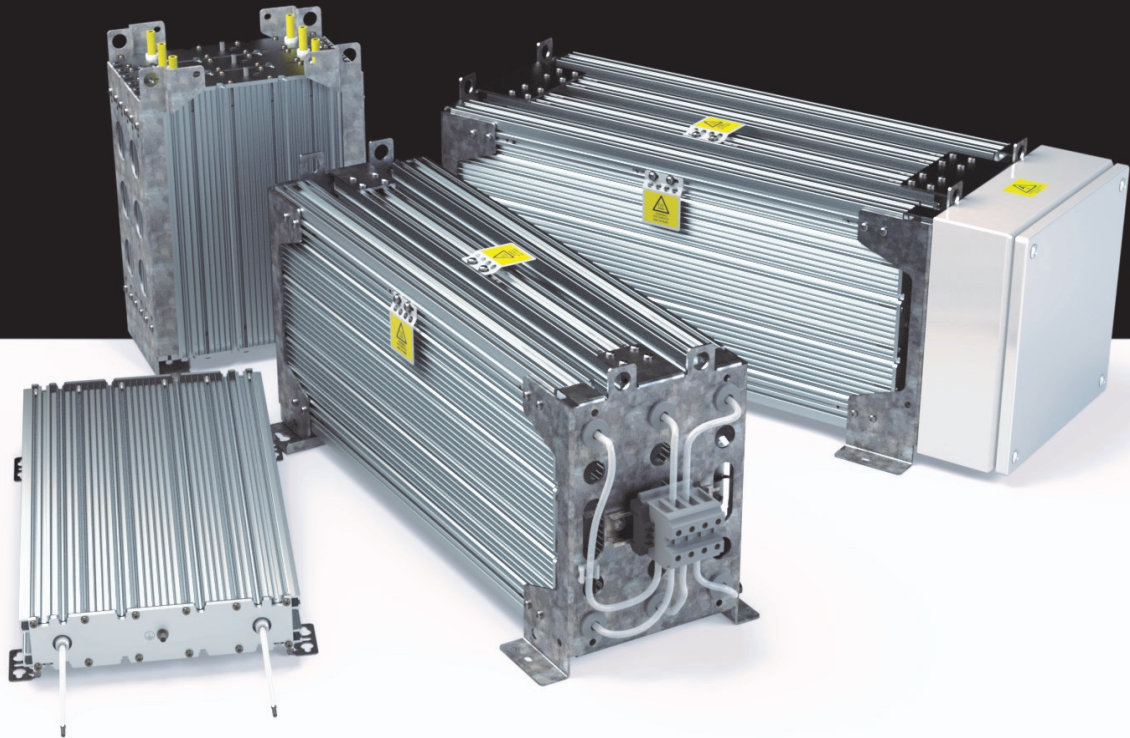




DANOTHERM™



The ALPHA Resistor Collection Catalogue - Resistors for Filter, Brake and High Energy Dump Applications

- Compact aluminum housed construction; small dimensions
- Fully insulated; no external live parts
- High IP Classes
- Low thermal drift, 100ppm
- Low noise
- Resistor components are UL approved
- Thermal models for all types available on request



Welcome to the world of power resistors

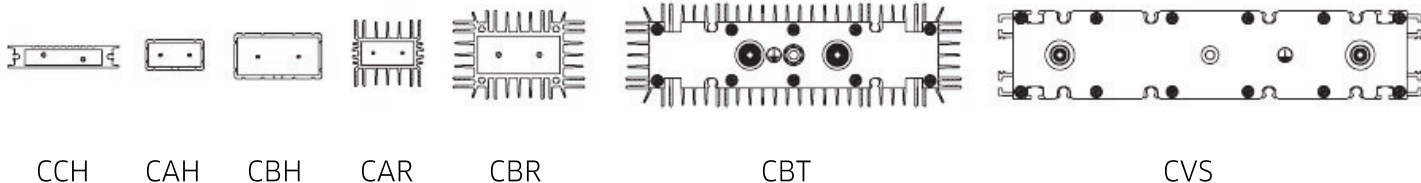


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Overview table

Type	Pn W @ 40°C According UL508	max temp. °C	R Ω min - max	Pulse load W T. amb. = 40°C				
				duty 1 second W	duty 5 second W	duty 10 second W	duty 20 second W	duty 40 second W
CCH 110	100	260	2 - 1000	2500	1150	800	540	295
CCH 166	160	265	4 - 1200	5700	2380	1600	930	470
CCH 216	200	275	6 - 1500	10500	3760	2350	1180	590
CCH 270	260	280	9 - 1700	14200	5050	3080	1540	770
CCH 320	300	285	10 - 2000	18600	6320	3550	1780	890
CCH 420	390	295	13 - 2000	24700	8390	4590	2290	1160
CCH 520	480	305	16 - 2000	30300	9710	5760	2880	1440
CCH 620	570	315	20 - 2000	38100	11900	6890	3440	1720
CCH 145 CT	80	210	2 - 1000	2540	1210	850	580	345
CCH 201 CT	120	215	4 - 1200	5780	2480	1690	920	460
CCH 251 CT	160	220	6 - 1500	10600	3940	2280	1140	570
CCH 305 CT	200	225	9 - 1700	14500	5220	2820	1410	700
CCH 355 CT	230	230	10 - 2000	19100	6550	3280	1640	820
CCH 455 CT	300	235	13 - 2000	25300	8310	4150	2080	1040
CCH 555 CT	370	245	16 - 2000	30900	10000	5170	2590	1290
CCH 655 CT	440	250	20 - 2000	38800	11800	5900	2950	1500
CAH / CAV 120 C	70	260	0.15 - 300	1070	410	320	240	170
CAH / CAV 150 C	90	260	0.3 - 600	2420	820	600	435	255
CAH / CAV 165 C	100	265	0.3 - 800	3630	1120	780	540	285
CAH / CAV 210 C	125	270	0.6 - 1200	7030	1800	1120	750	375
CAH / CAV 240 C	145	275	0.7 - 1500	9530	2350	1440	850	435
CAH / CAV 300 C	185	290	1 - 1200	12800	3150	1920	1100	550
CAH / CAV 360 C	220	305	1.2 - 2500	16700	4080	2460	1320	660
CAR 85 C	115	260	0.1 - 300	1090	420	330	250	180
CAR 115 C	150	265	0.25 - 600	2480	860	640	470	330
CAR 130 C	170	265	0.3 - 800	3750	1170	830	600	405
CAR 175 C	225	275	0.5 - 1200	7420	1910	1230	830	570
CAR 205 C	260	285	0.7 - 1400	10200	2540	1590	1050	700
CAR 265 C	335	300	1.0 - 2000	13800	3460	2140	1420	940
CAR 325 C	410	320	1.2 - 2500	18100	4460	2750	1810	1170
CAH / CAV 145 CT	60	210	0.15 - 300	1070	415	325	245	170
CAH / CAV 175 CT	75	210	0.3 - 600	2420	830	610	430	215
CAH / CAV 190 CT	80	215	0.3 - 800	3630	1120	780	460	235
CAH / CAV 235 CT	100	220	0.6 - 1200	7030	1810	1130	580	290
CAH / CAV 265 CT	110	220	0.7 - 1500	9530	2350	1340	670	335
CAH / CAV 325 CT	140	230	1 - 1200	12800	3180	1660	830	415
CAH / CAV 385 CT	165	235	1.2 - 2500	16700	3980	1990	1000	495
CAR 110 C/K/D T	105	210	0.1 - 300	1090	425	335	260	185



Type	Pn W @ 40°C According UL508	max temp. °C	R Ω min - max	Pulse load W T. amb. = 40°C				
				duty 1 second W	duty 5 second W	duty 10 second W	duty 20 second W	duty 40 second W
CAR 140 C/K/D T	135	210	0.25 - 600	2500	870	650	485	335
CAR 155 C/K/D T	150	215	0.3 - 800	3750	1190	840	610	420
CAR 200 C/K/D T	190	220	0.5 - 1200	7420	1940	1240	850	560
CAR 230 C/K/D T	210	225	0.7 - 1400	10200	2560	1600	1060	630
CAR 290 C/K/D T	265	235	1.0 - 2000	13800	3490	2150	1430	780
CAR 350 C/K/D T	310	250	1.2 - 2500	18100	4500	2760	1810	930
CBH / CBV 165 C	110	265	0.5 - 1000	5	1.4	0.9		0.3
CBH / CBV 215 C	155	270	0.8 - 1500	9.8	2.5	1.6		0.5
CBH / CBV 265 C	200	270	1.5 - 2000	16.6	4	2.4		0.6
CBH / CBV 335 C	270	280	1.8 - 2000	26.6	6.2	3.4		0.9
CBH / CBV 405 C	330	285	2.0 - 2000	34.1	8.5	4.3		1
CBR-V / H 175 C	311	265	0.8 - 1500	10.5	2.7	1.8		0.9
CBR-V / H 225 C	400	270	1.5 - 2000	18.3	4.5	2.8		1.2
CBR-V / H 295 C	525	275	1.8 - 2000	29.7	7.1	4.2		1.8
CBR-V / H 365 C	650	280	2.0 - 2000	38.4	11.3	6.7		2.4
CBR-V / H 426 C	980	285	2.4 - 2000	39.1	12.9	7.9		2.9
CBR-V / H 526 C	1220	295	3.0 - 2000	49.1	16.1	9.9		3.6
CBR-V / H 626 C	1460	305	3.5 - 2000	60.6	19.7	12		4.4
CBR-V / H 726 C	1700	310	4.0 - 2000	73.1	23.4	14.3		5.2
CBR-V 175 K	235	210	0.8 - 1500	10.5	2.7	1.8		0.8
CBR-V 225 K	305	215	1.5 - 2000	18.3	4.5	2.8		1.1
CBR-V 295 K	400	220	1.8 - 2000	29.7	7.1	4.2		1.5
CBR-V 365 K	495	225	2.0 - 2000	38.4	11.3	6.7		1.9
CBR-V 426 K	750	230	2.4 - 40	39.1	12.9	7.9		2.3
CBR-V 526 K	930	235	3.0 45	49.1	16.1	9.9		2.9
CBR-V 626 K	1100	240	3.5 - 50	60.6	19.7	12		3.6
CBR-V 726 K	1300	250	4.0 - 55	73.1	23.4	14.3		4.3
CBT-H 180 C	455	270	0.04 - 13	18.4	5.1	3	1.9	1.1
CBT-H 210 C	585	270	0.05 - 2000	24.7	6.1	3.8	2.5	1.7
CBT-H 260 C	830	280	0.07 - 2000	44	10.7	6.4	4	2.7
CBT-H 330 C	1350	280	0.09 - 2000	71	22	13	8	4.3
CBT-H 400 C	1650	290	0.11 - 2000	105	30	18	10.7	5.4
CBT-H 460 C	1900	300	0.14 - 2000	128	36	21	12	6.2
CBT-H 560 C	2310	310	0.18 - 110	190	50	28	15	7.6
CBT-H 660 C	2720	320	0.22 - 130	257	64	36	18	9.2
CBT-H 760 C	3200	330	0.27 - 150	315	78	43	21.5	10.7
CBT-H 860 C	3640	340	0.31 - 180	370	89	50	25	12.4
CBT-H 960 C	4070	350	0.35 - 220	480	110	56	28	14



