Aluminum housed wirewound resistor

Description
Hermetic aluminum case wire wound power resistor, intrinsically safe.

Features
IP65, high overload capacity, heat-sink mounting, self-extinguishing.

Applications
Dynamic braking, charge / discharge capacitor.

Market
Industrial automation, Railways, Energy.

Options
External thermal switch, internal fuse, special cement sealing for railway industry.

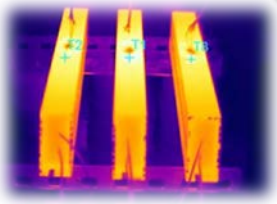
RFP

CE

RoHS COMPLIANT Pb Pb-Free

200 W ÷ 500 W
IP 65 – 1000 V

File number: E228809



ELECTRICAL AND MECHANICAL CHARACTERISTICS

refers to room temperature 25°C

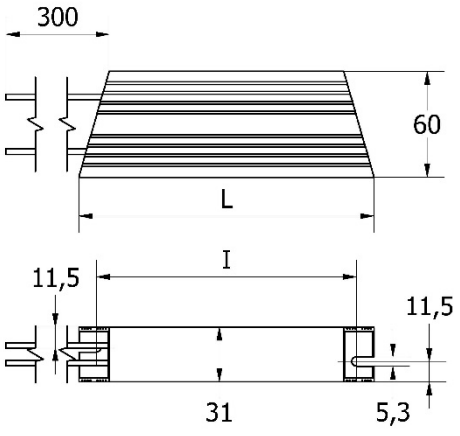
Model	I	L	Weight	Rated power (W)				Ohmic values
				Standard (surface ΔT 300°C)		Internal Fuse (ΔT surface 250°C)		
	mm	mm	Kg	H	V	H	V	Ω
RFP 200	147	167	.46	200	200	140	140	1.0 ÷ 220
RFP 300	197	217	.62	240	280	160	200	1.8 ÷ 390
RFP 400	247	267	.78	300	370	200	250	2.7 ÷ 560
RFP 500	317	337	.99	370	470	250	310	3.3 ÷ 820

Insulation resistance (1000 VDC) >1000 MΩ	Thermal time constant 800 s (1)	Max operating voltage 1000 V (2)	Dielectric strength 4000 V

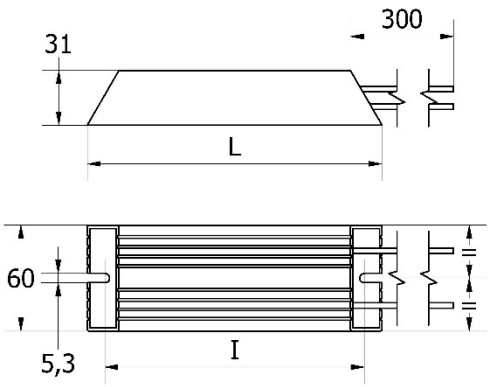
Active material: FeCrAl alloy (magnetic) TCR 70 * 10-6 /°C.
The standard version cable is PTFE single core AWG14 300°C 1000 V Style 10724 long 300 mm ±5 mm.
Depending on the ohmic value, the internal construction is made in two different ways: wire wound on mica plates, or wire coiled as a spring.
Housing is filled with quartzite sand and sealed with silicone base potting material.
Housing is an aluminum profile, oxidized to prevent corrosion, isolated with micanite sheets on all inner surfaces.
Standard tolerance on ohmic value is ±10%: RFP is built according to E12 series.
Unless otherwise specified, or the above drawing applicable standard of general tolerances for linear and angular dimensions is ISO 2768-1 class c; applicable standard for aluminum profile is EN 755-9:2008.
Picture above refers to model RFP V 500.

(1) Thermal time constant refer to 100% Rated power, the lower is the power supplied, the longer is thermal time constant.
(2) For the operation at 1000 V check the safety instruction at page 6.

