

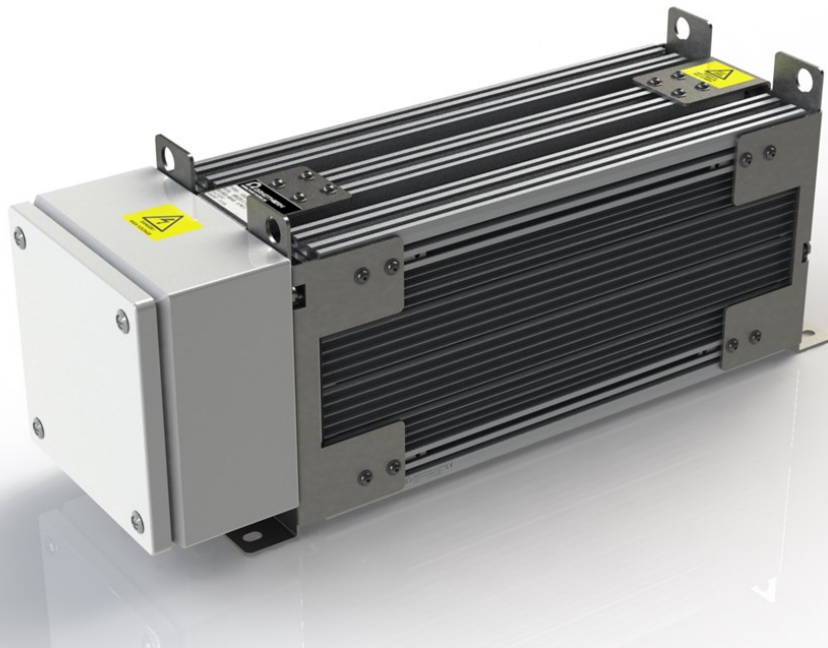
## CBS-H / CBS-V

### Compact Alpha Power Resistor

**12.7kW - 230kW**

**(64kJ - 1.2MJ) / profile**

**5/1800s pulse load**



The **CBS-H** and **CBS-V** with optional **integrated thermo watch** from our high power range of **ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS** are electrically insulated and with small dimensions. They can easily be fitted into compact constructions and are especially designed to endure very high pulse loads without getting hot and triggering any smoke alarm.

The steady state power range span from **410W** to **3565W** per case housing and up to 20 housings can be combined in one unit. The pulse load capability is up to 200 times the nominal power for one second every hour, depending on the ohm value and resistor wire, making several MW's as pulse load available. The total cool down is about one hour for all resistors.

Reinforced versions for **Low Voltage Ride Through - LVRT** (Energy Dump Resistors) for **Wind Turbines** are available. In fact, the CBS range is most suited for this application.

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.

**CBS** resistors are optionally available with connection box in different design for different cable sizes and from IP20/IP54, please require special data sheets. The resistors can on request comply to IP65.

## Construction

The resistors are designed as follows:

The resistor elements for high resistance types are wire wound on mica support sheets. Lower resistance elements are made with helix wound wire elements mounted in special designed ceramic fixtures. The outer housing is an aluminium case isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the case by ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium case with the fixed resistor element is filled with  $Al_2O_3$  or  $SiO_2$ . This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

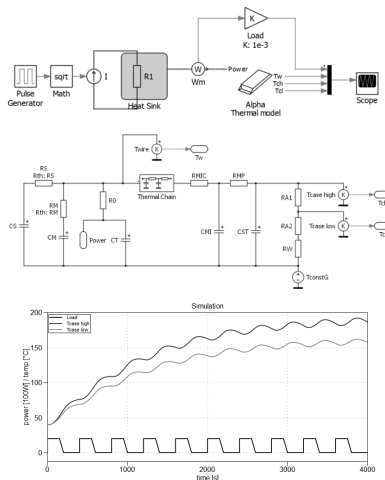
The standard cables are 300 mm AWG 10 – AWG 4 , 1000V. We can supply cables in specified length and mounted with cable shoes or connectors as required.