CBS



CMQ/HVBS

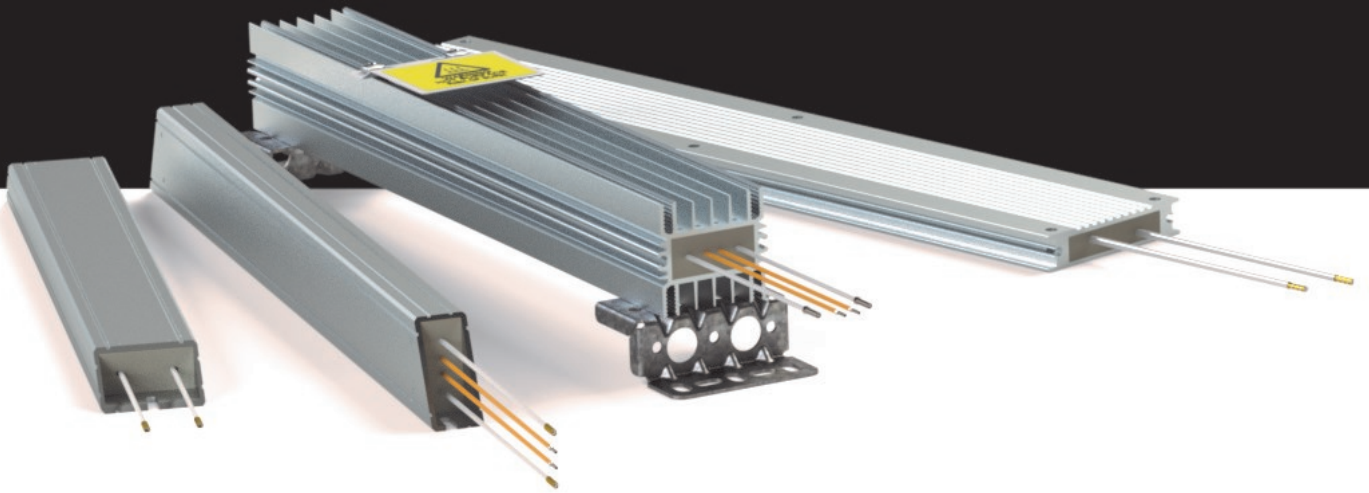


CBW

Type	Pn W @ 40°C According UL508	max temp. °C	R Ω min - max	Pulse load W T. amb. = 40°C				
				duty 1 second W	duty 5 second W	duty 10 second W	duty 20 second W	duty 40 second W
CBS 210 C	580	270	0.05-20		16	11	7.6	5.5
CBS 260 C	850	280	0.07-35		27	19	13.1	9.5
CBS 330 C	1135	280	0.09-50		45	31	21.3	15.5
CBS 400 C	1375	290	0.11-65		68	44	31	21.6
CBS 460 C	1585	300	0.14-85		92	59	40	28
CBS 560 C	1925	310	0.18-110		120	77	52	36
CBS 660 C	2270	320	0.22-130		160	100	66	46
CBS 760 C	2770	330	0.27-150		205	125	83	56
CBS 860 C	3190	340	0.31-180		255	155	100	67
CBS 960 C	3565	350	0.35-220		250	160	105	73
CMQ 210 C	800	270			23	16	11	8
CMQ 260 C	1100	280			46	31	21	15
CMQ 330 C	1500	280	0.07-80		71	47	32	23
CMQ 400 C	1900	290	0.10-110		120	75	49	34
CMQ 460 C	2200	300	0.12-130		150	93	61	42
CMQ 560 C	2700	310	0.15-160		210	130	83	57
CMQ 660 C	3100	320	0.19-200		260	160	100	69
CMQ 760 C	3500	330	0.23-240		350	210	130	88
CMQ 860 C	3850	340	0.27-280		350	215	140	95
CMQ 960 C	4150	350	0.30-320		460	275	175	115
CVS 400 C	1995	290	0.10-70		135	83	52	35
CVS 460 C	2310	300	0.12-85		190	115	71	46
CVS 560 C	2830	310	0.15-105		265	155	97	63
CVS 660 C	3250	320	0.19-130		340	200	120	79
CVS 760 C	3670	330	0.23-150		440	255	155	99
CVS 860 C	4040	340	0.27-180		500	290	175	115
CVS 960 C	4350	350	0.30-210		510	300	180	120
HVBS 300 C	850	280	0.05 - 30		22.4	15.4	11	8
HVBS 370 C	1050	280	0.07 - 50		41.3	27.8	19.3	13.9
HVBS 440 C	1250	290	0.09 - 70		66	43.6	29.3	20.6
HVBS 520 C	1365	300	0.10 - 90		81	54	37.1	26.6
HVBS 620 C	1950	310	0.13 - 110		120	77	51	35.8
HVBS 720 C	2500	320	0.15 - 140		155	98	65	45.1
HVBS 820 C	2900	330	0.19 - 170		185	115	77	53
HVBS 920 C	3200	340	0.22 - 200		270	165	105	69
HVBS 1000 C	3500	350	0.25 - 220		300	180	115	77
CBW-H 180 C	1050	170	0.04 - 13	17.5	5.5	3.4	2.1	1.3
CBW-H 210 C	1450	180	0.05 - 2000	19.4	5.3	3.6	2.6	1.8
CBW-H 260 C	2050	180	0.07 - 2000	46	11.3	6.9	4.5	3
CBW-H 330 C	2600	180	0.09 - 2000	78	24.4	15	9.3	5.7
CBW-H 400 C	3100	180	0.11 - 2000	115	34	20.8	12.7	7.8
CBW-H 460 C	3600	180	0.14 - 2000	140	41	25	15.4	9.4
CBW-H 560 C	4350	180	0.18 - 110	215	58	34	20.4	12.3
CBW-H 660 C	5200	180	0.22 - 130	295	76	44	26.1	15.4
CBW-H 760 C	5900	180	0.27 - 150	370	92	52	30.7	18
CBW-H 860 C	6750	180	0.31 - 180	440	105	61	35.5	20.8
CBW-H 960 C	7450	180	0.35 - 220	580	135	75	42.4	23.2



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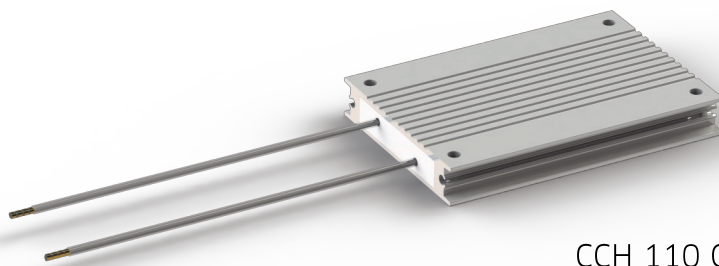
CCH / CAH / CAV / CAR

CCH with and without thermal switch

P _n W @ 40°C According UL508								
CAH/CAV CAR	P _n W @ 40°C According UL508	max temp. °C	R _Ω min - max	Pulse load W T. amb. = 40°C each 120s				
				duty 1 second W	duty 5 second W	duty 10 second W	duty 20 second W	duty 40 second W
CCH 110	100	260	2 - 1000	2500	1150	800	540	295
CCH 166	160	265	4 - 1200	5700	2380	1600	930	470
CCH 216	200	275	6 - 1500	10500	3760	2350	1180	590
CCH 270	260	280	9 - 1700	14200	5050	3080	1540	770
CCH 320	300	285	10 - 2000	18600	6320	3550	1780	890
CCH 420	390	295	13 - 2000	24700	8390	4590	2290	1160
CCH 520	480	305	16 - 2000	30300	9710	5760	2880	1440
CCH 620	570	315	20 - 2000	38100	11900	6890	3440	1720
CCH with internal thermal switch								
CCH 145 CT	80	210	2 - 1000	2540	1210	850	580	345
CCH 201 CT	120	215	4 - 1200	5780	2480	1690	920	460
CCH 251 CT	160	220	6 - 1500	10600	3940	2280	1140	570
CCH 305 CT	200	225	9 - 1700	14500	5220	2820	1410	700
CCH 355 CT	230	230	10 - 2000	19100	6550	3280	1640	820
CCH 455 CT	300	235	13 - 2000	25300	8310	4150	2080	1040
CCH 555 CT	370	245	16 - 2000	30900	10000	5170	2590	1290
CCH 655 CT	440	250	20 - 2000	38800	11800	5900	2950	1500

Construction and salient properties

- UL approved
- Compact dimensions
- Nominal power range from 80W–440W
- Energy levels from 6kJ-60J (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- MgO or SiO₂ filled for high thermal capacity/ high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet (CAR type)
- Optional thermal switch or PT100 element for thermal protection
- Cable (AWG 18–AWG10) or box connection up to 10mm²
- Customized to your needs and application (OEM versions available)



CCH 110 C

CAH/CAV/CAR cable connection

P _n W @ 40°C According UL508								
CAH/CAV CAR	P _n W @ 40°C According UL508	max temp. °C	R min - max Ω	Pulse load kW T. amb. = 40°C each 120s				
				duty 1 second W	duty 5 second W	duty 10 second W	duty 20 second W	duty 40 second W
CAH / CAV 120 C	70	260	0.15 - 300	1070	410	320	240	170
CAH / CAV 150 C	90	260	0.3 - 600	2420	820	600	435	255
CAH / CAV 165 C	100	265	0.3 - 800	3630	1120	780	540	285
CAH / CAV 210 C	125	270	0.6 - 1200	7030	1800	1120	750	375
CAH / CAV 240 C	145	275	0.7 - 1500	9530	2350	1440	850	435
CAH / CAV 300 C	185	290	1 - 1200	12800	3150	1920	1100	550
CAH / CAV 360 C	220	305	1.2 - 2500	16700	4080	2460	1320	660
CAR 85 C	115	260	0.1 - 300	1090	420	330	250	180
CAR 115 C	150	265	0.25 - 600	2480	860	640	470	330
CAR 130 C	170	265	0.3 - 800	3750	1170	830	600	405
CAR 175 C	225	275	0.5 - 1200	7420	1910	1230	830	570
CAR 205 C	260	285	0.7 - 1400	10200	2540	1590	1050	700
CAR 265 C	335	300	1.0 - 2000	13800	3460	2140	1420	940
CAR 325 C	410	320	1.2 - 2500	18100	4460	2750	1810	1170

Cable and connection box

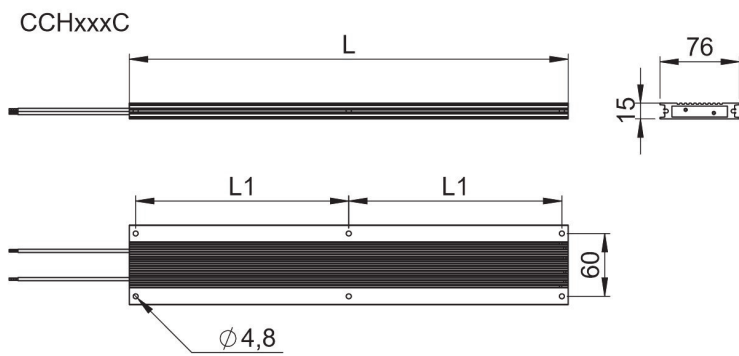
with and without thermal switch

P _n W @ 40°C According UL508								
CAH/CAV CAR	P _n W @ 40°C According UL508	max temp. °C	R min - max Ω	Pulse load kW T. amb. = 40°C each 120s				
				duty 1s second W	duty 5s second W	duty 10s second W	duty 20s second W	duty 40s second W
CAH / CAV 145 CT	60	210	0.15 - 300	1070	415	325	245	170
CAH / CAV 175 CT	75	210	0.3 - 600	2420	830	610	430	215
CAH / CAV 190 CT	80	215	0.3 - 800	3630	1120	780	460	235
CAH / CAV 235 CT	100	220	0.6 - 1200	7030	1810	1130	580	290
CAH / CAV 265 CT	110	220	0.7 - 1500	9530	2350	1340	670	335
CAH / CAV 325 CT	140	230	1 - 1200	12800	3180	1660	830	415
CAH / CAV 385 CT	165	235	1.2 - 2500	16700	3980	1990	1000	495
CAR 110 CT/K/DT	105	210	0.1 - 300	1090	425	335	260	185
CAR 140 CT/K/DT	135	210	0.25 - 600	2500	870	650	485	335
CAR 155 CT/K/DT	150	215	0.3 - 800	3750	1190	840	610	420
CAR 200 CT/K/DT	190	220	0.5 - 1200	7420	1940	1240	850	560
CAR 230 CT/K/DT	210	225	0.7 - 1400	10200	2560	1600	1060	630
CAR 290 CT/K/DT	265	235	1.0 - 2000	13800	3490	2150	1430	780
CAR 350 CT/K/DT	310	250	1.2 - 2500	18100	4500	2760	1810	930

Pulse ratings for short pulses depend on the ohm value. Resistors with lower resistance value have more wire than resistors with higher resistance values. The ratings in this table refer to resistors of about 40R.

