



DANOTHERM™



PR-series Thick Film Power Resistors

- Ideal for snubber and filter application
- Compact housed resistors with excellent heat conduction
- Must be used with external heatsink
- Molded housing which can withstand strong environmental conditions
- Optimized construction with high thermal conduction
- Large creep distance
- All internal electrical connections are welded

Thick film resistors PR series

Applications

Thick Film Resistors are ideally suited in electrical filters and snubbers because of their low parasitic inductance and easy to use. PR thick film resistors must be mounted on a heatsink to take full advantage of their power ratings. The base plate is electrically insulated. No additional insulation foil is required. Thermal grease is necessary to provide a good thermal contact between resistor base and heatsink. Recommended is a conductivity of 1W/mK or better. PR series are available in 4 housing types and 4 power ratings, ranging from 100W to over 800W.



PR100

Construction

Thick Film Resistors are produced by firing a special paste onto an alumina ceramic substrate. The electrical connections are tin welded to the thick film through copper wire, making a stable connection. The substrate on the bottom side has a metal finish (PR 250) to minimize partial discharge. The substrate is slightly outside the molded housing. When the housing is mounted to the heat sink, sufficient force for pressing the substrate to the heat sink is automatically applied. All materials are UL94-V0 listed.



PR102 / PR103

Mounting

The thick film resistors must be mounted on a heat sink. Between the heat sink and the resistor module, a thin layer of thermal grease must be applied (60–100 micrometers). Alternatively, high quality, thermal conductive, non-electrical insulating foils can be used. For proper mounting, please consult the mounting instructions. Mounting screws and washers are included.



PR101

De-rating

The nominal power depends on the heat sink temperature. When the resistor is used at higher temperatures, the nominal power must be linearly de-rated. Graph 1 and 2 give the nominal power values for PR100 and PR250, based on heatsink temperature. Graph 3 and 4 give the nominal power for PR600 and PR800, based on resistor base temperature.

Heat sink requirements

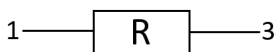
Depending on the total power which needs to be dissipated, a correct heat sink must be used. The maximum power the resistor can dissipate depends on the heat sink temperature and with that, on the thermal resistance of the heat sink and ambient temperature. The surface where the resistor will be mounted needs to be machined to a planarity of 50 micrometer and roughness of less than 6.3 micrometer.

General specifications	remark	PR100
Power rating	PR100	100W
	PR102	2x50W
Max power	not trimmed	150W
Resistance range	E12	1R0 to 1M0 *
Tolerance	standard	10%
	optional	up to 1%
Temperature coefficient		±100ppm/K
Max working voltage		1500 VAC
Working temperature range		-55°C - +155°C
Dielectric strength	1 minute 50Hz	2500VAC
Insulation resistance	@ 500V	> 10 ⁵ MΩ
Partial discharge	on request	< 80pC @ 2000VAC
Self inductance		40nH
Capacitance to heatsink		< 30pF
Overload	10s	2xP _n
Thermal resistance		0.5K/W
Heatsink flatness		0.05mm
Heatsink surface finish		6.3µm
Max torque for contacts		1.2Nm
Max torque for mounting		1.5Nm
Weight	PR100/PR101	18g
	PR102/PR103	24g

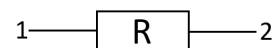
* For out of range or non-standard values, please contact Danotherm

Configurations

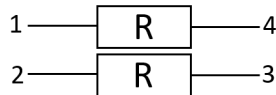
PR100



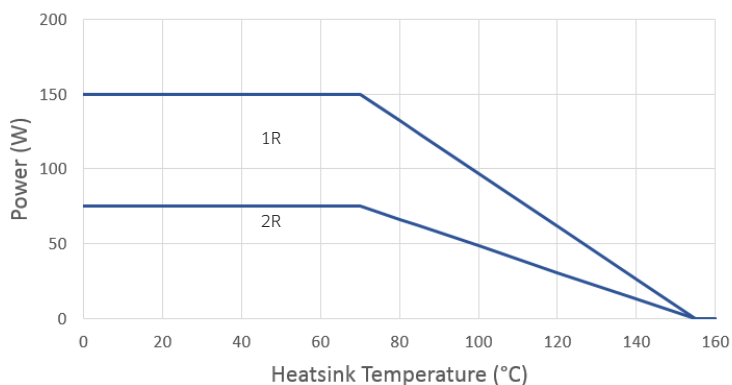
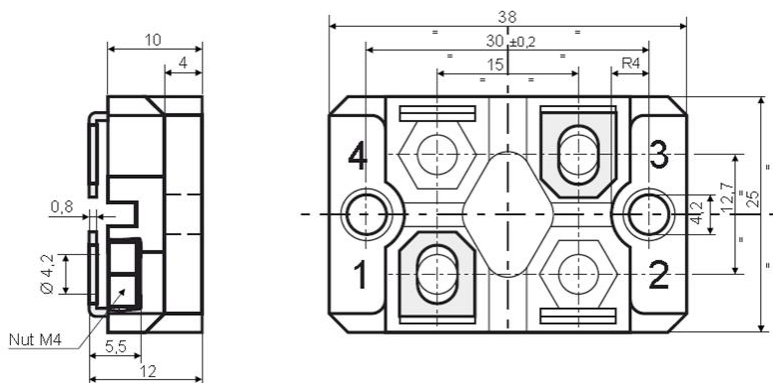
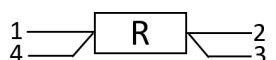
PR101



