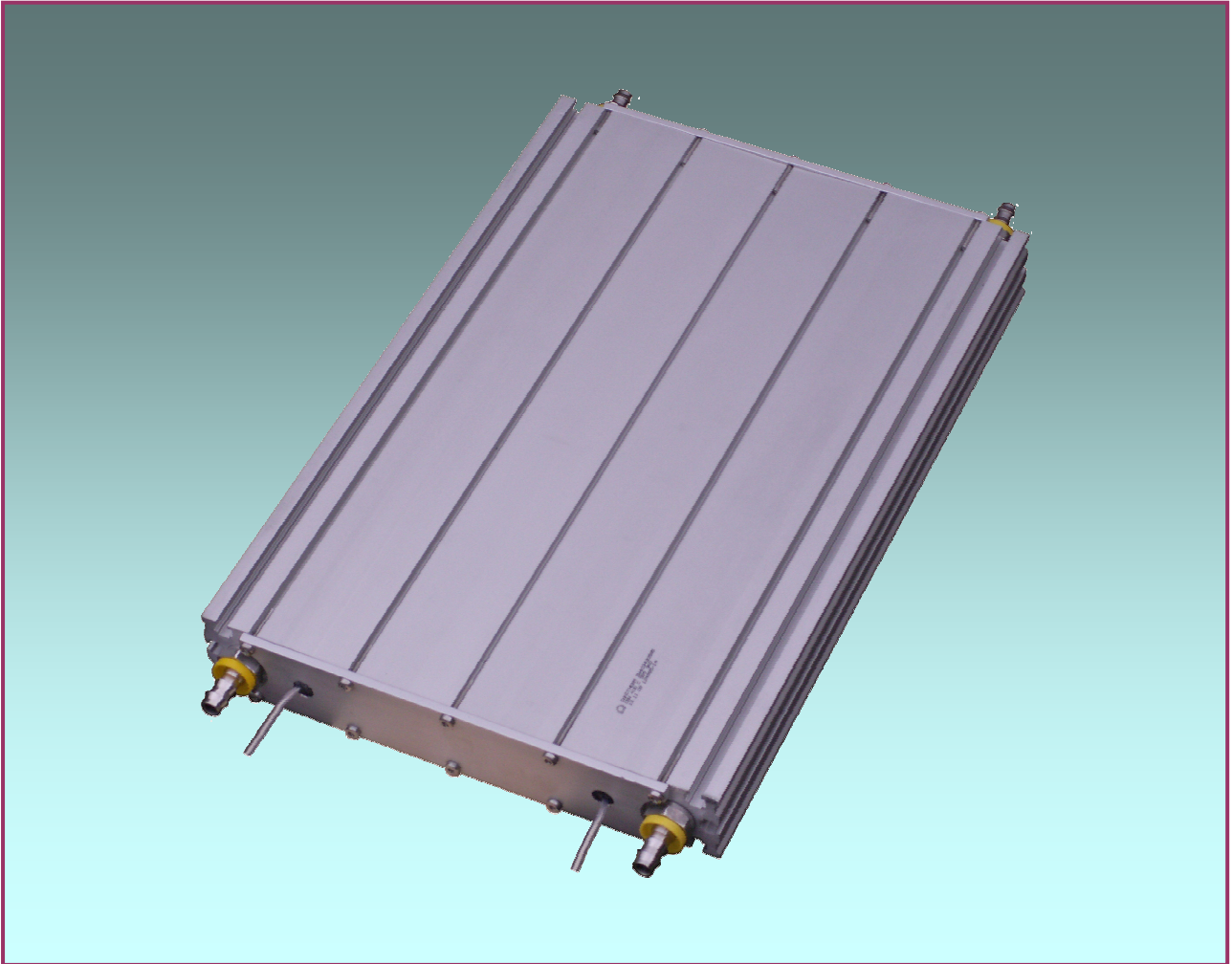


Water Cooled ALPHA CBW

ALUMINIUM HOUSED COMPACT BRAKE RESISTORS
IP50 / IP53 / IP65



The **CBW** is a new type of **Water Cooled Brake Resistor**. It combines the advantage of water cooling with the high pulse load ability of the traditional aluminum housed Alpha resistors. The **CBW** can easily be fitted into compact constructions. It is possible to stack several resistors close without distance when resistor banks are required.