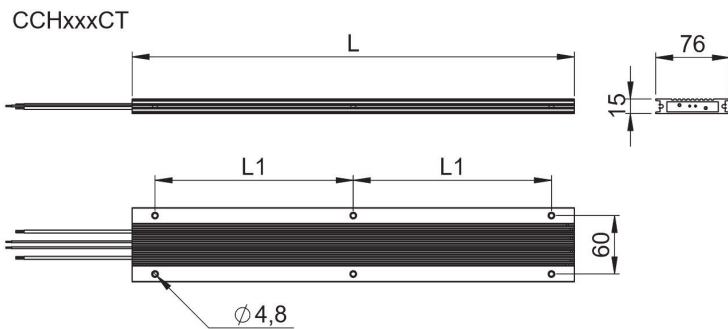
General specifications

Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20M Ω / case housing
Overload:@ 1 sec pulse / hour		10 - 100 x (depending on resistor)
Overload:@ 5 sec pulse / hour		4 - 25 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable version		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating TW 200°C version		Linear: 40°C = Pn to 70°C = 0.65 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of a neighboring component.
		If two or more brake resistors are mounted next to each other the distance between these should be 400mm. If this is less then the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	\pm 1mm
	13 - 100 Hz	@ \pm 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		\pm 10% (optional 5%)
Working voltage		UL: 600VAC. IEC: 690VAC / 850VDC
Time constant for heating up resistor		1000s
Thermal switch (optional)	Thermal switch	130 / 160 / 180 / 200 °C. 2A. 250 VAC NC
Minimum voltage		2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250 VAC cos ϕ =1 2.5A @ 24 VDC
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C



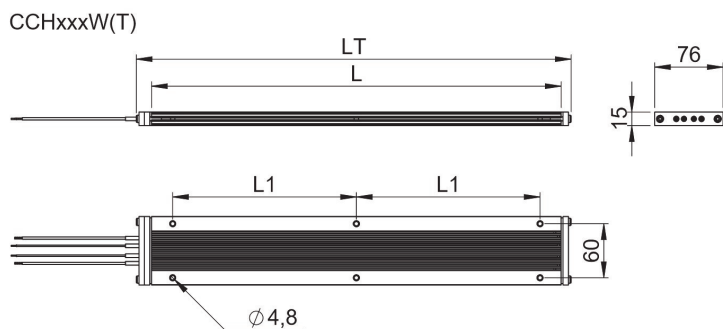
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 110	110	98	220
CCH 166	166	154	350
CCH 216	216	204	480
CCH 270	270	258	620
CCH 320	320	2x154	790
CCH 420	420	2x204	1050
CCH 520	520	2x241.5	1300
CCH 620	620	2x291.5	1550

CCH Cable version with thermal switch, IP54



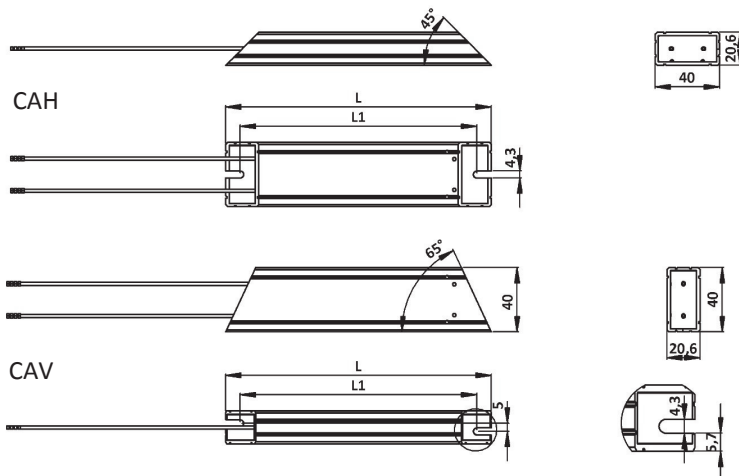
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 145 CT	145	98	270
CCH 201 CT	201	154	410
CCH 251 CT	251	204	540
CCH 305 CT	305	258	620
CCH 355 CT	355	2x154	850
CCH 455 CT	455	2x204	1110
CCH 555 CT	555	2x241.5	1360
CCH 655 CT	655	2x291.5	1610

CCH Cable version IP65, thermal switch IP65



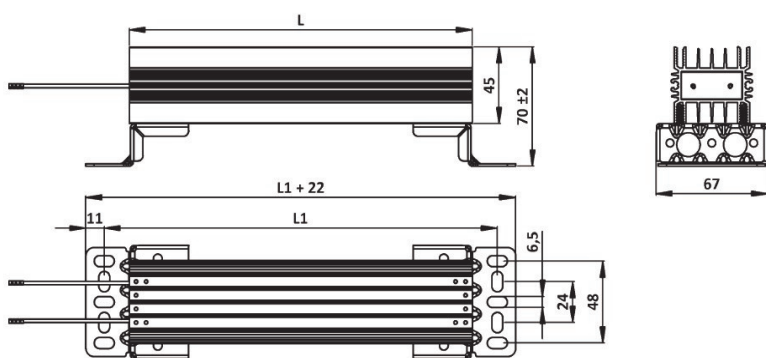
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 145 W(T)	145	98	270
CCH 201 W(T)	201	154	410
CCH 251 W(T)	251	204	540
CCH 305 W(T)	305	258	620
CCH 355 W(T)	355	2x154	850
CCH 455 W(T)	455	2x204	1110
CCH 555 W(T)	555	2x241.5	1360
CCH 655 W(T)	655	2x291.5	1610

Cable version IP54, thermal switch optional



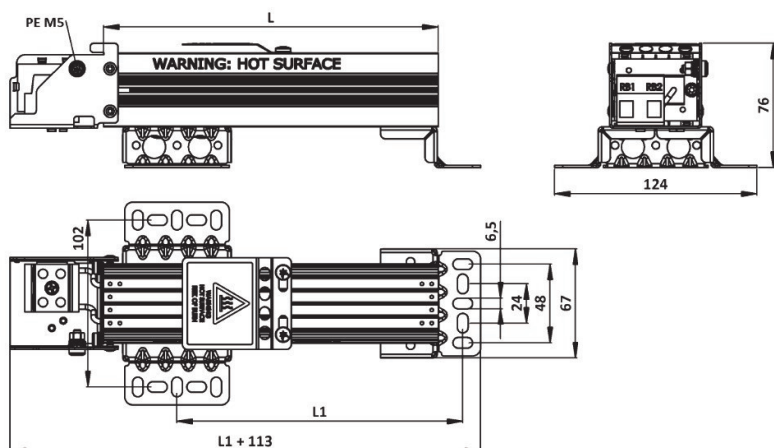
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAH / CAV 120 C	120	102	160
CAH / CAV 150 C	150	132	185
CAH / CAV 165 C	165	147	220
CAH / CAV 210 C	210	192	315
CAH / CAV 240 C	240	222	370
CAH / CAV 300 C	300	282	460
CAH / CAV 360 C	360	342	550
with thermal switch (T)			
CAH / CAV 145 CT	145	127	130
CAH / CAV 175 CT	175	157	160
CAH / CAV 190 CT	190	172	190
CAH / CAV 235 CT	235	217	280
CAH / CAV 265 CT	265	247	335
CAH / CAV 325 CT	325	307	425
CAH / CAV 385 CT	385	367	515

CAR cable type



Type	L ±2mm	L1 ±2mm	Weight g
CAR 85 C	85	115	200
CAR 115 C	115	145	280
CAR 130 C	130	160	300
CAR 175 C	175	205	380
CAR 205 C	205	235	530
CAR 265 C	265	295	600
CAR 325 C	325	355	740
with thermal switch (T)			
CAR 110 CT	110	140	155
CAR 140 CT	140	170	230
CAR 155 CT	155	185	250
CAR 200 CT	200	230	335
CAR 230 CT	230	260	470
CAR 290 CT	290	320	550
CAR 350 CT	350	380	685

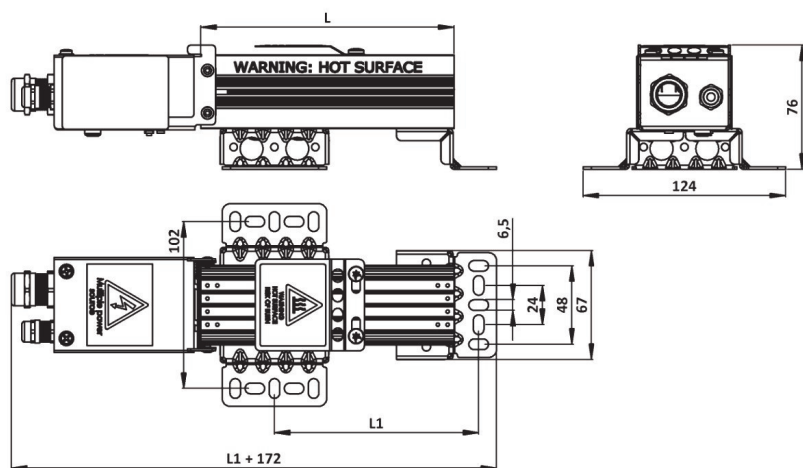
CAR K-Box



CAR Box type connection

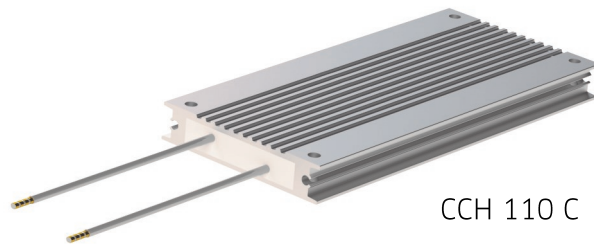
Type	L ± 2 mm	L1 ± 2 mm	Weight g
with connection box			
CAR 115 K/-D	115	85	450/650
CAR 130 K/-D	130	100	470/700
CAR 175 K/-D	175	145	550/750
CAR 205 K/-D	205	175	700/900
CAR 265 K/-D	265	235	800/950
CAR 325 K/-D	325	195	900/1100

CAR DT-Box

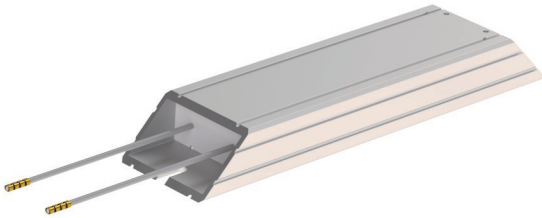


CAR Box type connection and thermal switch

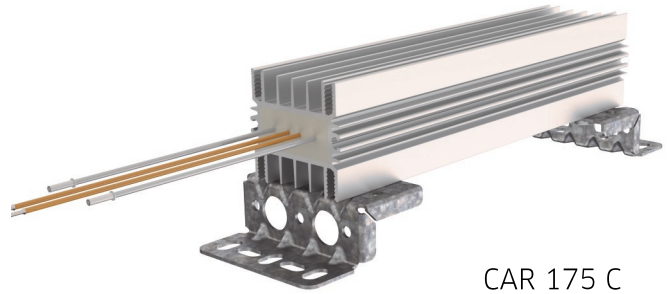
Type	L ± 2 mm	L1 ± 2 mm	Weight g
with connection box			
CAR 140 K / -DT	140	110	510/720
CAR 155 K / -DT	155	125	540/760
CAR 200 K / -DT	200	170	610/810
CAR 230 K / -DT	230	200	760/960
CAR 290 K / -DT	290	260	860/1010
CAR 350 K / -DT	350	320	970/1160



