber applications and power sources for industrial equipment. These models are fully RoHS compliant.

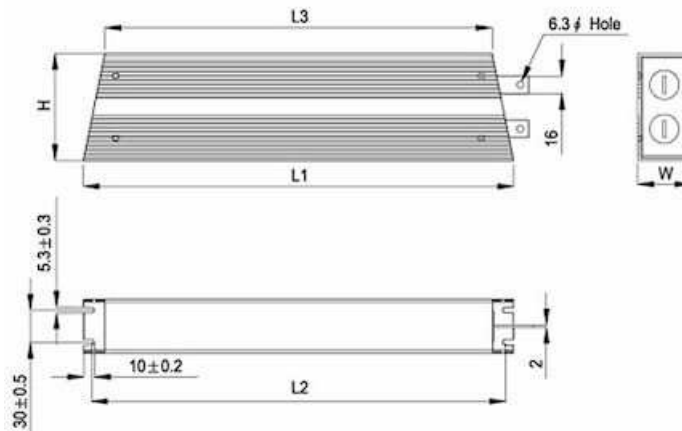
General Specifications

Model	Rated Power	Resistance Range		Resistance Tolerance
	Free Air	Inductive	Non-Inductive	
ULM1600	570	1.5-88	0.3-23	±1.0 (F) ±5.0 (J) ±10 (K)
ULM 2000	650	2.0-113	0.45-30.5	
ULM 2400	720	2.5-144	0.6-37	
ULM 2800	750	3.0-135	0.7-33.5	

Characteristics

Temperature Range	-55°C to +280°C
Insulation Resistance	20MΩ minimum
Dielectric Withstanding Volt.	AC 1500V, 2500V, 3500V, 4500V for 1 minute; Max leakage current: 2mA
Temp. Coefficient	±260ppm/C maximum
Short Time Overload	±(3%+0.05W) 5-10 X power rating (5 sec.)
Moisture Resistance	±(3%+0.05W) 40°C, 95% RH, DC100V case to terminal (500 hours)
Thermal Shock	±(5 %+0.05W) Power rating 30 minutes, -40C 15 minutes
Vibration	±(2%+0.05W) 10Hz-55Hz-10Hz (1 minute), 2 hours each direction
Moisture Load Life	±(3%+0.05W) 40°C, 95% RH, 0.1X Power rating 1.5 hours on, 30 minutes off (500 hours)
Load Life	±(5%+0.05W) Power rating 1.5 hours on, 30 minutes off (500 hours)

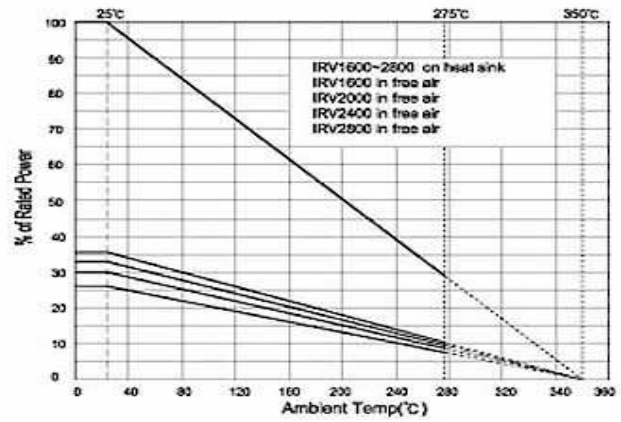
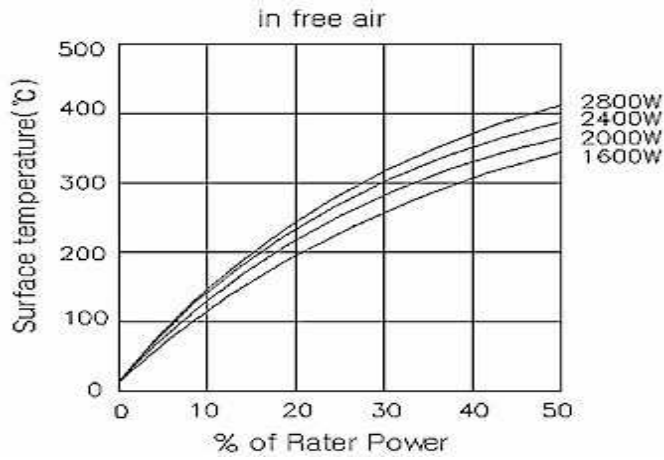
Dimensions



Model	Dimensions [mm]					
	L1±2	L2±2	L3±2	H±1	W±0.5	Weight [Kg]
ULM 1600	330	315	290	100	50	2.5
ULM 2000	440	385	360	100	50	3.1
ULM 2400	480	465	440	100	50	3.7
ULM 2800	550	535	510	100	50	4.3

High Power Metal Clad Resistors (UL® Recognized)