PR102

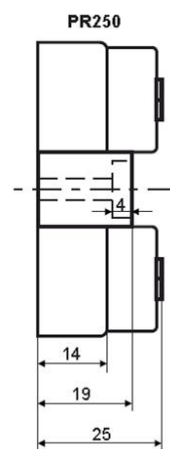
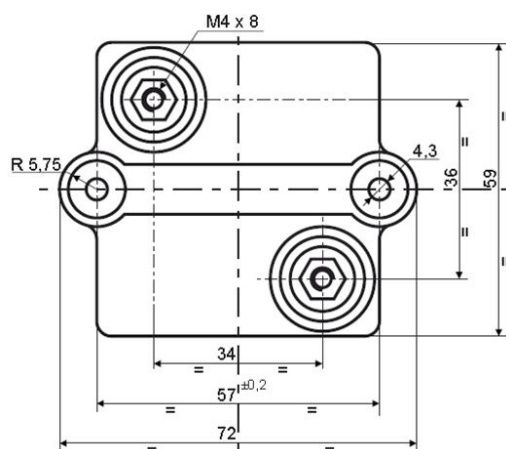


PR103

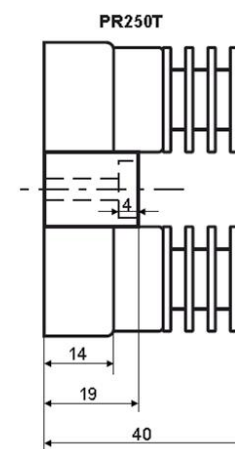


General specifications	remark	PR250
Power rating	@ heatsink 100°C	250W
Max power	not trimmed @ 70°C	500W
Resistance range	E12	1R0 to 1M0 *
Tolerance	standard	10%
	optional	up to 1%
Temperature coefficient		±100 ppm/K
Max working voltage		5000 VAC
Working temperature range		-55°C - +155°C
Dielectric strength	PR250	7000VAC
	PR250T	12000VAC
Insulation resistance	@ 500V	> 10 ⁵ MΩ
Creepage distance	PR250	42mm
	PR250T	65mm
Airgap distance	PR250	16mm
	PR250T	29mm
Partial discharge		< 10pC @ 5000VAC
Self inductance		80nH
Capacitance to heatsink		< 120pF
Overload	10s	4xP _n
Thermal resistance		0.15K/W
Heatsink flatness		0.05mm
Heatsink surface finish		6.3µm
Max torque for contacts		2Nm
Max torque for mounting		2Nm
Weight	PR250	100g
	PR250T	130g
Cable terminals	optional	

* For out of range or non-standard values, please contact Danotherm



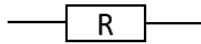
PR250



PR250T

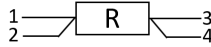
Configurations

PR250

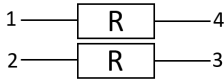


PR250

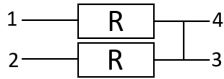
PR251



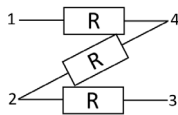
PR252



PR253



PR254



PR251 - PR254



PR250T

Heatsink calculation

PR resistors series must be mounted on a heatsink to take full advantage of the power capability. The maximum thermal resistance of the heatsink can be calculated by the following formula:

$$P = \frac{\Delta T}{R_{TH\ j-c} + R_{TH\ c-h} + R_{TH\ h-a}}$$

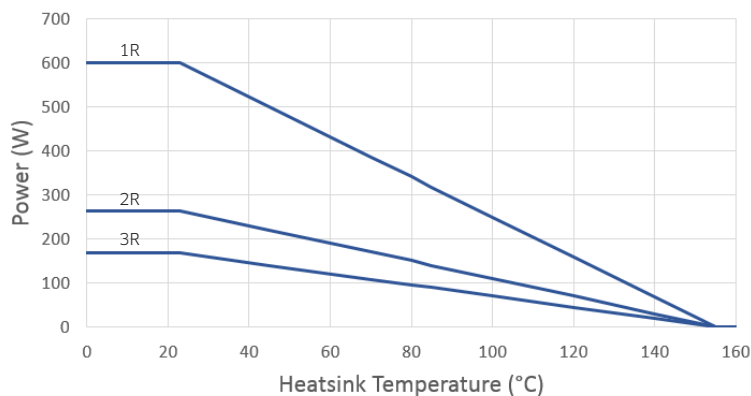
P is dissipated power in the resistor in Watts.

ΔT is the difference between maximum working temperature (155°C) and room temperature.

$R_{TH\ j-c}$ is the thermal resistance of the resistor between junction and case.
0.5K/W for PR100 and 0.15K/W for PR250

$R_{TH\ c-h}$ is the thermal resistance between the base plate of the resistor and the heatsink
This value is determined by the thickness and the properties of the paste, and the surface area size. Recommended is a paste with conductivity of 1W/mK or better.

$R_{TH\ h-a}$ is the thermal resistance of the heatsink to ambient. This value is given by the manufacturer of the heatsink.



General specifications	remark	PR600	PR800
Power rating	@ Bottom base 85°C	600W	800W
Max power	consult Danotherm	700W	950W
Resistance range	E12	1R0 to 1M0 *	
Tolerance	standard	10%	
	optional	up to 1%	
Temperature coefficient		±100 ppm/K	
Max working voltage		5000 VAC	
Working temperature range		-55°C - +155°C	
Dielectric strength	standard	7000VAC	
	on request	12000VAC	
Insulation resistance	@ 500V	> 10 ⁵ MΩ	
Creepage distance		42mm	
Airgap distance		16mm	
Partial discharge		< 10pC @ 5000VAC	
Self inductance		80nH	
Parallel capacitance		40pF	
Capacitance to heatsink		< 110pF	< 150pF
Overload	10s	1kW	
Thermal resistance		0.115K/W	0.11K/W
Heatsink flatness		0.05mm	
Heatsink surface finish		6.3µm	
Max torque for contacts		2Nm	
Max torque for mounting		2Nm	
Weight		95g	100g

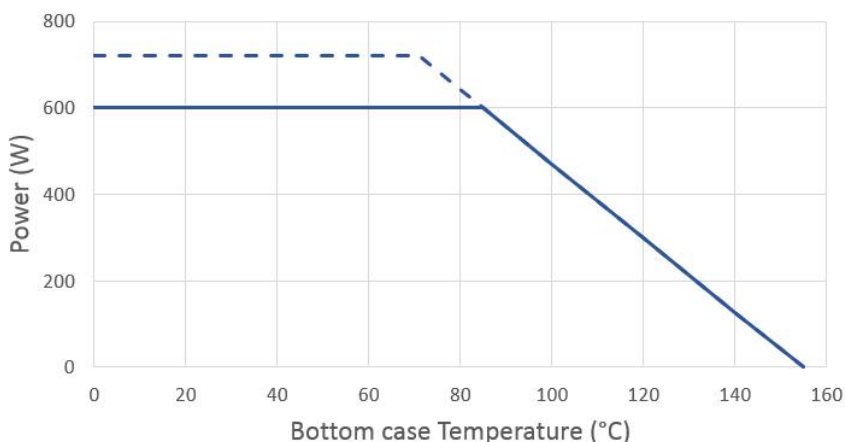
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Pulse load / overload capability.

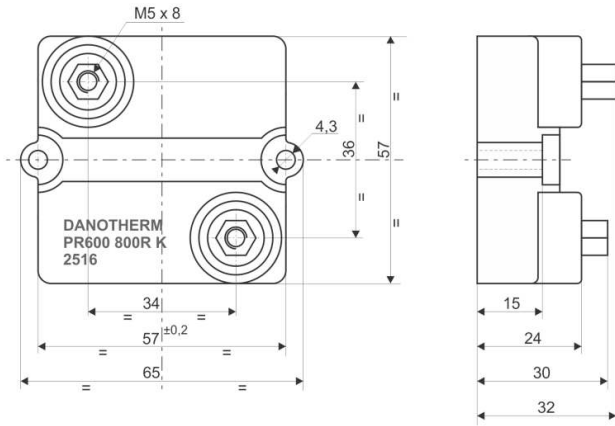
PR series resistors can be overloaded during a certain time. The energy the resistor can take is in relation to the duration of the overload. For repetitive overloads, a minimum cooldown time must be observed before the resistor can take another pulse load.