CCH 110 C



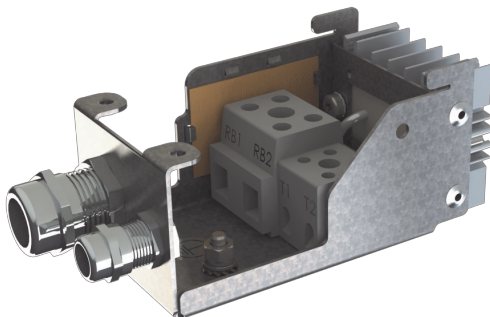
CAH 120 C



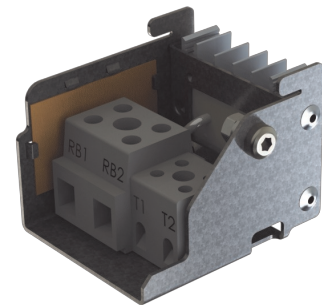
CAR 175 C

Connection boxes, only CAR types

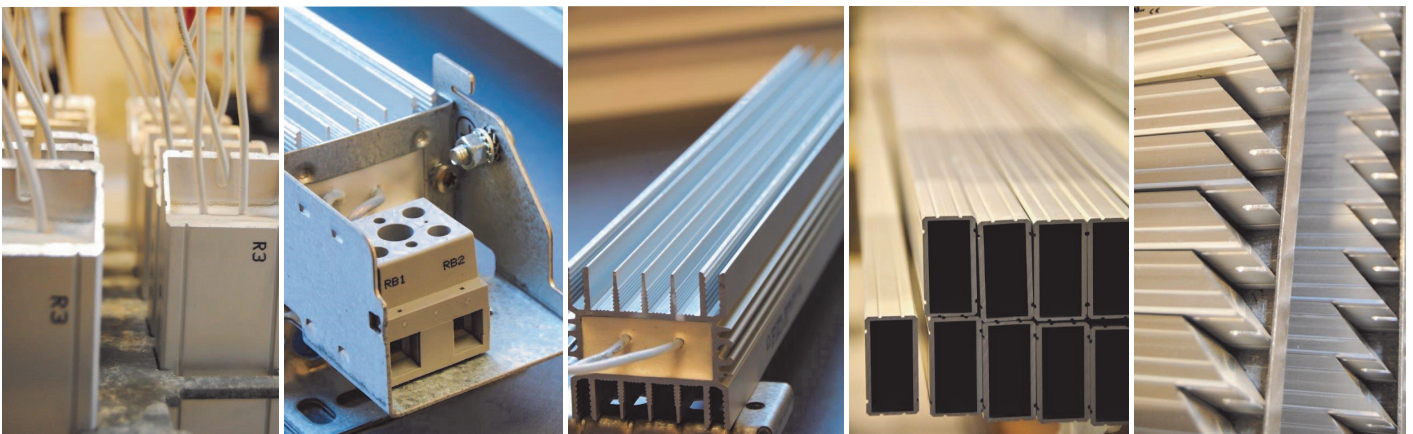
connection boxes	IP rating	cable gland	clamping mm	braid (min.) mm	connection mm ²	TS gland mm	clamping mm	connection mm ²
D-box	IP21	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4
K-box	IP00	-	-	-	0.75-10	-	-	0.5-4*



D-box



KT-box



Ingress Protection

The Ingress Protection rating (IP) value depends on the resistor and on the connection style. The basic IP rating for resistors is IP50 but by the addition of gaskets, they can be increased to IP54 or IP65 which is also possible for resistors with flying leads. For resistors with connection box type B, the maximal IP value is 65. Resistors with connection boxes D and G have an IP21 rating when mounted vertically and IP20 when mounted horizontally.

IP values and their type-tests are well defined; for instance "IP65" means dust cannot penetrate the box or if dust occurs internally, it will not influence the electrical properties. It should be able to withstand water jets from any direction with a certain pressure during 3 minutes; however, it does not mean that it can withstand continuous rain. If the resistor is used outdoors, then it should be protected against direct rain.

IP65 rated resistors can be cleaned with a high pressure hose, but this can only be done when the resistor has cooled down to the ambient temperature, otherwise the water will cool the housing causing a partial vacuum inside, drawing in water.

Danotherm offers standard solutions for one to four cases combined into one compact configuration with pulse-withstand capability of 1MW (5MJ) and also OEM versions with a maximum of 20 resistors. Depending on the electrical connection, the IP-class ranges from IP00 to IP65. Connections can be via a terminal box, DIN-rail terminals or cable lugs. These resistor types are also offered in high voltage versions and with higher ohmic values.

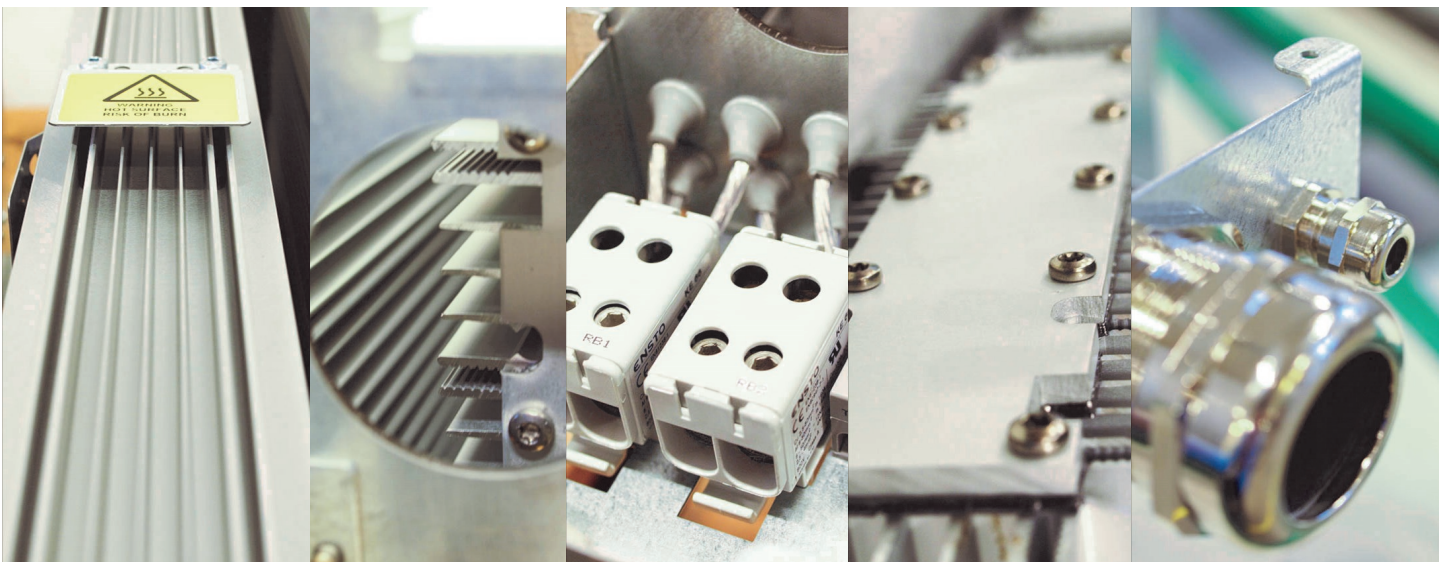
The salient features of Alpha resistors are that they have:

- Small dimensions
- Cool surfaces in operation
- High pulse load capabilities
- High vibration capabilities
- No external electrically-live parts
- High IP classes
- Intrinsically safe capabilities (on request)
- Low noise levels

Ω NIBE

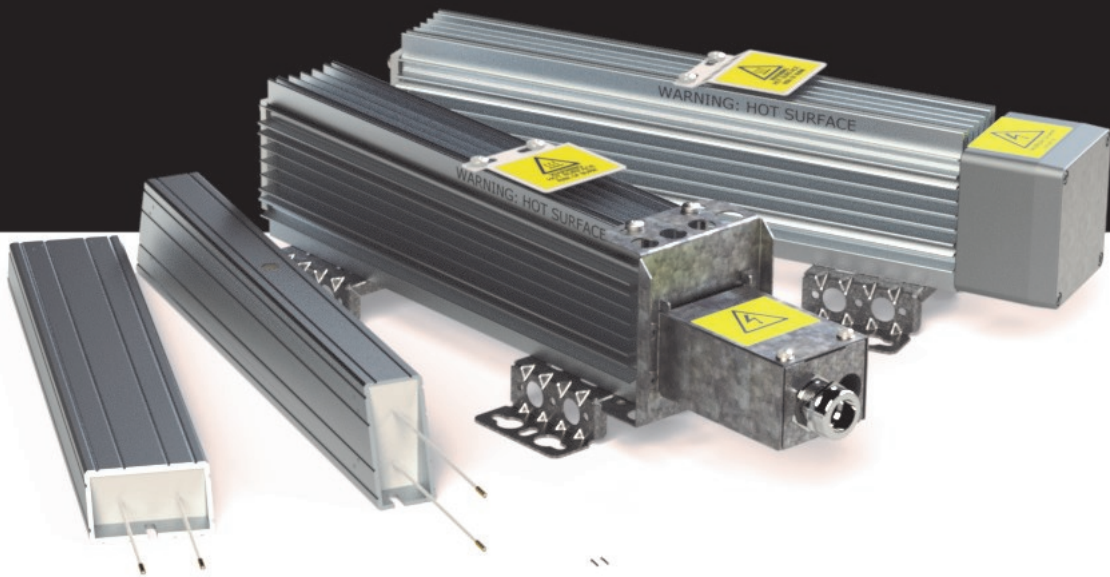
Danotherm Electric A/S

is a NIBE company





DANOTHERM™



CBH / CBV / CBR-V / CBR-H

CBH/CBV CBR-V/CBR-H	Pn [W] @ 40°C According UL508	max temp. [°C]	R [Ω] min - max	Pulse load [kW] T. Amb. = 40°C each 120s *			
				duty 1 second [kW]	duty 5 second [kW]	duty 10 second [kW]	duty 40 second [kW]
CBH / CBV 165 C	110	265	0.5 - 1000	5	1.4	0.9	0.3
CBH / CBV 215 C	155	270	0.8 - 1500	9.8	2.5	1.6	0.5
CBH / CBV 265 C	200	270	1.5 - 2000	16.6	4.0	2.4	0.6
CBH / CBV 335 C	270	280	1.8 - 2000	26.6	6.2	3.4	0.9
CBH / CBV 405 C	330	285	2.0 - 2000	34.1	8.5	4.3	1
CBR-V / H 175 C	311	265	0.8 - 1500	10.5	2.7	1.8	0.9
CBR-V / H 225 C	400	270	1.5 - 2000	18.3	4.5	2.8	1.2
CBR-V / H 295 C	525	275	1.8 - 2000	29.7	7.1	4.2	1.8
CBR-V / H 365 C	650	280	2.0 - 2000	38.4	11.3	6.7	2.4
CBR-V / H 426 C	980	285	2.4 - 2000	39.1	12.9	7.9	2.9
CBR-V / H 526 C	1220	295	3.0 - 2000	49.1	16.1	9.9	3.6
CBR-V / H 626 C	1460	305	3.5 - 2000	60.6	19.7	12	4.4
CBR-V / H 726 C	1700	310	4.0 - 2000	73.1	23.4	14.3	5.2

Construction and salient properties

- UL approved
- Compact dimensions
- Nominal power range from 110W–1700W
- Energy levels from 9kJ-150kJ per case housing (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Internal mica supported wirewound elements for higher ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- Al₂O₃ or SiO₂ filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optional thermal switch or PT100 element for thermal protection
- Cable (AWG 18–AWG10) or box connection up to 10mm²
- Customized to your needs and application (OEM versions available)



CBR-V 225 K

CBH / CBV / CBR cable connections IP54

with internal thermal switch

CBH/CBV CBR-V/CBR-H with Thermal switch	Pn [W] @ 40°C According UL508	max temp. [°C]	R [Ω] min - max	Pulse load [kW] T. Amb. = 40°C each 120s*			
				duty 1 second [kW]	duty 5 second [kW]	duty 10 second [kW]	duty 40 second [kW]
CBH / CBV 190 xT	85	210	0.5 - 1000	5	1.4	0.9	0.3
CBH / CBV 240 xT	120	215	0.8 - 1500	9.8	2.5	1.5	0.4
CBH / CBV 290 xT	150	220	1.5 - 2000	16.6	3.8	1.9	0.5
CBH / CBV 360 xT	200	225	1.8 - 2000	25.6	5.2	2.6	0.7
CBH / CBV 430 xT	250	230	2.0 - 2000	32.5	6.5	3.2	0.8
CBR-V / H 160 xT	280	210	0.5 - 1000	5.4	1.5	1	0.5
CBR-V / H 210 xT	360	210	0.8 - 1500	10.6	2.8	1.8	0.9
CBR-V / H 260 xT	450	225	1.5 - 2000	18.4	4.6	2.8	1.3
CBR-V / H 330 xT	570	230	1.8 - 2000	30	7.1	4.2	1.7
CBR-V / H 400 xT	680	230	2.0 - 2000	38.8	11.4	6.8	2.1
CBR-V / H 460 xT	790	240	2.4 - 2000	39.4	12.9	8	2.4
CBR-V / H 560 xT	960	250	3.0 - 2000	49.4	16.2	10	3.1
CBR-V / H 660 xT	1130	260	3.5 - 2000	60.6	19.7	12.1	3.8
CBR-V / H 760 xT	1290	260	4.0 - 2000	73.8	23.3	14.2	4.3

CBR K-box connection IP00

CBH/CBV CBR-V/CBR-H	Pn [W] @ 40°C	max temp. [°C]	R [Ω] min - max	Pulse load [kW] T. Amb. = 40°C each 120s*			
				duty 1 second [kW]	duty 5 second [kW]	duty 10 second [kW]	duty 40 second [kW]
CBR-V 175 K	235	210	0.8 - 1500	10.5	2.7	1.8	0.8
CBR-V 225 K	305	215	1.5 - 2000	18.3	4.5	2.8	1.1
CBR-V 295 K	400	220	1.8 - 2000	29.7	7.1	4.2	1.5
CBR-V 365 K	495	225	2.0 - 2000	38.4	11.3	6.7	1.9
CBR-V 426 K	750	230	2.4 - 40	39.1	12.9	7.9	2.3
CBR-V 526 K	930	235	3.0 45	49.1	16.1	9.9	2.9
CBR-V 626 K	1100	240	3.5 - 50	60.6	19.7	12	3.6
CBR-V 726 K	1300	250	4.0 - 55	73.1	23.4	14.3	4.3

* Pulse ratings for short pulses depend on the ohm value. Resistors with lower resistance value have more wire than resistors with higher resistance values. The ratings in this table refer to resistors of about 40R.