## Accessories

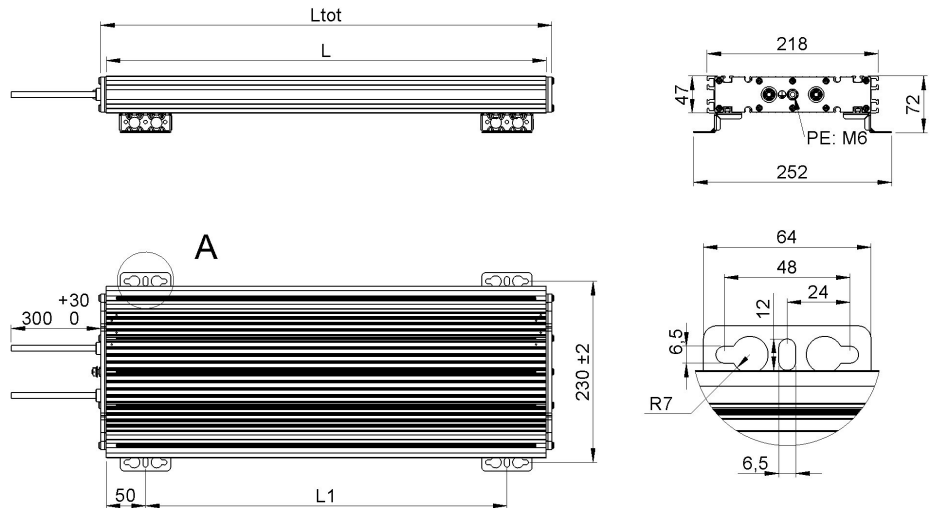
We can customize the resistor concerning; connection style, IP class, horizontal or vertical mounting, open terminals or connection box . PT-100 temperature sensor or thermal switch (TS). If a TW is needed the maximum temperature on the surface near the cables is 200°C.

## Thermal simulations

The start for each resistor selection is a power-time graph from your application. Danotherm is able to predict the temperature of the resistor by using sophisticated models.



Pn [W] @ 40°C According UL508						
CBS-BH(T)-XXX	1 profile  Pn [W] @ 40°C According UL508 Max surface 250°C	RΩ	1 profile  Max surface temp 190 °C	2 profiles  Max surface temp 250 °C	3 profiles  Max surface temp 250 °C	4 profiles  Max surface temp 250 °C
TW: Thermal watch	no TW	± 10%	TW	no TW	no TW	no TW
CBS 180	410		315			
CBS 210	580	0,02 - 30	445			
CBS 260	850	0,04 - 50	685			
CBS 330	1135	0,065 - 80	870	1930	2700	3630
CBS 400	1375	0,07 - 100	1055	2340	3300	4400
CBS 460	1585	0,09 - 140	1215	2700	3800	5000
CBS 560	1925	0,12 - 170	1480	3270	4620	6100
CBS 660	2270	0,15 - 210	1745	3860	5500	7300
CBS 760	2770	0,18 - 250	2130	4700	6650	8800
CBS 860	3190	0,2 - 300	2450	5400	7660	10200
CBS 960	3565	0,25 - 340	2740	6060	8500	11300
General specifications						
Temperature Coefficient:			< ± 100 ppm			
Dielectric strength		standard	3500 VAC @ 1 minute			
Working voltage		standard	1000 VAC / 1400 VDC			
Isolation Resistance:			> 20 MΩ / profile			
Overload:@ 1 sec pulse / hour			80 - 200 x (depending on resistor)			
Overload:@ 5 sec pulse / hour			30 - 60 x (depending on resistor)			
Environmental:			- 40 °C - 90 °C			
De-rating:			Linear: 40 °C = Pn to 70 °C = 0,75 * Pn			
Thermal switch (optional)			130 / 160 / 180 / 200 °C, 2A, 250 VAC NC			



Type	L +/- 2	L1 +/- 1	Type	L +/- 2	L1 +/- 1
CBS 180	180	80	CBS 560	560	460
CBS 210	210	110	CBS 660	660	560
CBS 260	260	160	CBS 760	760	660
CBS 330	330	230	CBS 860	860	760
CBS 400	440	300	CBS 960	960	860
CBS 460	460	360			