The steady state power range span from **1.0kW** to **5.7kW / component** and they can withstand pulse loads of up to 30 times these values for one second every 120 seconds.

Reinforced versions for **Fault Ride Through** (Energy Dump Resistors) for **Wind Turbines, Solar Plants and Small Power Plants** are available.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and on the surface for all possible load applications. We offer our assistance to customers to find the optimum solution for any situation.

CBW resistors are optionally available with connection box in different design for different cable sizes and from IP50 to IP65, please require special data sheets.

The resistors comply with IP50 to IP65 giving electrical protection.

Construction

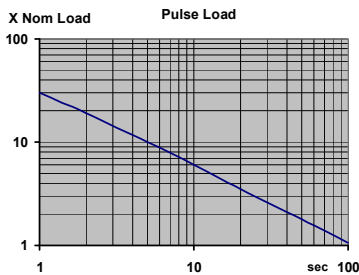
The resistor elements for high resistance types are wire wound on mica support sheets. Lower resistance elements are made with helix wound wire elements. The outer housing is an aluminium profile isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with quartz sand. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

Water cooling is via two extruded holes/tubes along the outer edges of the profile and heat transfer via the profile. This ensures a simple water system and that the resistors are stackable. The centre of the resistor reaches a minor temperature increase at steady state load. If this can not be tolerated the surface can be insulated. The standard cables are 300 mm PTFE, style depending on rated voltage.

PULSE LOAD
The curve shows the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse width from 1 to 40 seconds.

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For further optimization Danotherm offers individual thermal electric circuit models for all types and ohm values. With these models the temperatures of the resistor wire and the resistor surface can be simulated during any pulse load condition with standard software like PSpice. Alternatively Danotherm offers to make the thermal simulation for our customers.

Ratings: (Provisional Data)

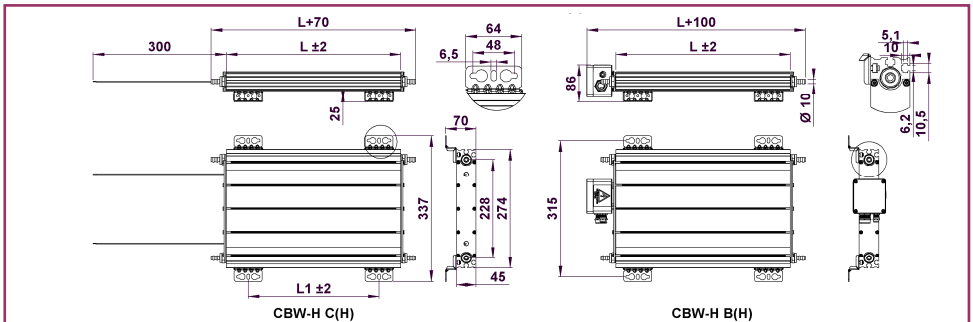
CBW-C (H) (T)	PN kW @40°C According to UL508	Max Surface temp. °C @40°C Water inlet	Pulse Load in 1s each 120s P1/120 kW @40°C	Pulse Load in 5s each 120s P5/120 kW @40°C	Pulse Load in 10s each 120s P10/120 kW @40°C	Pulse Load in 40s each 120s P40/120 kW @40°C	Time Const sec (Steady state)	R Ω ±10%
CBW 170 C	1.0	160	30	10	6.0	2.0	1000	0.2– 1.5k
CBW 210 C	1.4	160	42	14	8.4	2.8	1000	0.2– 2.5k
CBW 260 C	2.0	170	60	20	12	4.0	1000	0.2– 3.5k
CBW 330 C	2.5	170	75	25	15	5.0	1000	0.2 – 5.0k
CBW 400 C	3.0	170	90	30	18	6.0	1000	0.2–7.0k
CBW 460 C	3.5	170	105	35	21	7.0	1000	0.2–8.0k
CBW 560 C	4.2	170	137	41	23	6.7	1000	0.3 –120
CBW 660 C	5.0	170	150	50	30	10	1000	0.4–150
CBW 760 C	5.7	170	170	57	34	11.5	1000	0.5– 160