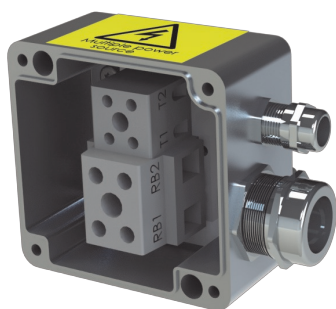
General specifications

Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20M Ω / case housing
Overload:@ 1 sec pulse / hour		40 - 120 x (depending on resistor)
Overload:@ 5 sec pulse / hour		10 - 27 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable version		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating TW 200°C version		Linear: 40°C = Pn to 70°C = 0.65 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of a neighboring component.
		If two or more brake resistors are mounted next to each other the distance between these should be 400mm. If this is less then the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		± 10% (optional 5%)
Working voltage	Standard	UL: 600VAC. IEC: 690VAC / 1100VDC
	On request	UL: 1000VAC. IEC: 1000VAC / 1400VDC
Time constant for heating up resistor		1000s
Thermal switch (optional)	Thermal switch	130 / 160 / 180 / 200 °C. 2A. 250 VAC NC
Minimum voltage		2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250 VAC cos ϕ =1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

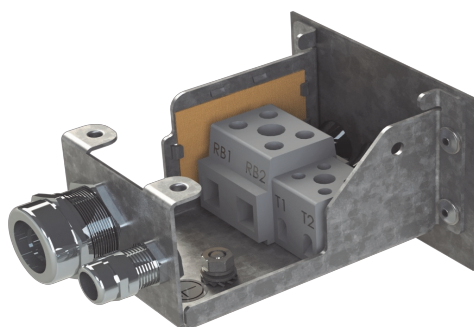
Connection boxes, only CBR types (optional)

connection boxes	IP rating	cable gland	clamping [mm]	braid (min.) [mm]	connection [mm ²]	TS gland [mm]	clamping [mm]	connection [mm ²]
B-box	IP65	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4
D-box	IP21	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4
K-box	IP00	-	-	-	0.75-10	-	-	0.5-4*

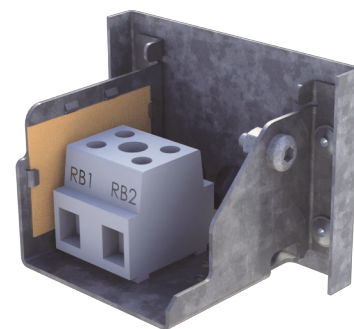
*TS with K-box optional



B-box



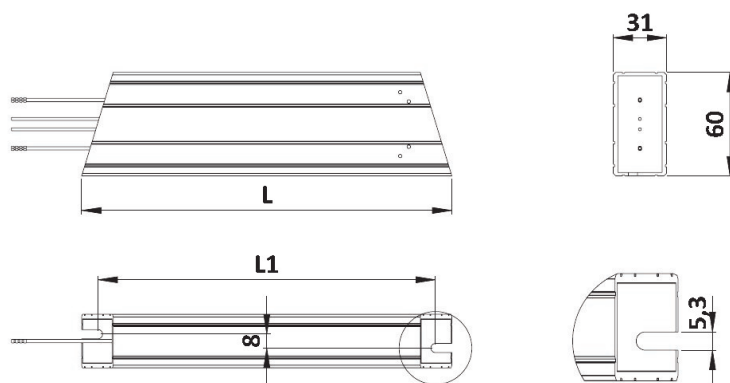
D-box



K-box

CBH / CBV Cable cable connection IP54

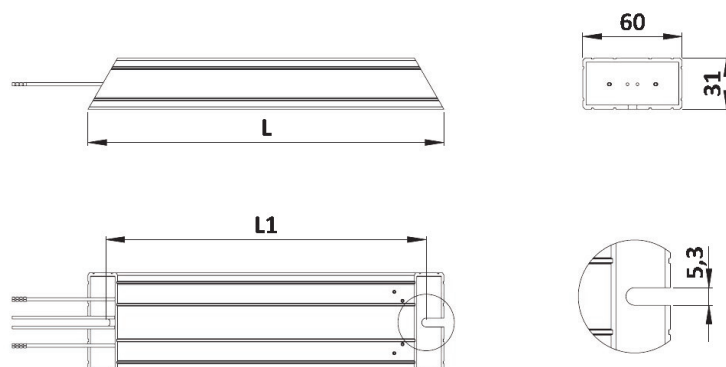
Type	L ± 2	L1 ± 2	Weight
	±2mm	±2mm	kg
CBH / CBV 165 C 800	165	146	0.39
CBH / CBV 215 C 800	215	196	0.63
CBH / CBV 265 C 800	265	246	0.88
CBH / CBV 335 C 800	335	316	1.2
CBH / CBV 405 C 800	405	386	1.5



CBH/CBV cable connections IP54

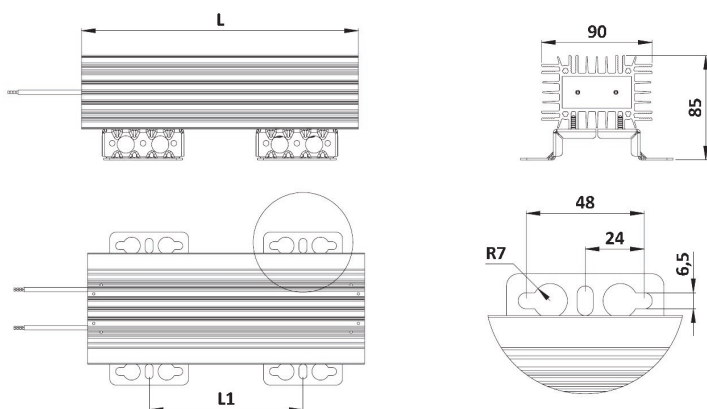
with internal thermal switch

Type	L	L1	Weight
	±2mm	±2mm	kg
CBH/CBV 190 CT 800	190	171	0.5
CBH/CBV 240 CT 800	240	221	0.71
CBH/CBV 290 CT 800	290	271	0.97
CBH/CBV 360 CT 800	360	341	1.3
CBH/CBV 430 CT 800	430	411	1.6



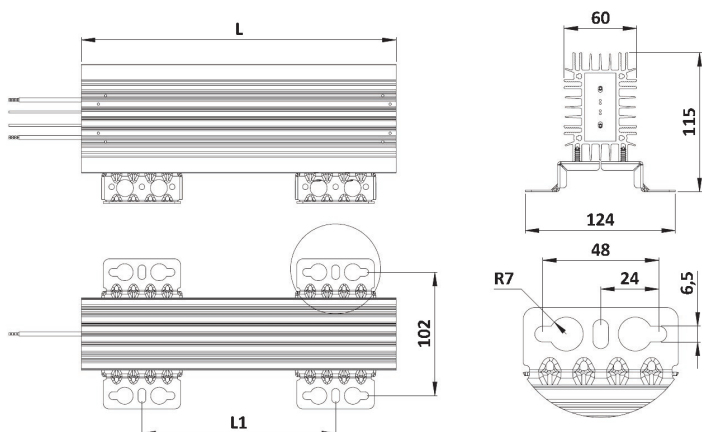
Mechanical drawings

Cable connections IP54 CBR-V ... C ...



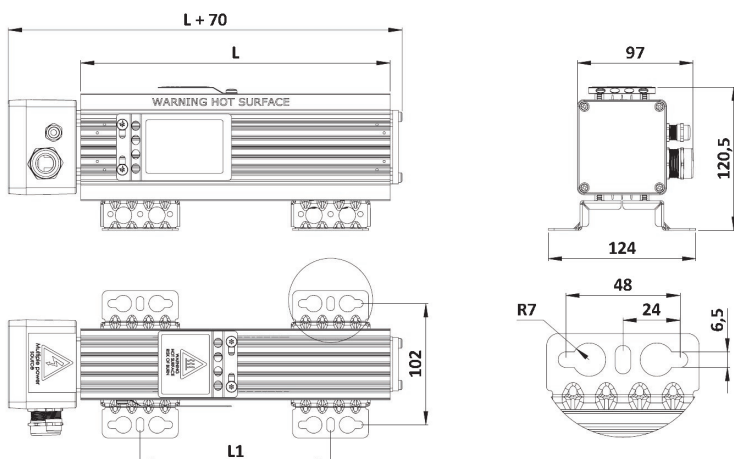
Type	L ± 2 ±2mm	L1 ± 2 ±2mm	Weight kg
CBR-V/CBR-H 175 C 001	175	75	1.5
CBR-V/CBR-H 225 C 001	225	125	1.8
CBR-V/CBR-H 295 C 001	295	195	2.3
CBR-V/CBR-H 365 C 001	365	265	2.8
CBR-V/CBR-H 426 C 001	426	326	3.2
CBR-V/CBR-H 526 C 001	526	426	3.8
CBR-V/CBR-H 626 C 001	626	526	4.5
CBR-V/CBR-H 726 C 001	726	626	5.2

Cable connections IP54 - with internal thermal switch CBR-V ... CT...



-H / -V W(T)	L ±2mm	L1 ±2mm	Weight kg
CBR-H/CBR-V 160 CT 081	160	70	1.5
CBR-H/CBR-V 210 CT 081	210	110	1.8
CBR-H/CBR-V 260 CT 081	260	160	2.1
CBR-H/CBR-V 330 CT 081	330	230	2.6
CBR-H/CBR-V 400 CT 081	400	300	3.1
CBR-H/CBR-V 460 CT 081	460	360	3.5
CBR-H/CBR-V 560 CT 081	560	460	4.1
CBR-H/CBR-V 660 CT 081	660	560	4.8
CBR-H/CBR-V 760 CT 081	760	660	5.5

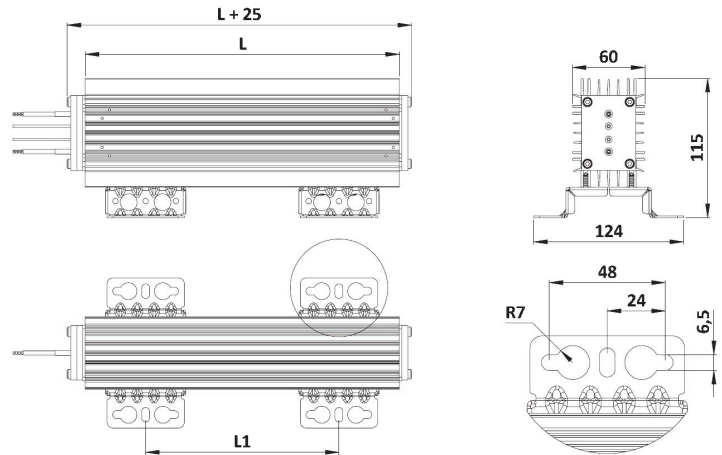
B-box connection IP54 - with internal thermal switch CBR-V ... BT...