CBS-H 400 CH(T) 22R 2 8 1

Last digits XXX > 400: Customer specified version, otherwise:

Number of profiles 1, 2, 3 or 4

Thermo switch temperature: 3=80°C; 4=100°C; 5=130°C; 6=160°C; 7=180°C; 8=200°C; 9=PT100

0=cable connection; 2=connection box

Ohm value (Examples: 2R2 = 2.2 Ω, 22R = 22 Ω, 220R = 220 Ω, 2k2 = 2.2 kΩ)




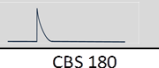
T = Thermal watch (NC)

Wire element (L.b.d. by Danotherm) E = parallel, H = series

Connector; Box: 0 = IP00; D = IP20; B = IP65, C = cable version

Length of resistor in mm. (210, 260, 330, 400, 460, 560, 660, 760, 860, 960)

H = Horizontal mounting feet, V = Vertical mounting feet

	Multiple square pulses each 120 seconds									
	P1/120 kW@40°C	Max surface temp. °C @ 40°C	P5/120 kW@40°C	Max surface temp. °C @ 40°C	P10/120 kW@40°C	Max surface temp. °C @ 40°C	P20/120 kW@40°C	Max surface temp. °C @ 40°C	P40/120 kW@40°C	Max surface temp. °C @ 40°C
CBS 180	23	125	7,4	165	4,3	180	2,4	200	1,4	210
CBS 210	37	150	11	190	6,2	210	3,5	220	2	240
CBS 260	57	180	16,3	220	9,1	240	5,1	250	2,8	260
CBS 330	84	190	23,5	240	13,1	250	7,2	260	4	280
CBS 400	118	220	31,5	260	17,3	270	9,5	290	5,2	300
CBS 460	154	230	39	260	21,3	270	11,6	290	6,3	300
CBS 560	204	250	50	280	27	290	14,7	300	7,9	310
CBS 660	240	240	60	270	33	290	17,7	300	9,6	310
CBS 760	280	250	70	280	38	290	20,5	300	11,1	320
CBS 860	344	260	83	290	45	300	24	310	13	320
CBS 960	360	270	89	300	49	310	26	320	14	340
	One single square pulse each 1800 seconds									
	P 1 second [kW]	Max surface temp.	P 5 seconds [kW]	Max surface temp.	P 10 seconds [kW]	Max surface temp.	P 20 seconds [kW]	Max surface temp.	P 40 seconds [kW]	Max surface temp.
CBS 180	32	55	12,7	70	8,2	75	5,2	85	3,4	100
CBS 210	55	65	20,3	80	12,8	90	8	100	5,2	110
CBS 260	89	70	32,3	90	20,3	100	12,6	110	8,2	130
CBS 330	138	75	49	95	30,8	110	19,2	120	12,3	140
CBS 400	204	80	69	110	43	120	26,5	130	17	160
CBS 460	288	85	92	110	56	120	34,3	140	21,5	160
CBS 560	396	90	124	110	75	130	46	140	28,5	160
CBS 660	468	90	148	110	91	130	56	140	35	160
CBS 760	544	90	174	110	107	130	66	140	42	170
CBS 860	712	100	218	120	132	130	80	150	50	170
CBS 960	720	100	230	120	142	140	87	150	55	180
	One single triangle pulse each 1800 seconds									
	P 1 second [kW]	Max surface temp.	P 5 seconds [kW]	Max surface temp.	P 10 seconds [kW]	Max surface temp.	P 20 seconds [kW]	Max surface temp.	P 40 seconds [kW]	Max surface temp.
CBS 180	66	60	27,8	70	18,3	80	11,4	90	7,3	100
CBS 210	114	60	44,5	80	28,5	90	17,5	100	11,1	120
CBS 260	188	70	70	90	45	100	27,5	120	17,5	140
CBS 330	290	80	106	100	68	110	42	130	26,5	150
CBS 400	424	80	150	110	95	130	58	140	36,5	160
CBS 460	600	90	200	110	123	130	74,5	140	46	160
CBS 560	832	90	268	120	164	130	99	150	61,5	170
CBS 660	976	90	320	120	198	130	120	150	75	170
CBS 760	1136	90	376	120	234	130	142	150	89	170
CBS 860	1488	100	472	120	288	140	174	150	107	180
CBS 960	1504	100	496	130	308	140	190	160	118	180
One single logarithmic pulse each 1800 seconds (e-curve) $E = \tau \cdot P_{max}$ $p(t) = P_{max} \cdot e^{-t/\tau}$ $\tau = \frac{R \cdot C}{2}$										
	$\tau = 1$ s [kJ]	Max surface temp.	$\tau = 5$ s [kJ]	Max surface temp.	$\tau = 10$ s [kJ]	Max surface temp.	$\tau = 20$ s [kJ]	Max surface temp.	$\tau = 40$ s [kJ]	Max surface temp.
CBS 180	52,5	65	107	90	134	100	172	110	228	130
CBS 210	88	75	166	100	204	110	260	130	344	150
CBS 260	140	80	260	110	324	130	408	150	540	175
CBS 330	216	90	396	120	488	140	624	160	816	190
CBS 400	308	100	552	140	672	150	848	180	1120	210
CBS 460	424	100	712	140	864	150	1088	180	1408	210
CBS 560	584	110	952	140	1152	160	1440	190	1856	220
CBS 660	688	110	1152	140	1408	160	1760	180	2272	210
CBS 760	800	110	1360	150	1664	160	2080	190	2688	220
CBS 860	1022	110	1664	150	2016	170	2496	190	3232	220
CBS 960	1056	120	1792	150	2208	170	2752	200	3584	230

#### Pulse load

The ability to withstand pulse loads varies per resistor size and length and diameter of the internal resistor wire. As such, it is impossible to create standard graphs that would apply for most customers applications. In some cases the load is a combination of a square form + triangle, such as High Voltage Ride Through (HVRT) and emergency brake situation.

On request Danotherm performs simulations based on the actual application. For better understanding, Danotherm has already produced tables for some different load forms for resistors with standard wire. Please, note that these are only examples.

The table shown is based on a resistor with a 5 ohm value and normal wire thickness. Depending on the application we can change the construction of the resistor to fulfill the demands best without over dimensioning. In the table the absolute peak power of various shapes of pulses during 1 to 40 seconds can be found. For the single pulses, one pulse per half an hour is applied. At that time, the resistor wire temperature will reach its maximum limit.

Danotherm can customize the resistor concerning; connection style, IP class, horizontal or vertical mounting, open terminals or connection box . PT-100 temperature sensor or thermal switch (TS), if a TS is needed the maximum temperature at the cable side surface is 200°C.

Danotherm has standard solutions for 1 up to 4 case housings combined in one compact configuration with pulse withstand capability of 1MW (5MJ) and OEM version with maximum 20 profiles. Depending on the electrical connection, the IP class ranges from IP 20 to IP 65. Connection can be box, DIN-rail terminals or cable version.

The salient features of Alpha resistors are that they have:

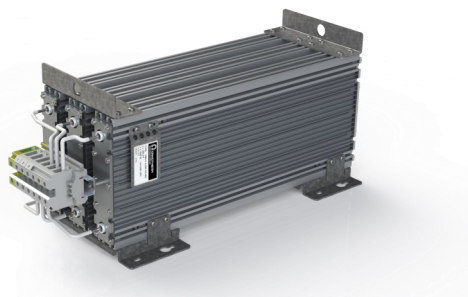
- Compact
- Cool surface
- High pulse load capability
- High vibration capability
- No live parts outside
- High IP class
- Fail safe (on request)
- Low noise level



Triple unit CBS-H 210 B  
Pnom. = 410—3565W, IP 54  
Connection box

**Ω NIBE**

Danotherm Electric A/S  
is a NIBE company



CBS-V 530 SHT 283

unit CBS  
Pnom. = 2700—8500 W triple (282)  
Pnom. = 3630—11300 W quadruple (284)  
Connection Box with 3 cable glands 1x thermostat  
and 2x Resistors , IP 54 protection class



CBS-H 460 BHT 284