Vertical version (V)



Horizontal version (H)



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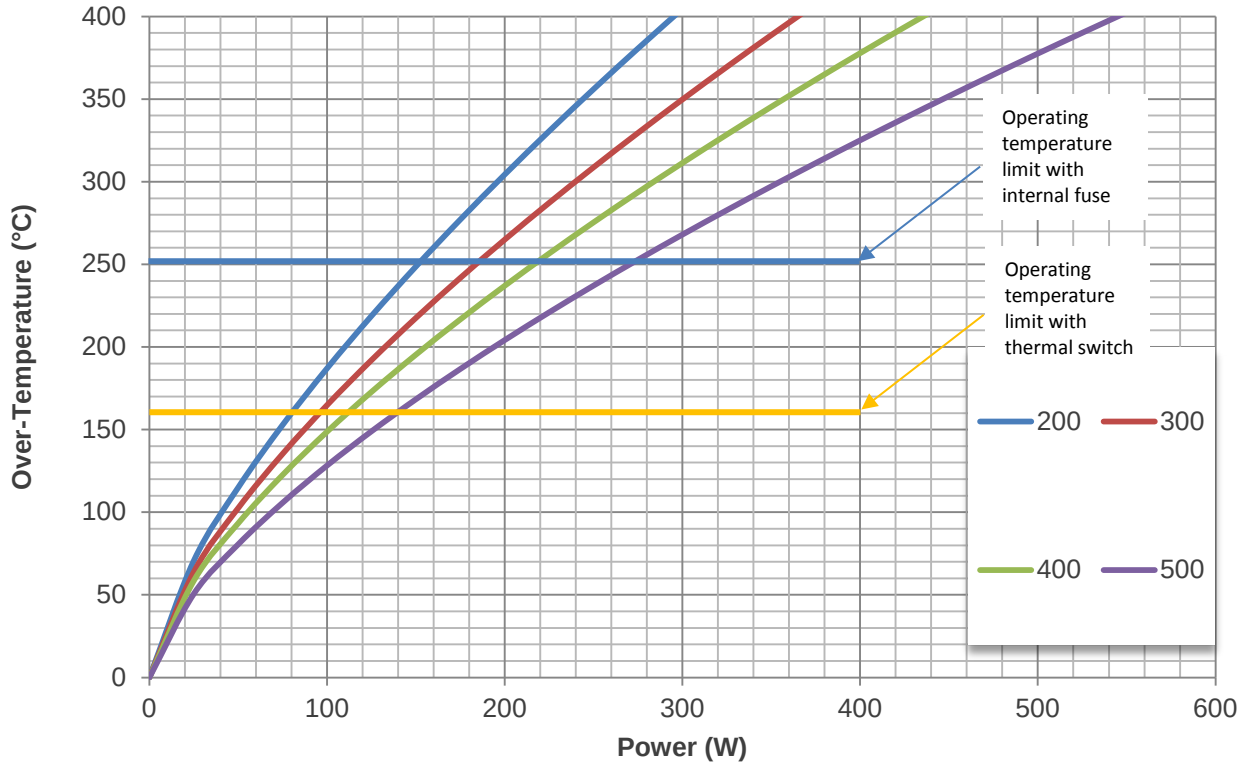
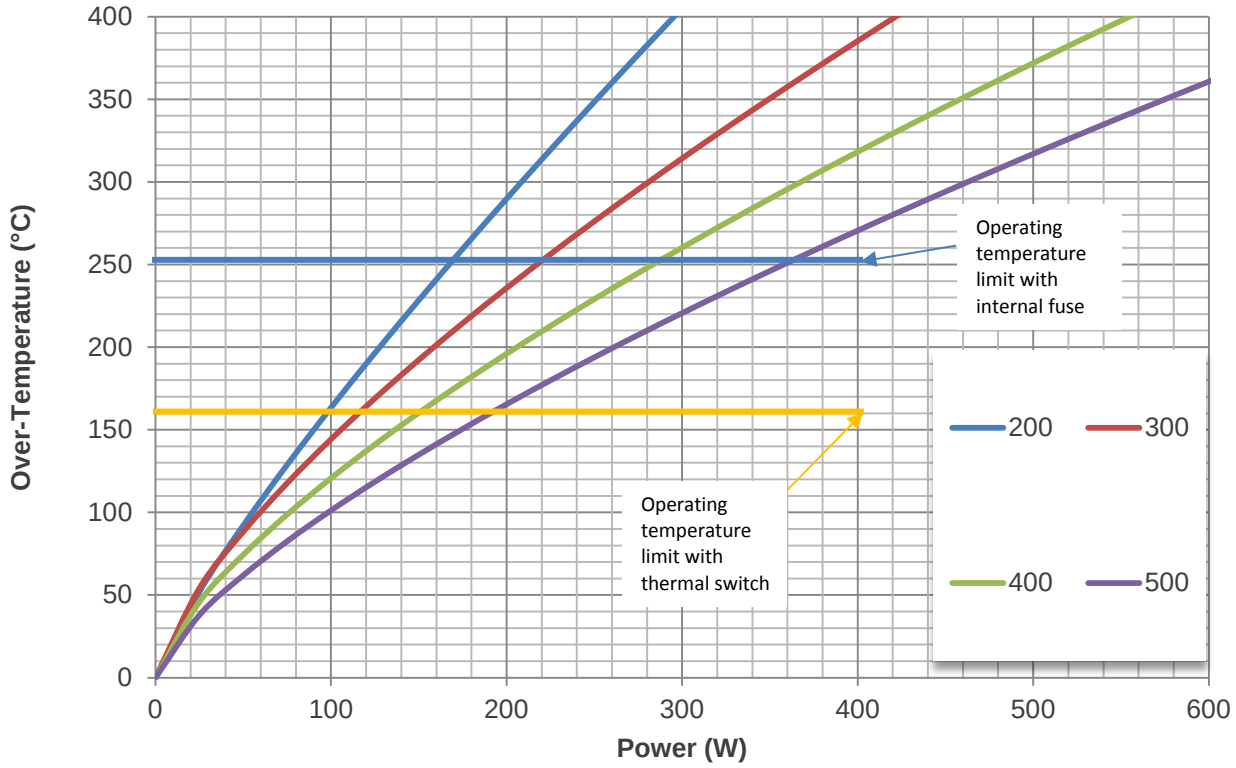
POWER VS. OVER-TEMPERATURE (HORIZONTAL VERSION)