Type	L ±2mm	L1 ±2mm	Weight kg
CBR-V 160 B T 281	160	70	1.3
CBR-V 210 B T 281	210	110	1.8
CBR-V 260 B T 281	260	160	2.4
CBR-V 330 B T 281	330	230	3.0
CBR-V 400 B T 281	400	300	3.5
CBR-V 460 B T 281	460	360	3.9
CBR-V 560 B T 281	560	460	4.6
CBR-V 660 B T 281	660	560	5.4
CBR-V 760 B T 281	760	660	6.1

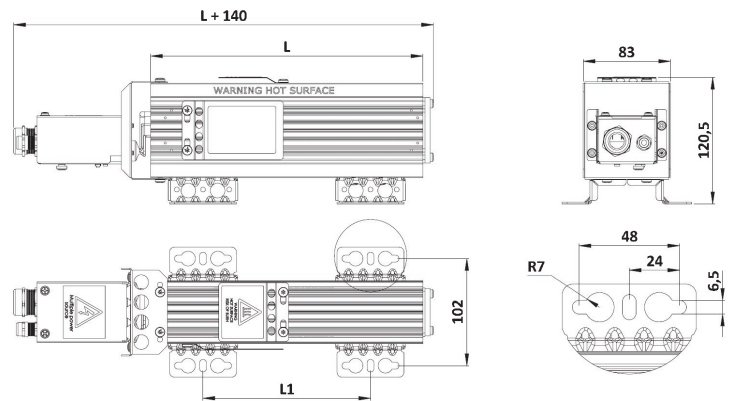
Cable connection type IP65 'W' with or without internal thermal switch CBR-V ... W ...

-H / -V W(T)	L	L1	Weight
	±2mm	±2mm	kg
CBR-H/CBR-V 160 WX 081	160	70	1.5
CBR-H/CBR-V 210 WX 081	210	110	1.8
CBR-H/CBR-V 260 WX 081	260	160	2.1
CBR-H/CBR-V 330 WX 081	330	230	2.6
CBR-H/CBR-V 400 WX 081	400	300	3.1
CBR-H/CBR-V 460 WX 081	460	360	3.5
CBR-H/CBR-V 560 WX 081	560	460	4.1
CBR-H/CBR-V 660 WX 081	660	560	4.8
CBR-H/CBR-V 760 WX 081	760	660	5.5



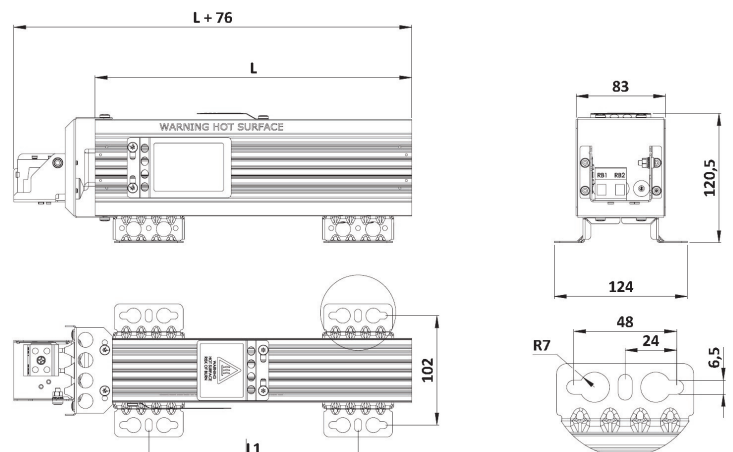
Box connection IP20/IP21 - with internal thermal switch CBR-V ... D ...

Type	L	L1	Weight
	±2mm	±2mm	kg
CBR-V 160 D T 281	160	70	1.3
CBR-V 210 D T 281	210	110	1.8
CBR-V 260 D T 281	260	160	2.4
CBR-V 330 D T 281	330	230	3.0
CBR-V 400 D T 281	400	300	3.5
CBR-V 460 D T 281	460	360	3.9
CBR-V 560 D T 281	560	460	4.6
CBR-V 660 D T 281	660	560	5.4
CBR-V 760 D T 281	760	660	6.1



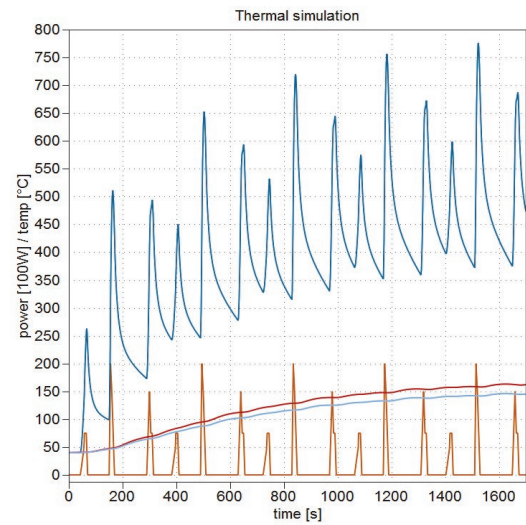
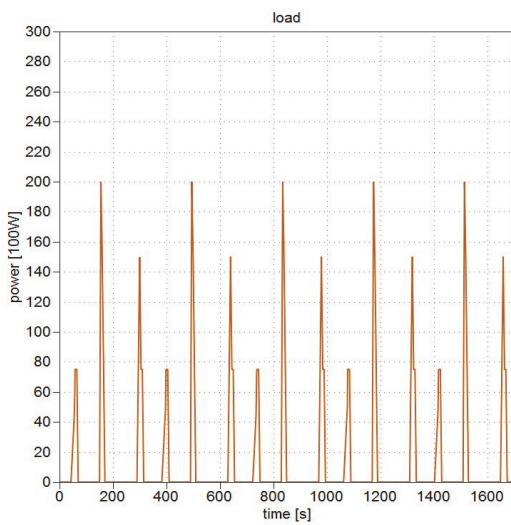
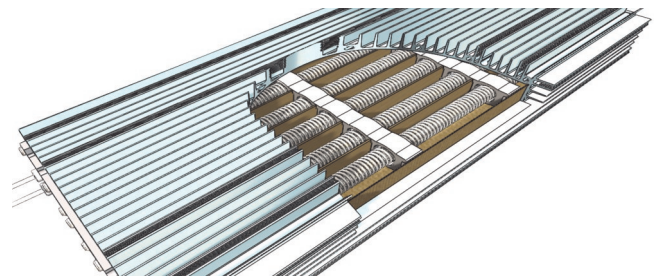
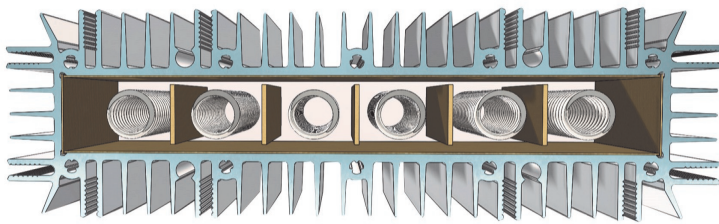
Box connection IP00 CBR-V ... K ...

Type	L	L1	Weight
	±2mm	±2mm	kg
CBR-V 175 K 201	175	75	1.3
CBR-V 225 K 201	225	125	1.8
CBR-V 295 K 201	295	195	2.4
CBR-V 365 K 201	365	265	3.0
CBR-V 426 K 201	426	326	3.5
CBR-V 526 K 201	526	426	3.9
CBR-V 626 K 201	626	526	4.6
CBR-V 726 K 201	726	626	5.4



Danotherm has developed a thermal simulation method by which it is possible to optimize a resistor to a specified application. This gives following benefits:

- Short and fast engineering time, saving engineering costs
- Individual thermic model simulations can be done by Danotherm or handled by the customer. Individual thermic models are available on request.
- Simulation software for electrical circuits can be used for thermal simulations (PSpice, Matlab, Plecs or any other)
- For more complex loads a data file (like csv) can be used for input
- Optimizing the design, reducing overall size and costs
- Proof of capability is given without even building and testing samples



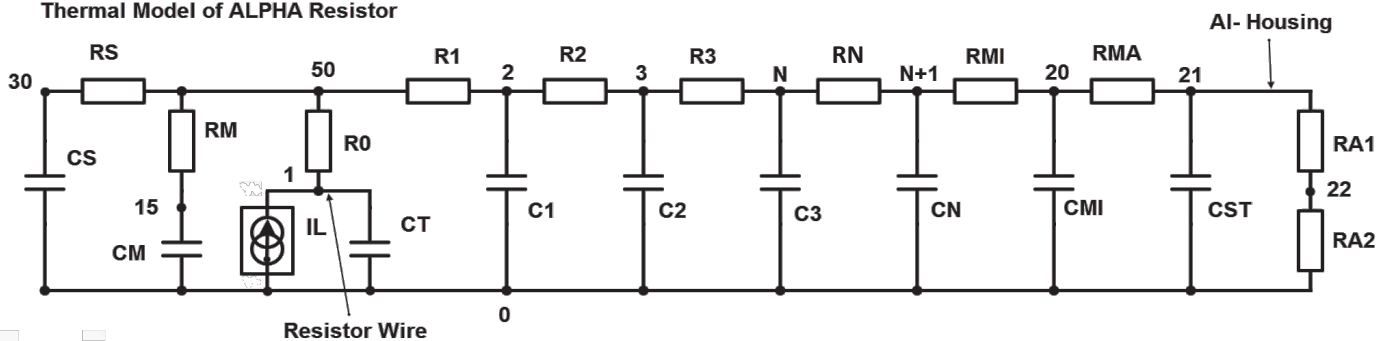
Measured on site: Brake Power saved in .csv file.

Other possibilities could be a description of a typical or worst case brake pulse and a repeat cycle.

Simulation made by Danotherm

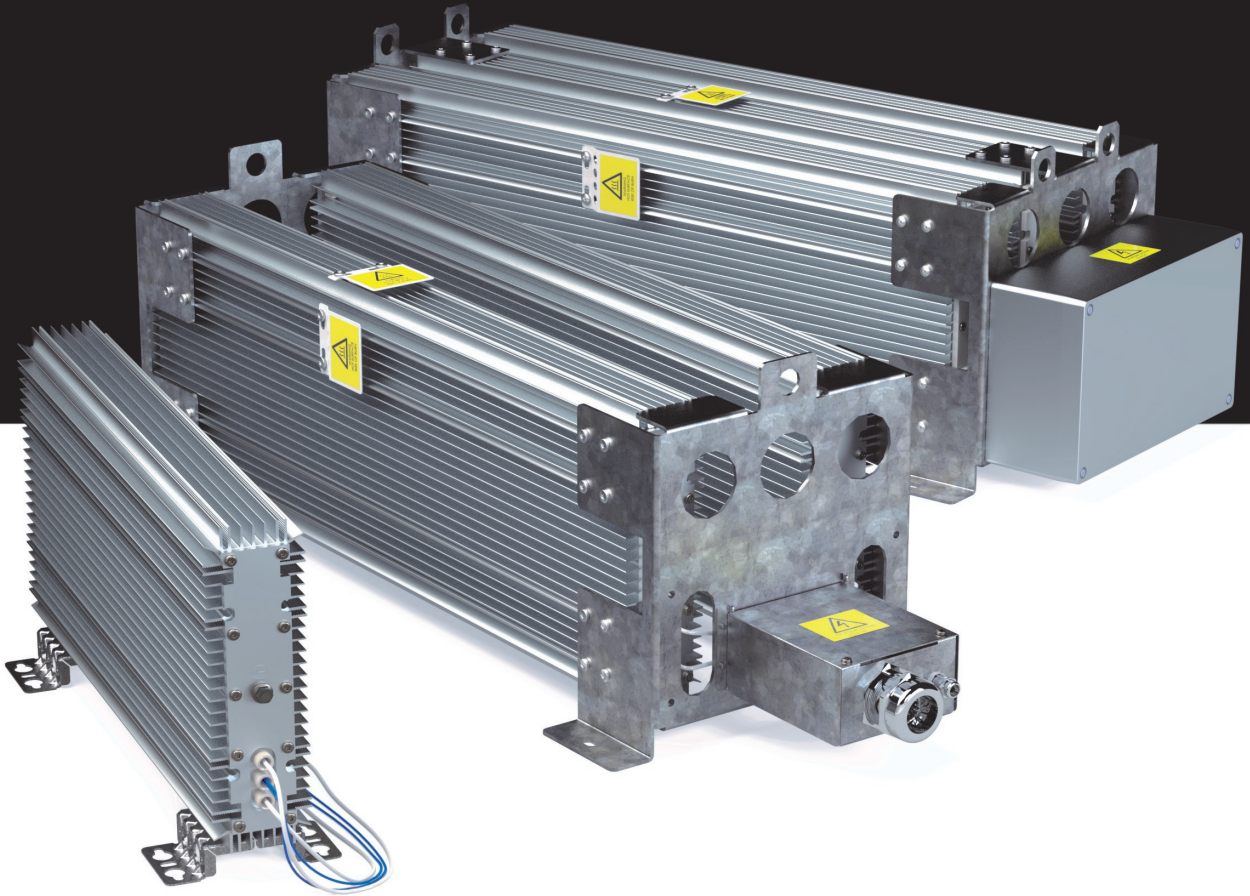
Results of temperature simulation of specified load in a suggested resistor type.

