

## ALUMINUM HOUSED WIREWOUND RESISTORS

**Series : MAL**

**Features:**

- Aluminum heat sink housing
- Complete welded construction
- Available in non-inductive style ( type **MAL-N**)  
either Aryton- Perry winding for lowest reactive components
- Mounts on chassis to utilize heat-sink effect
- Wattage from **5 Watts to 2000 Watts**
- Any custom value or custom design available
- **RoHS** Compliant directive 2002/95/EC
- Lead (Pb)-free solder contacts.



**Technical specification:**

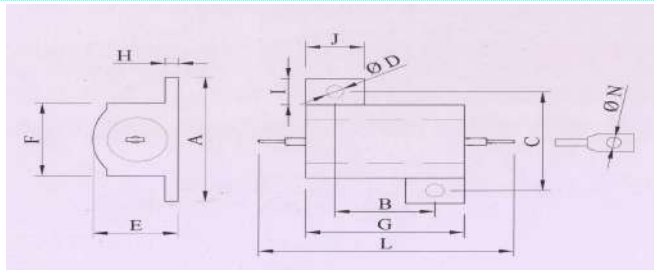
DESCRIPTION	SERIES
	<b>MAL5 ~ MAL2000</b>
Resistance range*	0.1Ω ~ 1KΩ
Resistance tolerance	±1% ~ ±5%
Temperature coefficient	≤ 200 ppm/°C
Maximum dissipation @ 70°C	5W ~ 2000W
Maximum permissible voltage	$\sqrt{P \times R}$
Insulation resistance	10 <sup>3</sup> MΩ at 500 V dc
Stability, R max.	
Load	△ R±(5.0% +0.05Ω )
Climatic test	△ R±(1.5% +0.05Ω )
Soldering	△ R±(0.5% +0.05Ω )
Short time overload	△ R±(2.0% +0.05Ω)

**Standard electrical specification:**

TYPE	POWER RATING @ 25°C(W)		RESISTANCE RANGE (IN Ω)	TOLERANCE (IN %)	WEIGHT TYPICAL (IN g)
	WITH HEAT SINK	FREE AIR			
MAL5	5W	3W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	4 g
MAL10	10W	5W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	8 g
MAL25	25W	12.5W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	13 g
MAL50	50W	25W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	28 g
MAL100	100W	50W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	315 g
MAL200	200W	100W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	520 g
MAL300	300W	150W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	830 g
MAL500	500W	250W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	1270 g
MAL750	750W	375W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	1900 g
MAL1000	1000W	500W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	2220 g
MAL1500	1500W	750W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	3200 g
MAL2000	2000W	1000W	0.1Ω ~ 1KΩ	±1%(F), ±5%(J)	3500 g

**\* Note :** Higher or low ohmic value other than resistance range & Non inductive type are available on request

**Dimensions :1.0 MAL5 & MAL10**

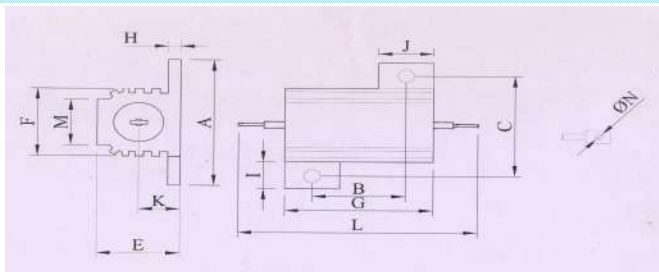


**Physical Data:**

**1.0 SPECIFICATION FOR MAL5 & MAL10 :**

TYPE	DIMENSIONS (MM)											
	A	B	C	D	E	F	G	H	I	J	L	N
MAL 5	21 ±1	9.5 ±0.3	15 ±0.3	2.5 ±0.2	11 max.	10.5 ±1	15 ±1	1.5 ±0.3	6 max.	6.5 max.	30 max.	1.8 ±0.5
MAL10	22 ±1	12.5 ±0.3	16 ±0.3	2.5 ±0.2	14 max.	12 ±1	19 ±1	1.8 ±0.3	6 max.	6.5 max.	35 max.	1.8 ±0.5

**Dimensions :2.0 MAL25 & MAL50**

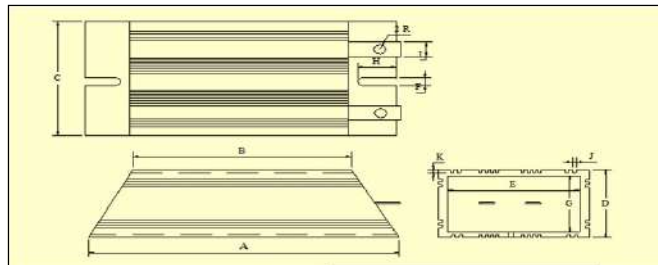


**Physical Data:**

**2.0 SPECIFICATION FOR MAL25 & MAL50 :**

TYPE	DIMENSIONS (MM)											
	A	B	C	D	E	F	G	H	I	J	L	N
MAL 25	30 ±1	17 ±0.5	22.5 ±0.5	3.0 ±0.3	16 max.	16 ±1	27 ±2	2.5 ±0.5	8 max.	9 max.	52 max.	2.2 ±0.5
MAL50	30 ±1	40 ±0.5	22.5 ±0.5	3.0 ±0.3	16.2 max.	16 ±1	50 ±2	2.5 ±0.5	9 max.	11 max.	72 max.	2.2 ±0.5