POWER VS. OVER-TEMPERATURE (VERTICAL VERSION)



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SURFACE TEMPERATURE CHARACTERISTICS

The rated power stated in this datasheet is applicable to a horizontally mounted resistor (see Page 5, *Installation*, picture nr. 2) at an ambient temperature of 20°C and an external surface temperature of 300°C. Vertically mounted (V) resistors have better thermal exchange performance than horizontal versions (H); for reference, two different graphs are provided.

Power dissipation is influenced by the following:

☐ Mounting position and arrangement: insulators / panel / heat–sink (allows the exchange of heat by conductivity); distance between elements and mounting panel; vertical mounting (picture 1), horizontal mounting (picture 2), or located on edge (picture 3).

☐ Number of resistors mounted together (grouping) and their distances.

☐ Ambient temperature (in free air or inside an enclosure).

In general, the vertical mounting position (picture 1) allows a better convective thermal exchange, and the Rth is approximately 10% less than for a horizontally mounted resistor (picture 2).

Please contact the Fairfild technical office for appropriate test reports and for more details.

OVERLOAD CONDITIONS

Case resistors are most commonly used for overload operation, such as the precharge of capacitors, dynamic braking of VFDs, and crowbar operations.

There are three typical overload conditions: **cyclic work load** (i.e. braking of a lift), **long overload** (i.e. due to a fault in the system), and the third is an **isolated single pulse** (emergency braking, precharge in case of short circuit or abnormal duty).