Thermal Model of ALPHA Resistor





DANOTHERM™



CBT-H / CBT-V

CBT 1 / 2 / 3 / and 4 housing cases

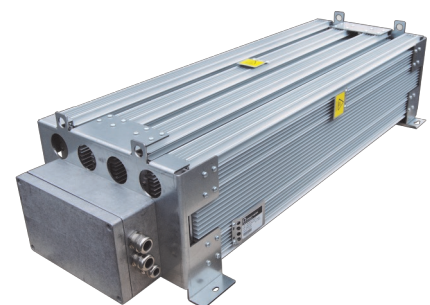
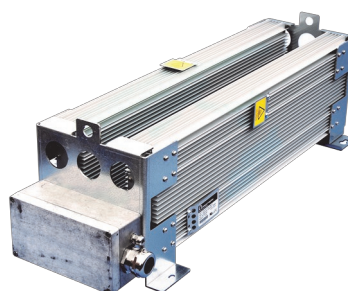
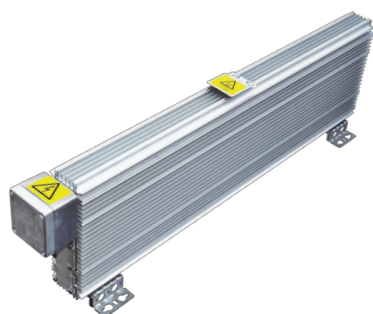
Pn [W] @ 40°C According UL508							
CBT-BH(T)-XXX	1 body	max case temp. [°C]	R [Ω] min - max ± 10%	Pn [W] @ 40°C			
	Pn [W] @ 40°C According UL508			1 case	2 cases	3 cases	4 cases
TS: Thermal switch	no TS			TS 200°C	no TS, max case temp. 250°C		
CBT 180	455	270	0.04 - 13	410			
CBT 210	585	270	0.05 - 2000	530			
CBT 260	830	280	0.07 - 2000	750			
CBT 330	1350	280	0.09 - 2000	1225			
CBT 400	1650	290	0.11 - 2000	1495	2200	3000	4000
CBT 460	1900	300	0.14 - 2000	1725	2800	4200	5600
CBT 560	2310	310	0.18 - 110	2095	3500	5200	6900
CBT 660	2720	320	0.22 - 130	2470	4200	6300	8400
CBT 760	3200	330	0.27 - 150	2905	5000	7200	9600
CBT 860	3640	340	0.31- 180	3305	5500	8000	10800
CBT 960	4070	350	0.35 - 220	3695	6900	9000	12000

Construction and properties

- Compact dimensions
- Nominal power range from 455W–4070W
- Energy levels from 25kJ-550kJ per case housing (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Internal mica supported wirewound elements for higher ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- Al₂O₃ or SiO₂ filled for high thermal capacity/ high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optional thermal switch or PT100 element for thermal protection
- Cable (AWG 14–AWG4) or box connection up to 50mm²
- Multiple case housings (from 2-4 housings)
- Customized to your needs and application (OEM versions available)
- For UL approval, consult Danotherm



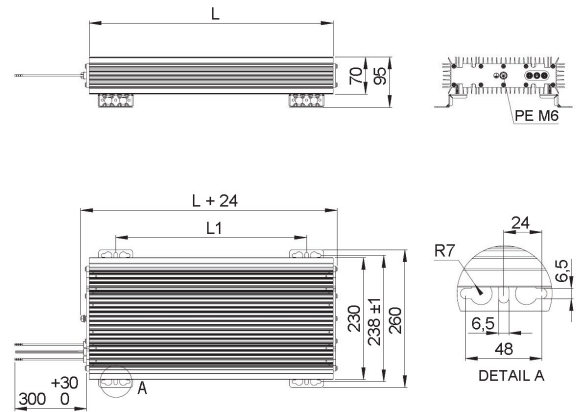
Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20M Ω / case housing
Overload:@ 1 sec pulse / hour		40 - 120 x (depending on resistor)
Overload:@ 5 sec pulse / hour		10 - 27 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable version		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating TW 200°C version		Linear: 40°C = Pn to 70°C = 0.65 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of neighbouring component.
		If two or more brake resistors are mounted next to each other the distance between these should be 400mm. If this is less then the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		± 10% (optional 5%)
Working voltage	cable	UL: 1000VAC. IEC: 1000VAC / 1400VDC
	conn. Box	UL: 600VAC. IEC: 690VAC / 1100VDC
Time constant for heating up		1000 - 3000s
Thermal switch (optional)		130 / 160 / 180 / 200 °C. 2A. 250 VAC NC
Minimum voltage	Thermal switch	2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250 VAC cos ϕ =1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables		IP 21
	IP 65	90°C



Mechanical drawings

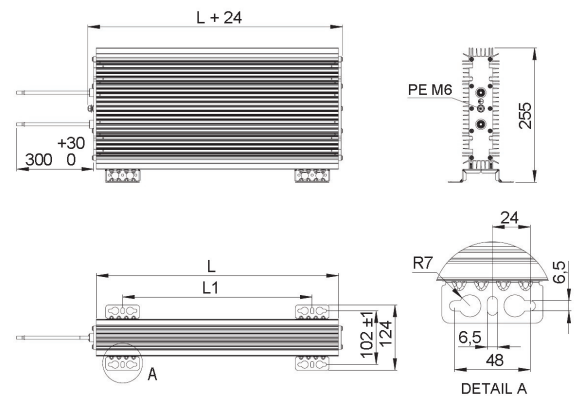
Cable connection IP50 type CBT-H ..C..

P_n	Duty* 5/120	Horizontal type CBT -	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP50	mm	mm	kg	Ω
0.45	6	-H 180 C(H)(T) 0X1	180	70	3.1	0.04 - 13
0.58	10.1	-H 210 C(H)(T) 0X1	210	110	3.6	0.05 - 2000
0.83	17.9	-H 260 C(H)(T) 0X1	260	160	4.5	0.07 - 2000
1.35	27.5	-H 330 C(H)(T) 0X1	330	230	5.9	0.09 - 2000
1.65	37	-H 400 C(H)(T) 0X1	400	300	7.3	0.11 - 2000
1.9	48	-H 460 C(H)(T) 0X1	460	360	8.5	0.14 - 2000
2.3	58	-H 560 C(H)(T) 0X1	560	460	10	0.18 - 110
2.7	69	-H 660 C(H)(T) 0X1	660	560	12	0.22 - 130
3.2	82	-H 760 C(H)(T) 0X1	760	660	13.8	0.27 - 150
3.6	95	-H 860 C(H)(T) 0X1	860	760	16	0.31 - 180
4.1	111	-H 960 C(H)(T) 0X1	960	860	17.8	0.35 - 220



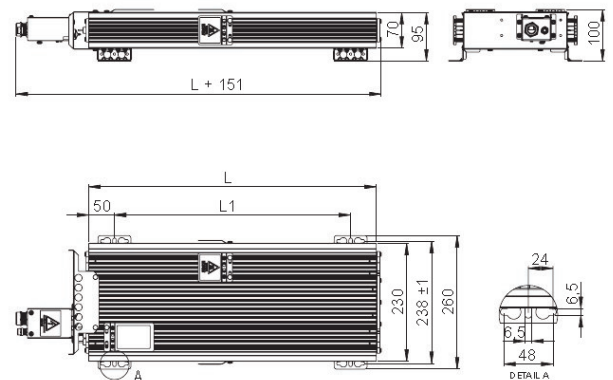
Cable connection IP50 type CBT-V..C..

P_n	Duty* 5/120	Vertical type CBT -	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP50	mm	mm	kg	Ω
0.45	6	-V 180 C(H)(T) 0X1	180	70	3.1	0.04 - 13
0.58	10.1	-V 210 C(H)(T) 0X1	210	110	3.6	0.05 - 2000
0.83	17.9	-V 260 C(H)(T) 0X1	260	160	4.5	0.07 - 2000
1.35	27.5	-V 330 C(H)(T) 0X1	330	230	5.9	0.09 - 2000
1.65	37	-V 400 C(H)(T) 0X1	400	300	7.3	0.11 - 2000
1.9	48	-V 460 C(H)(T) 0X1	460	360	8.5	0.14 - 2000
2.3	58	-V 560 C(H)(T) 0X1	560	460	10	0.18 - 110
2.7	69	-V 660 C(H)(T) 0X1	660	560	12	0.22 - 130
3.2	82	-V 760 C(H)(T) 0X1	760	660	13.8	0.27 - 150
3.6	95	-V 860 C(H)(T) 0X1	860	760	16	0.31 - 180
4.1	111	-V 960 C(H)(T) 0X1	960	860	17.8	0.35 - 220

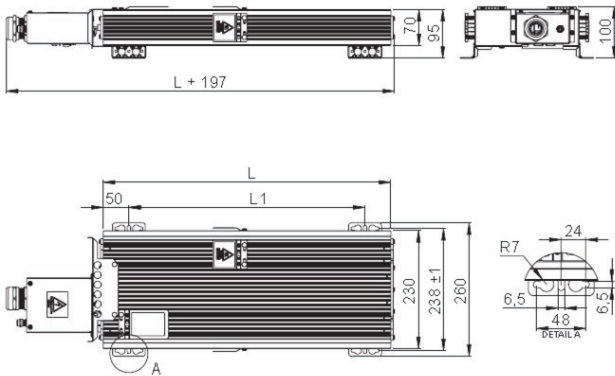


Box connection type IP20/IP21 CBT-H..D..1

P_n	Duty* 5/120	Type CBT -	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP20/IP21	mm	mm	kg	Ω
0.45	6	-H 180 D(H)(T) 2X1	180	70	3.9	0.04 - 13
0.58	10.1	-H 210 D(H)(T) 2X1	210	110	4.2	0.05 - 2000
0.83	17.9	-H 260 D(H)(T) 2X1	260	160	5.1	0.07 - 2000
1.35	27.5	-H 330 D(H)(T) 2X1	330	230	6.7	0.09 - 2000
1.65	37	-H 400 D(H)(T) 2X1	400	300	8.2	0.11 - 2000
1.9	48	-H 460 D(H)(T) 2X1	460	360	9.2	0.14 - 2000
2.3	58	-H 560 D(H)(T) 2X1	560	460	11	0.18 - 110
2.7	69	-H 660 D(H)(T) 2X1	660	560	12.8	0.22 - 130
3.2	82	-H 760 D(H)(T) 2X1	760	660	14.6	0.27 - 150
3.6	95	-H 860 D(H)(T) 2X1	860	760	16.8	0.31 - 180
4.1	111	-H 960 D(H)(T) 2X1	960	860	18.6	0.35 - 220