General Specifications

Temperature Coefficient:	<±100ppm	
Dielectric strength:	Standard:	3500VAC 1 minute
	On Demand	6000 VAC 1 minute
Working Voltage:	Standard	1000VAC; 1400VDC
	On Demand	2500 VAC; 3500VDC
Isolation Resistance:	> 20 MΩ	
Overload:	5x in 10s; 30-50 x in 1s	
Temperature of cooling water/ water-glycol (inlet)	-20 °C – 80 °C	
Pressure	Working: 6 BAR; Test: 10 BAR	
De-Rating	Depends on cooling conditions, ask Danotherm	
Thermo watch, optional	130°C/160°C/180°C / 200°C, 2A, 250V, NC	

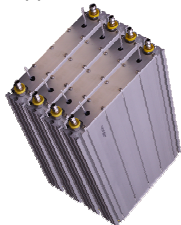
PN: NOMINAL POWER WITH COOLING flow 0.6 – 1.2 l/min/ kW and mounted in a vertical position with in- and out lets up and water connections on terminal end connected. (Water flows in series)
Water can alternatively flow in parallel. When in parallel outlets must be upwards to avoid air in the cooling tubes.

If mounted in other directions precautions must be taken to avoid air in cooling tubes.



Type	L mm	L1 mm	W Kg	Type	L mm	L1 mm	W Kg
CBW-H 170 C (H) (T)	170	70	5.2	CBW-H 460 C (H) (T)	460	360	12.3
CBW-H 210 C (H) (T)	210	110	6.4	CBW-H 560 C H (T)	560	460	14.7
CBW-H 260 C (H) (T)	260	160	7.6	CBW-H 660 C H (T)	660	560	17.1
CBW-H 330 C (H) (T)	330	230	9.2	CBW-H 760 C H (T)	760	660	19.5
CBW-H 400 C (H) (T)	400	300	10.9	Longest possible type	1000		

Applications:



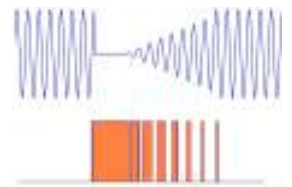
Can be stacked without distance



Power Filter Resistor



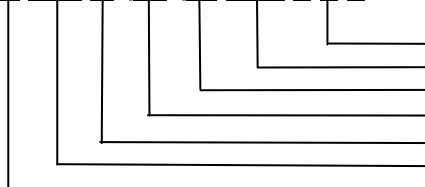
Reinforced versions are available for Fault Ride Through / Power Dump Resistors for Wind Turbines and other power plants.



Type identification:

Please specify your CBW Brake resistor as follows

CBW-H 660 C (H) (T) 22R 0 0 1



Last digits XXX > 400: Customer specified version, otherwise:
Thermo watch temperature: 3=80°; 4=100°; 5=130; 6=160; 7 = 180; 8 =200°C
Ohm Value (Examples: 2R2 = 2.2Ω; 22R = 22 Ω; 220R = 220Ω; 1K0 = 1.0 kΩ)
T: Thermo watch
H: Helix wire element (Specified by Danotherm)
Connection C: Cables B: IP 65 Connection Box
Length of resistor profile in mm
H: Horizontally mounted profile