In all three cases, for pulses of duration less than 60 s, the mass of the wire must be taken into account to define the admissible overload. The mass of the wire is dependent upon ohmic value.

Unless the pulse is very short (<0,5 s), the mass of the quartzite sand inside also plays an important role in the calculation of the global thermal capacity. The longer the duration of pulse, the higher the multiplier of the thermal capacity of the wire.

Fairfild technical office is at your disposal for further detailed information.

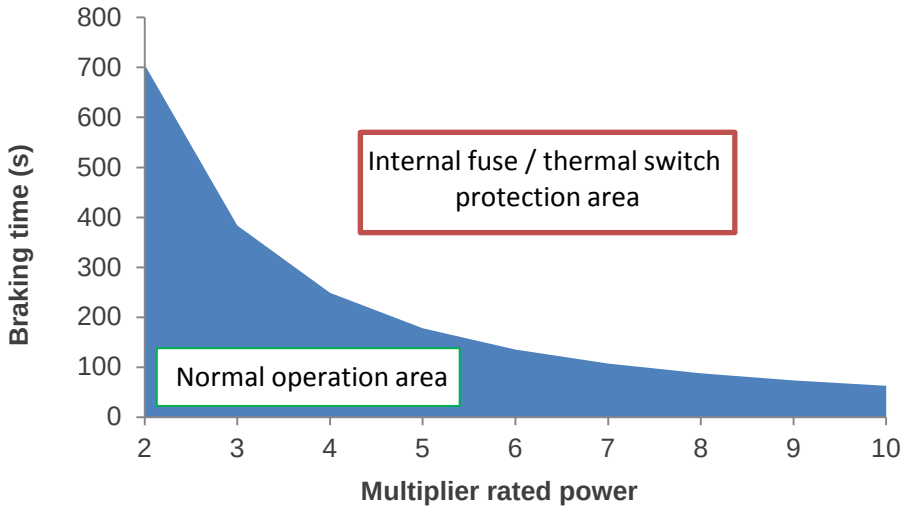
For operation in a cyclic work load condition, the following table shows the max power that can be supplied for different duty cycles and periods.

CYCLIC WORK LOAD

Model	Peak Power (W)								
		Horizontal version (H)				Vertical version (V)			
	t	ED 2.50%	ED 6%	ED 10%	ED 25%	ED 2.50%	ED 6%	ED 10%	ED 25%
RFP 200	60	7.50	3.20	2.00	0.80	7.50	3.20	2.00	0.80
	120	7.10	3.00	1.90	0.80	7.10	3.00	1.90	0.80
	240	6.80	2.90	1.80	0.70	6.80	2.90	1.80	0.70
RFP 300	60	9.00	3.80	2.40	1.00	10.50	4.50	2.70	1.10
	120	8.60	3.60	2.20	0.90	10.00	4.30	2.60	1.10
	240	8.10	3.50	2.10	0.90	9.50	4.00	2.50	1.00
RFP 400	60	11.30	4.80	2.90	1.20	13.90	5.90	3.60	1.50
	120	10.70	4.60	2.80	1.10	13.20	5.60	3.40	1.40
	240	10.20	4.30	2.60	1.10	12.50	5.30	3.30	1.30
RFP 500	60	13.90	5.90	3.60	1.50	17.70	7.50	4.60	1.90
	120	13.20	5.60	3.40	1.40	16.80	7.10	4.40	1.80
	240	12.50	5.30	3.30	1.30	15.90	6.80	4.10	1.70

LONG OVERLOAD – internal fuse vs. thermal switch protection

It is possible to supply the resistor with a long overload for a certain amount of time in function of the multiplier of the rated power. In the graph, the blue area represents the safe long overload: in this area there is no risk of damage to the component. Outside of the blue area, use of internal fuse or thermal switch (to protect the component against damages) is advised.



The optional "**internal fuse**" is meant to be fail-safe for the component: in case of opening there is no effect outside the housing. The internal fuse protects the resistor against an overload from 2 to 10 times the rated power. The use of resistor is limited at 250 °C. **Once the fuse is open, the resistor cannot be used again.**

The optional "**thermal switch**" prevents the opening of the resistor only when the continuous power is less than 6 times the rated power. The use of the resistor is limited at 160 °C. Once the temperature of the case cools to less than 160°C, the thermal switch contact will close. The thermal switch must be connected to the command circuit in order to exclude the resistor in case of open contact.

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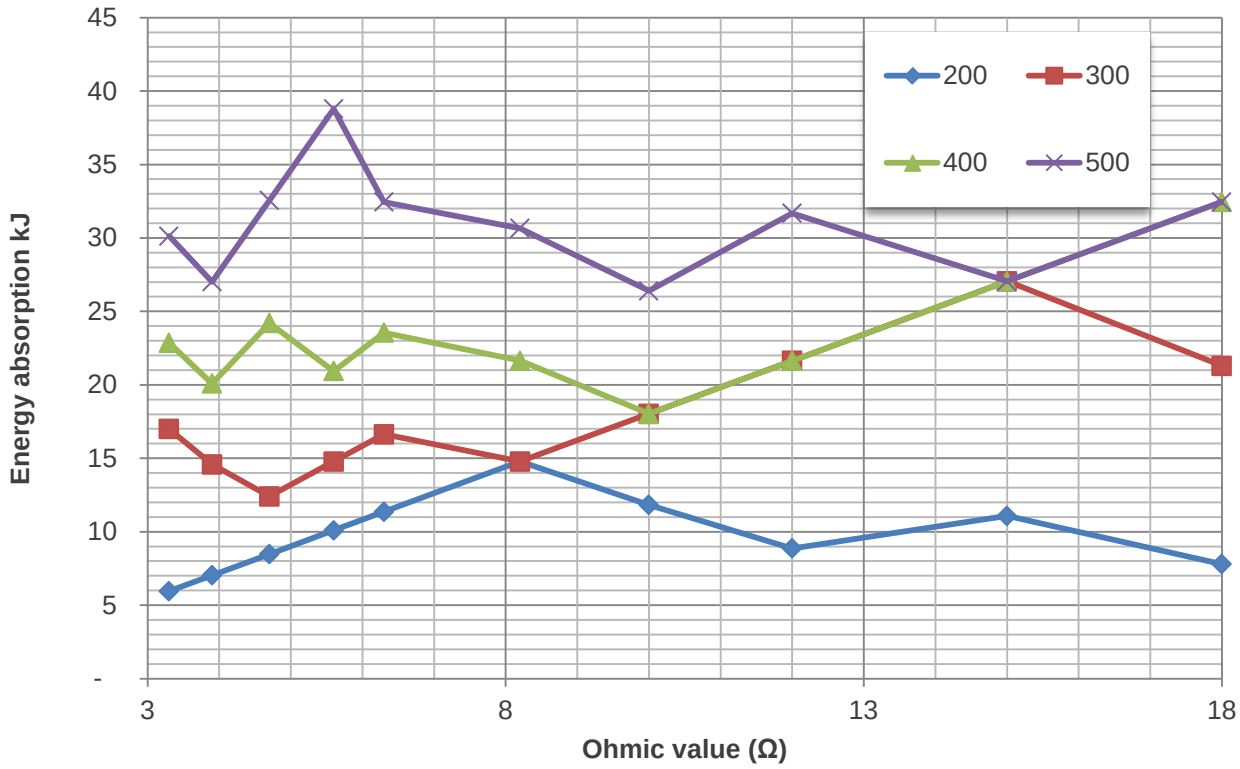
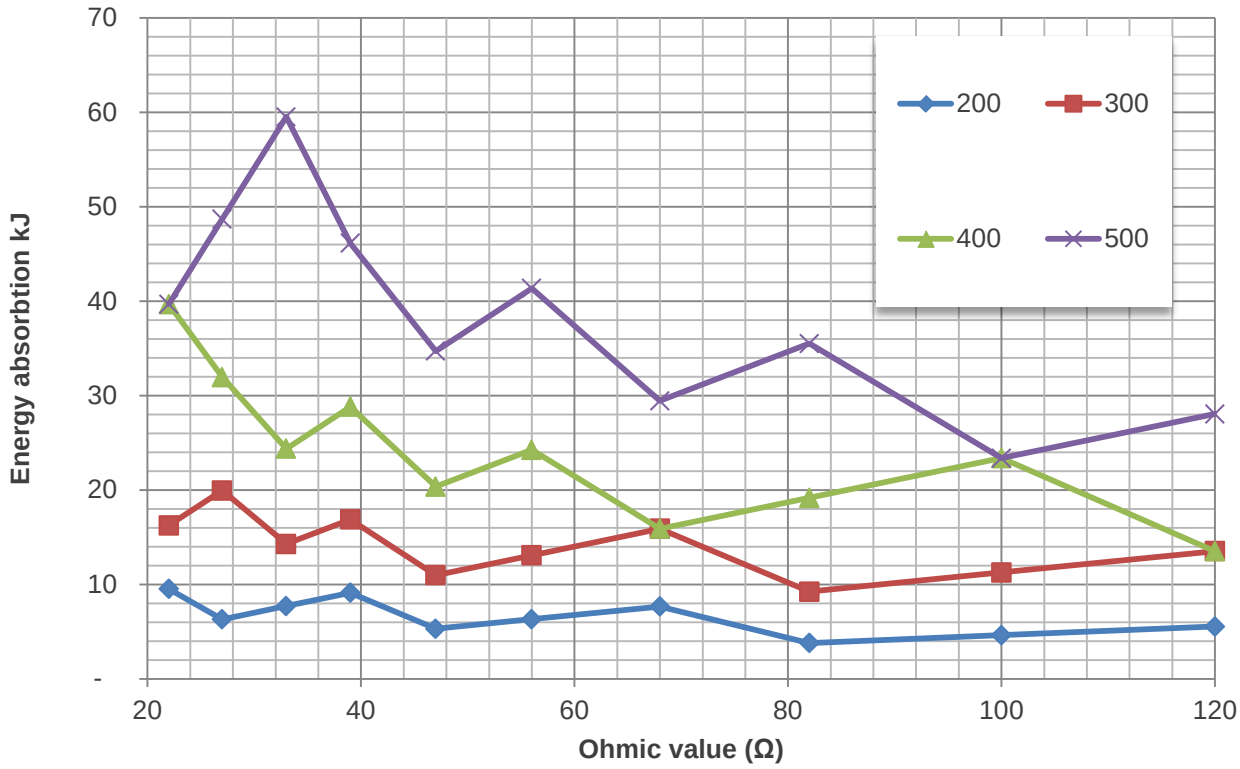
PULSE LOAD GRAPH

In case of an isolated pulse, the admissible energy depends on the duration of the pulse.
The following graph shows the pulse energy (kJ) for isolated pulses with duration max 0.5 s for ohmic values between 3.3 Ω and 120 Ω.
For admissible energy for a duration exceeding 0.5 s, and for other ohmic values, please contact Fairfild technical office.

Pulse energy (DT wire 900°C) with duration < 0.5 s (isolated pulse)



Pulse energy (DT wire 900°C) with duration < 0.5 s (isolated pulse)



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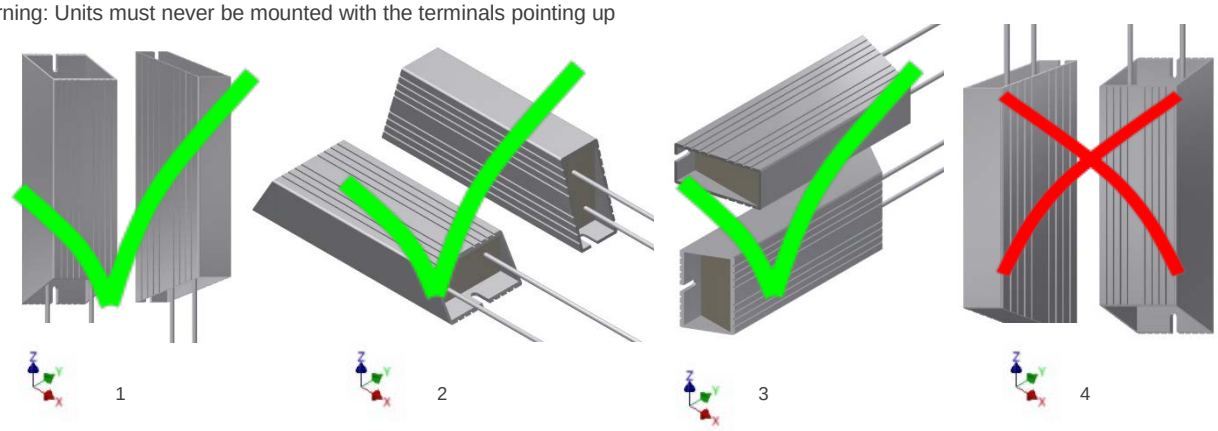
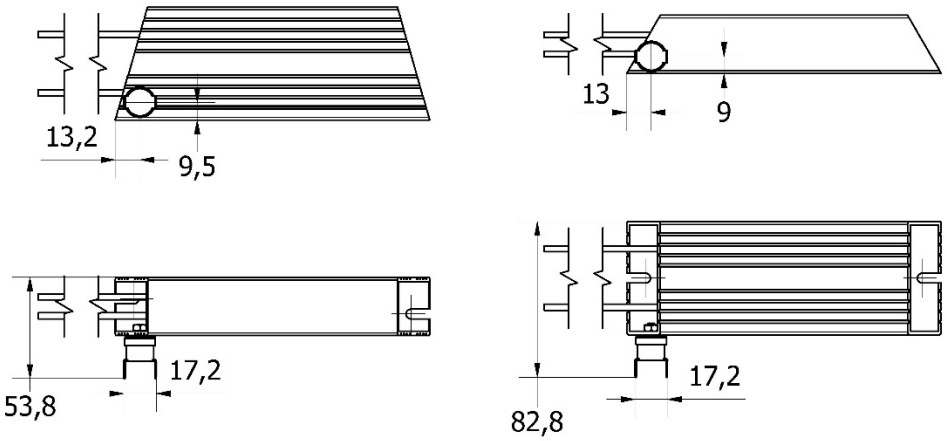
Installation

Warning: Units must never be mounted with the terminals pointing up



Thermal switch

External thermal switch: NC; temp. int.: 160±5°C; rated voltage 250 V; rated current: 10 A; terminals: 6.3 x 0.8 mm, dielectric strength 2000 V; switching cycles: 100000; contact resistance: < 30 mΩ, hysteresis / reset temperature: 20 K ±5 K; degree of protection IP00 (EN 60529); approvals UL 873, VDE / ENEC EN 60730-1 / -2-9, CSA C22.2 No. 24. Optional thermal switch must be specified on the order.



Marking

The resistor housing is marked with indelible high temperature ink.
FAIRFILD – RFP H 500 150R 10% WW/YY (week / year).

Packing

The resistor is packed in a way to preserve incidental damage during transport. To avoid handling damage it is recommended to never pull on the resistor cables and to handle with care during removal of the resistor from the original factory packaging.

Disclaimer

Every effort has been made to ensure that the information in this datasheet is accurate. Fairfild is not responsible for printing or clerical errors. All properties and characteristics mentioned in this datasheet are only for informational purposes. The information in this datasheet is offered solely for your consideration and should not be taken as a warranty or representation for which we assume legal responsibility. The customer bears all responsibility for use and application of Fairfild products. There is no responsibility of the manufacturer for any damage to persons and properties in case of improper use. Fairfild reserves the right to change specifications without prior notice.

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Ordering information

RFP Z W XXX RRRR 10%

Z	H (horizontal) or V (vertical version)
W	F : internal fuse T : thermal switch FT : internal fuse and thermal switch
XXX	Model 200, 300, 400, 500
RRRR	Resistance value (nominal at 20°C)

Example
RFP H F 500 150R 10%
RFP is the name of the product
H denotes horizontal version
F denotes internal fuse
500 is the model
150R means 150 Ω that is the nominal ohmic value at 20°C
10% denotes ohmic value tolerance, in this case the value of the resistor is acceptable within a 135 Ω - 165 Ω range.

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Safety instructions to prevent explosion

Supplying the resistor with continuous high power (more than 50 times rated power) will cause immediate overheating and eventually melt the internal resistive wire. Likewise, the properties of quartzite sand will exhibit similar behaviour, with a certain delay due to thermal inertia.
Overheating will cause the sand and wire to melt together until the current stops flowing through the circuit.
In case the thermal capacity of the quartzite is not enough to blow out the electric arc of the melted wire, the incandescent matter can reach the aluminum case and melt it. The result may be an explosion due to high internal pressure (see images below for reference).
Under conditions where the supply is DC, the voltage is high, and the ohmic value is low, it may be quite impossible to extinguish the electric arc inside the resistor.

The following table shows the max allowable on-time (in seconds) that is possible to apply to the resistor with a power supply of **1000 VDC** without causing damage to the resistor. Other tables with different voltages are available for reference upon request at the Fairfild technical office.
High ohmic values are not listed because if the wire is undamaged, its thermal capacity is low and the quartzite sand can extinguish the arc.
Fuses should be considered for protection against very high and short pulses. Please contact the Fairfild technical office for help in choosing the right fuse for your application.
Both internal fuse and thermal switch options are not adequate to prevent damage in the case of short pulses for more than 10 times the rated power.

R (Ω)	Current (A)	200	300	400	500
1	1000.0	0.01			
1.2	833.3	0.01			
1.5	666.7	0.01			
1.8	555.6	0.01	0.02		
2.2	454.5	0.01	0.02		
2.7	370.4	0.02	0.04	0.05	
3.3	303.0	0.02	0.06	0.08	0.10
3.9	256.4	0.03	0.06	0.08	0.11
4.7	212.8	0.04	0.06	0.11	0.15
5.6	178.6	0.06	0.08	0.12	0.22
6.3	158.7	0.07	0.10	0.15	0.20
8.2	122.0	0.12	0.12	0.18	0.25
10	100.0	0.12	0.18	0.18	0.26
12	83.3	0.11	0.26	0.26	0.38
15	66.7	0.17	0.41	0.41	0.41
18	55.6	0.14	0.38	0.58	0.58
22	45.5	0.21	0.36	0.87	0.87
27	37.0	0.17	0.54	0.86	1.31
33	30.3	0.25	0.47	0.80	1.96
39	25.6	0.36	0.66	1.12	1.80
47	21.3	0.25	0.52	0.96	1.63
56	17.9	0.35	0.73	1.36	2.32
68	14.7	0.52	1.08	1.08	2.00
82	12.2	0.31	0.76	1.57	2.91
100	10.0	0.46	1.13	2.34	2.34
120	8.3	0.55	1.62	1.62	3.37
150	6.7	0.83	1.04	1.04	2.54
180	5.6	0.39	1.50	1.50	3.65
220	4.5	0.58	2.23	2.23	5.45
270	3.7		1.06	3.37	3.37
330	3.0		1.59	5.03	
390	2.6		2.22		

Available test reports and additional technical documentation

1. Intervention time of thermal switch and internal fuse in function of power multiplier and external temperature
2. Long overload behaviour
3. Cyclic load test
4. Continuous power in different orientation. space in between. nr. of elements. mounting arrangement
5. Admissible energy absorption for isolated pulse with duration within 1 s and 10 s for all ohmic values

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