For high demands on overload capabilities, metal thick film versions are available. Please, contact Danotherm for additional options at info@danotherm.dk

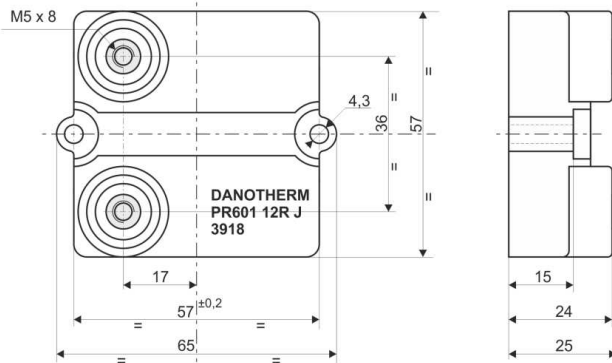
For each PR series, an energy-time graph is available and can be send to you on request. Please, contact the Danotherm sales office at info@danotherm.dk



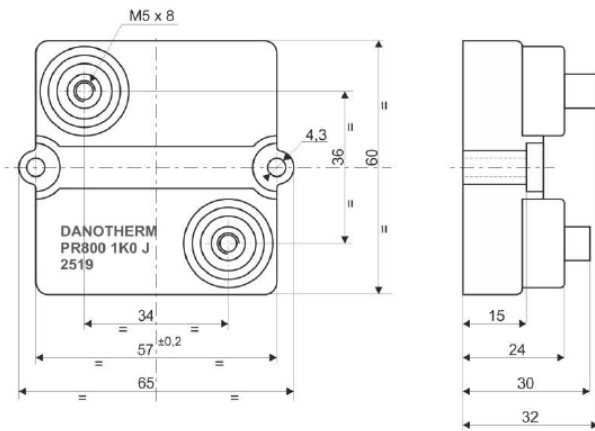
PR600 / PR601



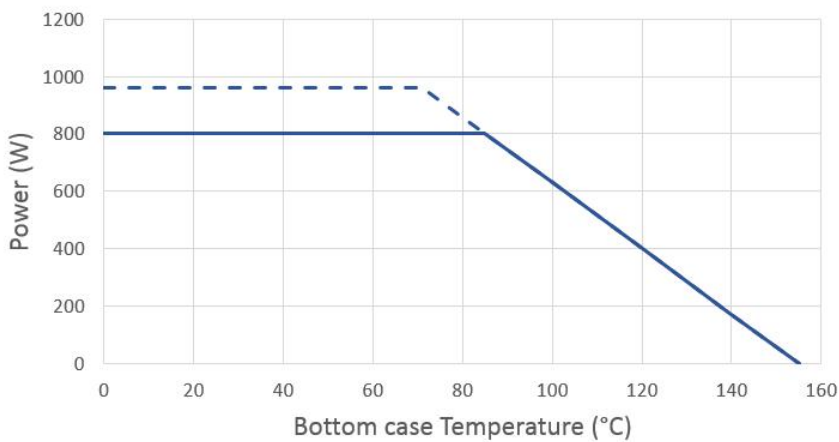
PR600



PR601



PR800



PR800

Overview of the ALPHA resistor family (IP00-IP65)



Power: 60-410W	Power: 85W - 1.7kW	Power: 410W - 12kW	Power: 445W-15kW	Power: 860W-25kW
	9-150kJ @5s	25-550kJ @5s	80kJ-2.5MJ @5s	6.4kJ-1.1MJ @5s
- Applications	- Applications	- Applications	- Applications	- Applications
Charge / Discharge	High Pulse load	High Pulse load	High Pulse load	Short recovery time
Brake	Brake	Brake	Brake	Brake
Filter	Filter	Filter	Medium voltage	Filter
Charge / Discharge	Charge / High Pulse	Charge / High Pulse	Charge / High Pulse	High Pulse

Other resistor types from Danotherm (IP00-IP65)



Multi purpose	Outdoor & Marine	Filter	Medium & HV	Filter & load
Power: 100W-5kW	Power: 1-500kW	Power: 4-200kW	Power: 500W->	Power: 5kW-1MW
Ceramic wirewound	Steel tube	Wirewound	Steel grid	Steel tube

Official Danotherm dealer



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