SURFACE TEMPERATURE INCREASE VS POWER LOAD & DERATING



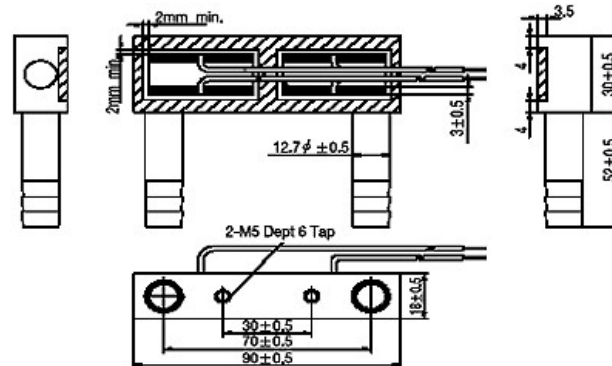
These are 500W & 1000W high power resistors exhibiting very low operating temperatures. These models offer very low inductance and high surge handling capacity. They consist of a flat resistive element with twisted pair leads. A 5kV dielectric strength is ensured with an alumina substrate. The low operating temperature of the element gives a low failure rate in high-density, compact instruments and equipment. These models can be used in snubber resistors, GTO and IGBT in electric power conversion systems.

General Specifications

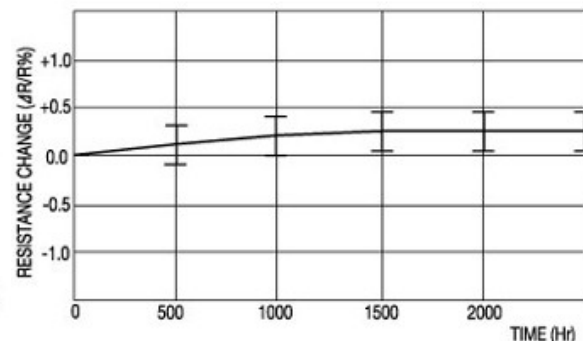
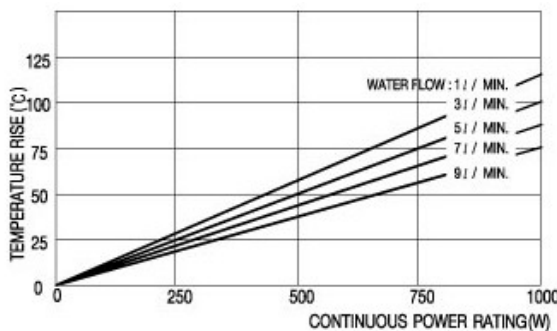
Rated Power	WCR500: 500W (water cooling), WCR1000: 1000W (water cooling)
Resistance Range	10, 20, 40 120 ohms
T.C.R	250ppm/C
Resistance Tolerance	10%
Dielectric Strength	2000VA C Between terminals and fin
Max. Water Pressure	6kg/cm squared
Volume of water flow	6 liters/min
Std. Water temp.	41C
Min. water temp.	Over dew point
Water temp. rise	1.4C At outlet (power rating)
Fin temp. rise	14.0C On the M5 tapping screw. (rated power)
Surface temp. rise	50.0C On the Heat sink surface Resistor surface temperature. (rated power)
Max. surf. Temp	110C On the element surface
Pressure loss	0.06 kg/cm squared
Weight	355g



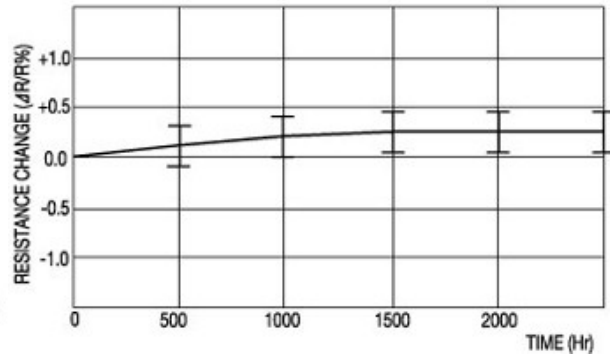
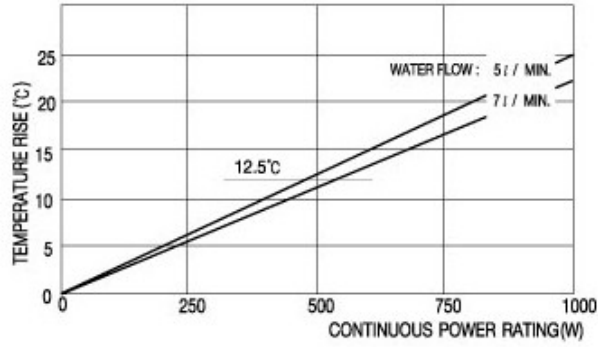
Dimensions



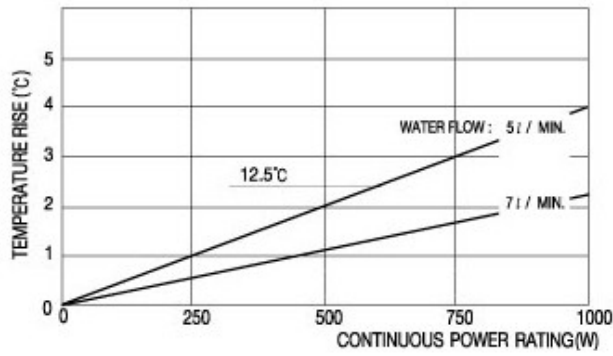
Surface Temperature Rise vs Power Rating & Load Life



Surface Temperature Rise vs Power Rating & Load Life



Cooling Water Temperature Rise vs Power Rating





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