**Dimensions :3.0 MAL100 ~ MAL2000**



**Physical Data:**

**1.0 SPECIFICATION FOR MAL5 & MAL10 :**

TYPE	DIMENSIONS (MM)			
	A Nominal	B Nominal	C ±5	D ±5
MAL 100	100	85	65	33
MAL 200	165	150	65	33
MAL 300	215	200	65	33
MAL 500	330	315	65	33
MAL 750	330	290	83	44
MAL 1000	400	360	83	44
MAL 1500	550	510	83	44
MAL 2000	600	560	83	44

### Heat Sink Size :

Type	MAL5	MAL10	MAL25	MAL50	MAL100	MAL200	MAL300	MAL500	MAL750	MAL1000	MAL1500	MAL2000
Area (CM <sup>2</sup> )	60	100	225	225	2210	2210	2210	2210	3652	3652	3652	3652
Thickness (MM <sup>2</sup> )	1	1	1.5	3	3	3	3	3	5	5	5	5

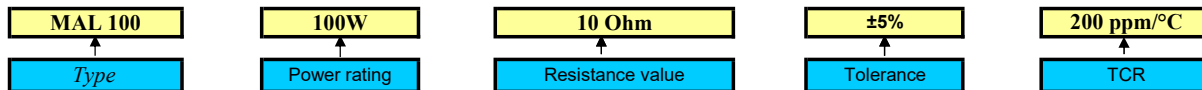
### Marking:

The MAL type the nominal resistance & tolerance are marked on the resistor body using four coloured bands. OR marked using LEGEND marking; for e.g : MFR

10E 10W J

### Part Numbering Information:

Part Number : Type number, power rating, resistance value, tolerance, tcr.



Examples: PART NO. : MAL100, 100W, 10 Ohm, ±5%, 200ppm/°C

### MATERIAL SPECIFICATIONS:

**Element** : Copper-nickel alloy or nickel-chrome alloy, depending on resistance value

**Core** : Ceramic, steatite or alumina, depending on physical size

**Encapsulant** : Silicone cement construction

**Housing** : Aluminium with hard anodic coating (optional) golden/ silver.

**Standard Terminals** : Tinned steel

### Performance Data (Procedure & Requirements):

TEST	PROCEDURE	REQUIREMENTS
<b>Robustness Of Termination</b>	Load 10N for MAL5 ~ MAL50 Load 20 N for MAL100 ~ MAL2000	No mechanical damage $\Delta R/R$ max.: $\pm(0.50\% + 0.05 \Omega)$
<b>Resistance To Soldering Heat</b>	16 hrs steam or 16 hrs. at 155°C 10 sec. $\pm 0.5$ sec. in solder at 260° $\pm 5^\circ$ C Using flux	>95% coverage covered (good tinning) $\Delta R/R$ max.: $\pm(0.5\% + 0.05 \Omega)$
<b>Temperature Cycling</b>	30 minutes at -55°C & 30 minutes at 200°C Total 5 number of cycles.	No visual damage $\Delta R/R$ max.: $\pm(1.0\% + 0.05 \Omega)$
<b>Short Time Overload</b>	5 X Rated power for 5 sec. upto 10W size 10 X Rated power for 5 sec. from 25W size & above.	$\Delta R/R$ max.: $\pm(2.0 + 0.05 \Omega)$
<b>Endurance @ 25°C</b>	1000 hrs. load with Pn (power nominal) 1.5 hr. ON & 0.5 hr. OFF	No visual damage $\Delta R/R$ max.: $\pm(5.0\% + 0.1 \Omega)$
<b>Temperature Rise Test</b>	Horizontally mounted, loaded with Pn	Hot spot temperature less than maximum body temperature
<b>Damp Heat Steady State</b>	56 days, 40°C; 90 to 95% Rh; dissipation $\leq 0.01Pn$	No visual damage $\Delta R/R$ max.: $\pm(5.0\% + 0.1 \Omega)$
<b>Temperature Coefficient</b>	At 25/-55/25 °C & 25/200/25 °C	Within specified limits
<b>Dielectric Strength</b>	V- Block method for 1 minute duration At 500 V dc	> 10 <sup>3</sup> M $\Omega$
<b>Insulation Resistance</b>	1000 V for MAL5 to MAL50 & 2000 V for MAL100 to MAL2000, for 1 minute duration	No flashover $\Delta R/R$ max.: $\pm(0.5\% + 0.1 \Omega)$

### Derating Curve:

