Aluminium Housed Power Resistors

Type CFH Series

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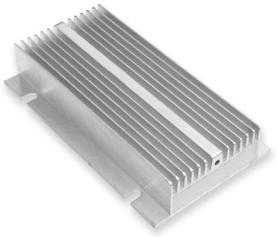


The CFH is a high quality range of aluminium housed power resistors offering environmental protection to IP55, 6kV dielectric strength, 1.8kW power dissipation, and the ability to absorb electrical pulses of up to 24kJ.
The use of advanced materials in the construction of this device enables operating temperatures of up to 450ºC giving very high power density.

Key Features

- **2200W in a 72cm² footprint**
  - **Unparalleled power density of 31W/cm²**
- **Impressive Pulse Capability**
  - **Large active element can absorb up to 24kJ**
- **No Heatsink Required**
  - **Dissipates up to 950W in free air**
- **Slimline Casing**
  - **30mm casing height for design flexibility**
- **Environmental Protection to IP55**
  - **Reliable in the harshest conditions**

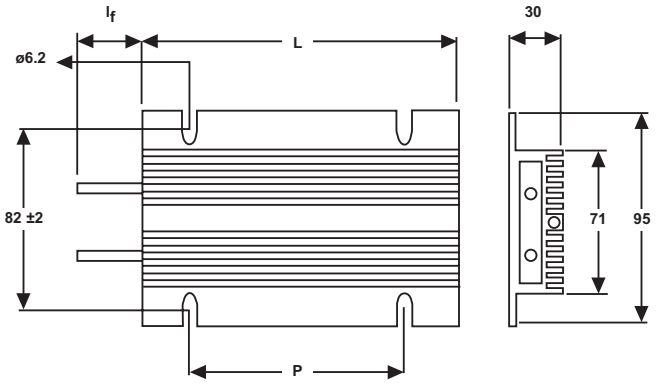
Applications

- **Braking**
- **Balancing**
- **Capacitor Charging & Discharging**
- **Crowbar**
- **Filter**
- **Power Supplies**
- **Electrical Machinery**
- **Inrush Limiting**

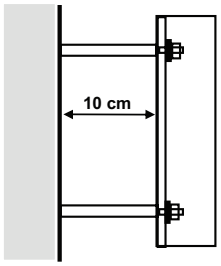
Characteristics - Electrical

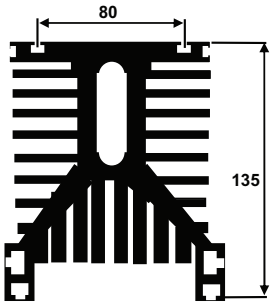
	CFH350	CFH500	CFH750	CFH1100
Dissipation @ 25°C with Heatsink (Watts):	650	850	1300	1800
Without Heatsink:	350	500	750	1100
With Water Cooled Heatsink (40°C):	750	1000	1500	2200
Overload Rating (5s):	4000	5600	8000	12000
Ohmic Value Min (Ohms):	0R5	0R5	0R5	0R5
Max:	10K	18K	27K	27K
Tolerance:	±5% Standard			
Maximum Working Voltage (DC/ACrms) Volts:	1500	2500	3500	4000
Insulation Resistance (Volts):	>=10000 MΩ			
Dielectric Strength (AC peak) Volts:	4500 standard and 6000 special			
Inductance (Henries):	5-50 µH at 1000 Hz	7-70 µH at 1000 Hz	10-100 µH at 1000 Hz	20-200 µH at 1000 Hz
Standard Heatsink area (mm²):	1600	1600	1600	1600
Thickness (mm):	135	135	135	135
Protection Grade (IP):	IP55			
Mounting:	Vertically			
Cable Length:	300mm			
Weight (g):	460	670	920	1250
Heat Dissipation:	Although the use of proprietary heat sinks with lower thermal resistance is acceptable, up rating is not recommended. The use of proprietary heat sink compound to improve thermal conductivity is essential.			

Dimensions



Type	CFH350	CFH500	CFH750	CFH1100
L	110 mm	160 mm	220 mm	320 mm
P	60 mm	110 mm	140 mm	240 mm





Application Notes

Power rating. The dissipation power of a resistor depends also from the mounting position. If the resistor is mounted onto a surface, the latter takes part positively (if it is large and conductive) or negatively (if it is small and insulating) to the thermal dissipation.

Data of power rating are referred to a resistor mounted vertically, with terminals in the lower side and away from the nearest surface at least 10cm, in order to avoid thermal influence from the wall.

Surface temperature rise @ Pn. During the load application, the surface temperature is not homogeneous, and it is higher on the flat surface of the resistor (surface that in the practical application shall be fixed to a heat sink or to a metallic surface to help the thermal dissipation).

Max.power rating of a resistor mounted onto a heat sink. Standard heat sink is a common heat sink (as shown) used for the cooling of semiconductors, with two grooves for components mounting.

The distance between the axes of these two grooves is 80 mm. In this case both heat sink and resistor will be mounted upright. The length of the heat sink shall be at least 40 mm longer than the resistor's body (20 mm for each side).

Power rating of a resistor mounted on a water-cooled heat sink. If the heat sink is water-cooled, power dissipation increases considerably, and the limiting power rating is due to temperature of the resistor body. In the case illustrated in the specifications board, the temperature of the heat sink is 40°C and the resistor's surface reaches 300°C. In this case too, the length of the heat sink shall be at least 20 mm longer than the resistor's body.

Absorbed energy @ 250°C ΔT. It represents the quantity of energy stored into the resistor when it has reached 250°C of temperature rise. The above indication is an index of the thermal capacity of the resistor.

Absorbed energy in 5". It gives an index of behaviour of the resistor to short overloads.

Absorbed energy in time ≥0.2". During a short impulse (from 0 to 2 sec.), the resistor may stand only the energy that the thermal capacity of the resistance wire is able to absorb. In fact the phenomenon is too short to let significant heat conduction from wire to filling material. The energy absorbed from the resistor in this case results from this simple equation:

$$Q_J = Cs\ P\ \Delta T$$ **where:**

- QJ is the quantity of energy expressed in Joule, - Cs is the specific heat of the employed resistance alloy expressed in J g^{-1}• $°K^{-1}$, - P is the weight of the wire in grams and - ΔT is the rise of temperature, expressed in °K, reached by the wire during the impulse.

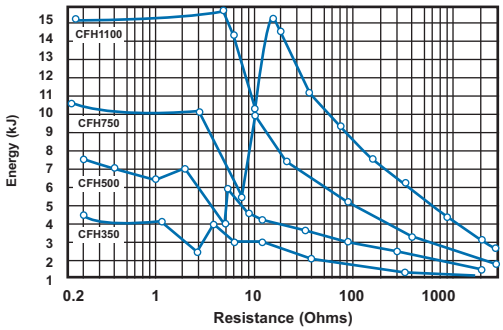
As type and quantity of wire are characteristics of every resistance value and resistor model, the acceptable temperature limit of wire is relevant.

This limit (@ 25°C) is:
- 500°C for the standard operations (steady state load);
- 800°C for not repeatable overload.

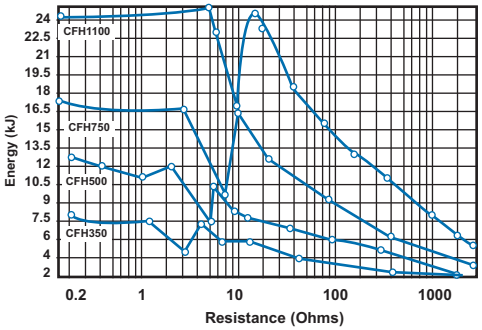
The following graphs show these two conditions for each resistance value and resistor type.

Pulse Energy

Absorbed energy for wire temperature of 500°C
(Impulse time ≤ 0,2")



Absorbed energy for wire temperature of 800°C
(Impulse time ≤ 0,2")



These graphs are irregular owing to the necessity to adapt the commercial dimension of wire to the resistance range, however they are enough to show the trend of this characteristic.

Should the energy value of an impulse be too close to the limits given from these graphs, it is suitable to consult the factory for further information concerning the precise value of absorbed energy for the used resistor.

Application Notes (continued)

Resistance Range. The resistance range fulfils almost all the use of power resistors, but in cases of special requirements, lower or higher resistance values are available on request as well as closer tolerances.

Inductance. The inductance changes with the resistance value and is not very influenced from frequency. On request the CFH resistors are available with non inductive windings (Airton-Perry's system) and are identified by adding the letter N after the CFH identification (e.g.CFHN500). The inductance of the CFHN resistors is less then 1 µH.

Parasitic Capacity. Parasitic capacity does not depend on the resistance value, but it changes with frequency. The supplied value are just referred to 1 kHz (the higher) and 100 kHz. During normal load conditions the effects of parasitic capacity are negligible. However in the presence of transients of high voltage <10µsec, the housing may be a source of interference for most sensitive electronic circuits. For a correct grounding of the housing, CFH resistors are available, on request, with a threaded hole M5.

Limiting Element Voltage. This is the maximum voltage, which should not be exceeded during the application conditions. The rated values are rather elevated, but special designs with higher limiting element voltage are available for particular requirements.

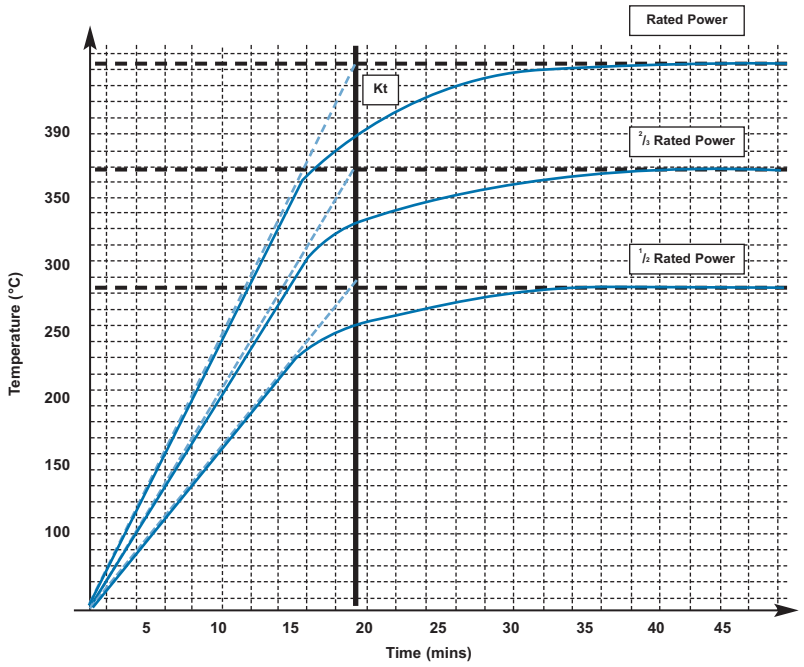
The limiting element voltage of non inductive resistors is lower than the standard resistors (Please contact us for advice).

Insulation resistance and dielectric strength. After a long load time, the insulation resistance of CFH resistors keeps elevated as the employed insulating material does not get damaged despite the high thermal conditions.

Thermal time constant. The dimension of the resistor models is proportional to power rating and weight, therefore their behaviour during the rise of temperature, when the rated power is applied, is analogous.

Of course the application of a heat sinks or the mounting of the resistor on a surface, will modify the thermal time constant which is peculiar for each application.

Thermal Time Constant Kt



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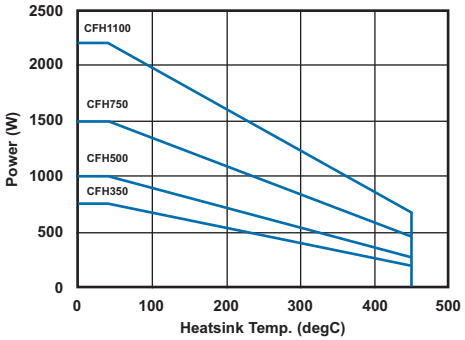
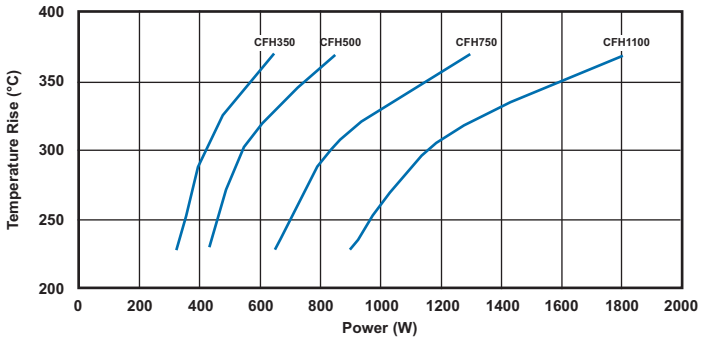
Derating Curve



Surface Temperature Rise



How to Order

CFH	750	A	680R	J
Common Part	**Power Rating**	**Termination**	**Resistance Value**	**Tolerance**
CFH - Aluminium Housed Power Resistor	350 W 500 W 750 W 1100 W	A - 300mm Flying Leads B - 1000mm Flying Leads	0.1ohm (100mΩ) R10 1 ohm (1000mΩ) 1R0 1K (1000Ω) 1K0	J – 5%