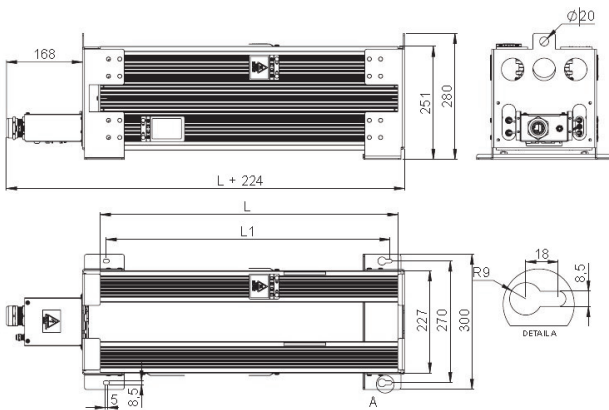


Box connection IP20 / IP21 type CBT-H ..G2.1



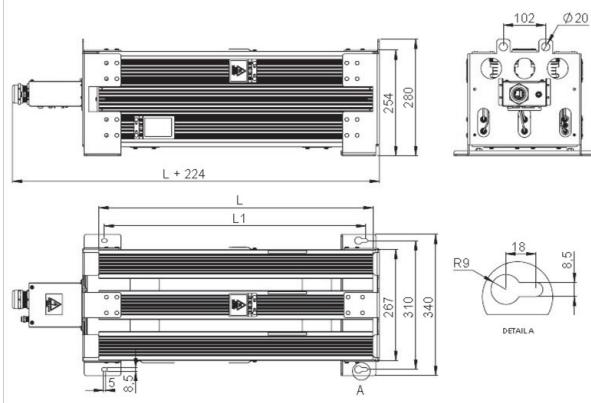
P_n	Duty* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
kW	kW	IP20/IP21	mm	mm	kg	Ω
0.45	6	-H 180 G(H)(T) 2X1	180	70	3.9	0.04 - 13
0.58	10.1	-H 210 G(H)(T) 2X1	210	110	4.2	0.05 - 2000
0.83	17.9	-H 260 G(H)(T) 2X1	260	160	5.1	0.07 - 2000
1.35	27.5	-H 330 G(H)(T) 2X1	330	230	6.7	0.09 - 2000
1.65	37	-H 400 G(H)(T) 2X1	400	300	8.2	0.11 - 2000
1.9	48	-H 460 G(H)(T) 2X1	460	360	9.2	0.14 - 2000
2.3	58	-H 560 G(H)(T) 2X1	560	460	11	0.18 - 110
2.7	69	-H 660 G(H)(T) 2X1	660	560	12.8	0.22 - 130
3.2	82	-H 760 G(H)(T) 2X1	760	660	14.6	0.27 - 150
3.6	95	-H 860 G(H)(T) 2X1	860	760	16.8	0.31 - 180
4.1	111	-H 960 G(H)(T) 2X1	960	860	18.6	0.35 - 220

Box connection IP20 / IP21 type CBT-V ..G2.2



P_n	Duty* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
kW	kW	IP20/IP21	mm	mm	kg	Ω
2.2	50	-H 400 G(H)(T) 2X2	400	300	18	0.06 - 1000
2.8	60	-H 460 G(H)(T) 2X2	460	360	20.5	0.07 - 1000
3.5	80	-H 560 G(H)(T) 2X2	560	460	23.5	0.09 - 55
4.2	95	-H 660 G(H)(T) 2X2	660	560	27	0.11 - 65
5.0	110	-H 760 G(H)(T) 2X2	760	660	30.5	0.14 - 75
5.5	125	-H 860 G(H)(T) 2X2	860	760	35.5	0.16 - 90
6.9	150	-H 960 G(H)(T) 2X2	960	860	39	0.18 - 110

Box connection IP20 / IP21 type CBT-V ..G3.3

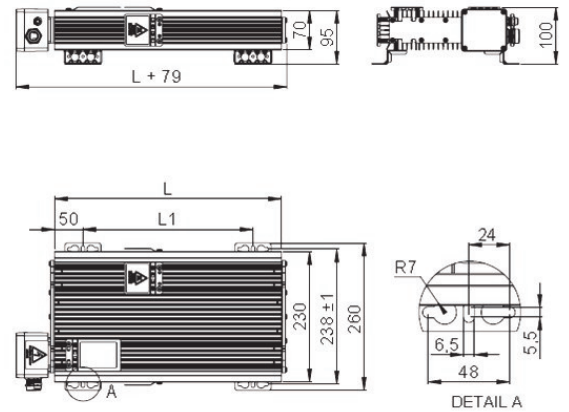


P_n	Duty* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
kW	kW	IP20/IP21	mm	mm	kg	Ω
3.0	70	-H 400 G(H)(T) 2X3	400	300	25.5	0.04 - 1000
4.2	90	-H 460 G(H)(T) 2X3	460	360	29	0.05 - 1000
5.2	120	-H 560 G(H)(T) 2X3	560	460	33.5	0.06 - 35
6.3	140	-H 660 G(H)(T) 2X3	660	560	39	0.07 - 45
7.2	165	-H 760 G(H)(T) 2X3	760	660	44.5	0.09 - 50
8.0	185	-H 860 G(H)(T) 2X3	860	760	51	0.10 - 60
9.0	220	-H 960 G(H)(T) 2X3	960	860	57	0.12 - 70

Mechanical drawings

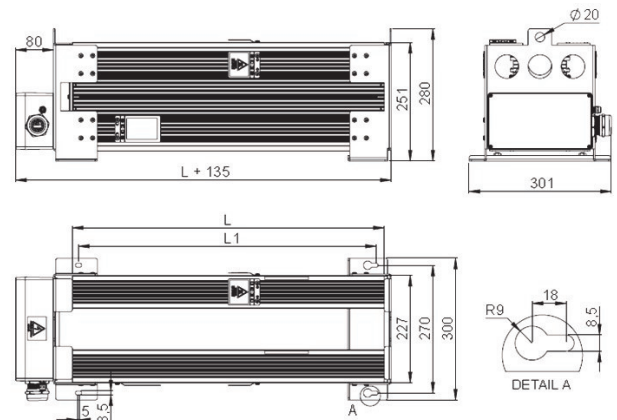
Box connection IP54 / IP65 type CBT-H ..B2.1

P_n	Pulse* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP54/IP65	mm	mm	kg	Ω
0.41	6	-H 180 B(H)(T) 2X1	180	70	3.9	0.04 - 13
0.53	10.1	-H 210 B(H)(T) 2X1	210	110	4.2	0.05 - 2000
0.75	17.9	-H 260 B(H)(T) 2X1	260	160	5.1	0.07 - 2000
1.2	27.5	-H 330 B(H)(T) 2X1	330	230	6.7	0.09 - 2000
1.4	37	-H 400 B(H)(T) 2X1	400	300	8.2	0.11 - 2000
1.7	48	-H 460 B(H)(T) 2X1	460	360	9.2	0.14 - 2000
2.0	58	-H 560 B(H)(T) 2X1	560	460	11	0.18 - 110
2.47	69	-H 660 B(H)(T) 2X1	660	560	12.8	0.22 - 130
2.9	82	-H 760 B(H)(T) 2X1	760	660	14.6	0.27 - 150
3.3	95	-H 860 B(H)(T) 2X1	860	760	16.8	0.31- 180
3.6	111	-H 960 B(H)(T) 2X1	960	860	18.6	0.35 - 220



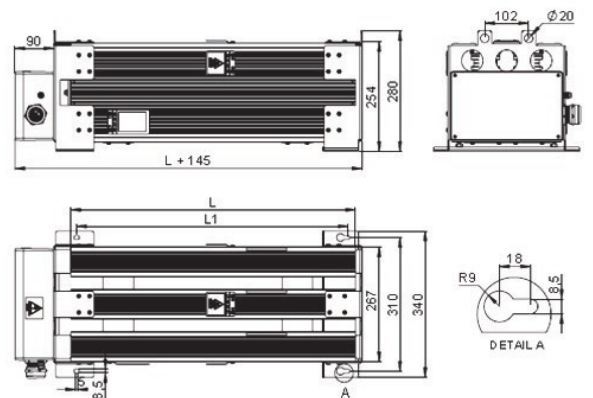
Box connection IP54 / IP65 type CBT-V ..B2.2

P_n	Pulse* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP54/IP65	mm	mm	kg	Ω
2.0	50	-H 400 B(H)(T) 2X2	400	300	18	0.06 - 1000
2.5	65	-H 460 B(H)(T) 2X2	460	360	20.5	0.07 - 1000
3.1	80	-H 560 B(H)(T) 2X2	560	460	23.5	0.09 - 55
3.8	100	-H 660 B(H)(T) 2X2	660	560	27	0.11 - 65
4.5	110	-H 760 B(H)(T) 2X2	760	660	30.5	0.14 - 75
5.0	130	-H 860 B(H)(T) 2X2	860	760	35.5	0.16- 90
6.2	160	-H 960 B(H)(T) 2X2	960	860	39	0.18 - 110

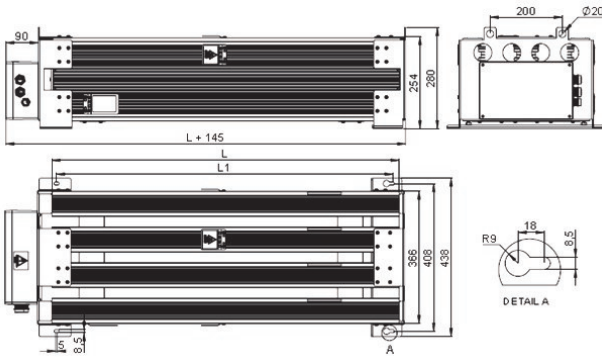


Box connection type IP54 / IP65 CBT-V ..B2.2

P_n	Pulse* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP54/IP65	mm	mm	kg	Ω
2.8	70	-H 400 B(H)(T) 2X3	400	300	25.5	0.04 - 1000
3.8	90	-H 460 B(H)(T) 2X3	460	360	29	0.05 - 1000
4.7	110	-H 560 B(H)(T) 2X3	560	460	33.5	0.06 - 35
5.7	130	-H 660 B(H)(T) 2X3	660	560	39	0.07 - 45
6.5	150	-H 760 B(H)(T) 2X3	760	660	44.5	0.09 - 50
7.2	170	-H 860 B(H)(T) 2X3	860	760	51	0.10- 60
8.1	195	-H 960 B(H)(T) 2X3	960	860	57	0.12 - 70



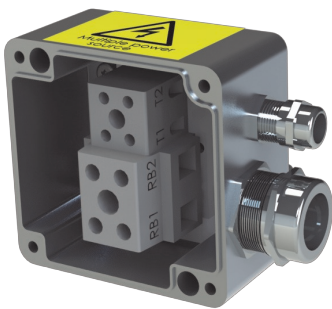
Box connection type IP54 / IP65 CBT-V ..B2.4



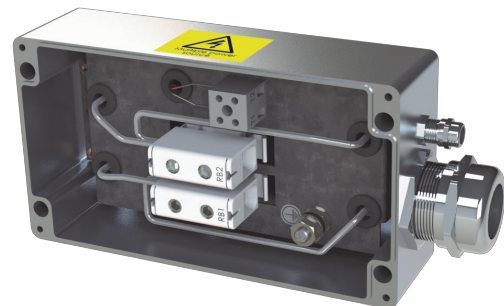
P_n	Duty* 5/120	Type CBT-	$L \pm 2$	$L1 \pm 2$	Weight (SiO2)	Resistance Range
kW	kW	IP20/IP21	mm	mm	kg	Ω
3.6	80	-H 400 B(H)(T) 2X4	400	300	25.5	0.36-460
5.0	110	-H 460 B(H)(T) 2X4	460	360	29	0.4-530
6.2	140	-H 560 B(H)(T) 2X4	560	460	33.5	0.5-33
7.6	170	-H 660 B(H)(T) 2X4	660	560	39	0.6-40
8.7	190	-H 760 B(H)(T) 2X4	760	660	44.5	0.66-50
9.8	210	-H 860 B(H)(T) 2X4	860	760	51	0.76-60
10.8	240	-H 960 B(H)(T) 2X4	960	860	57	0.86-60

connection boxes	IP rating	cable gland	clamping range [mm]	braid diameter (min.) [mm]	elec. connection [mm ²]
B-box (single housing)	IP65	M25	9-16.6	7.5	0.75-10
D-box	IP21	M25	9-16.6	7.5	0.75-10
G-box	IP21	M40	19-28	15	2.5-50
B-box (multiple housings)	IP65	M32	11-21	9	2.5-50
B-box (multiple housings)	IP65	M40	19-28	15	2.5-50
thermal switch (optional)	-	M12	3-7	-	0.5-4

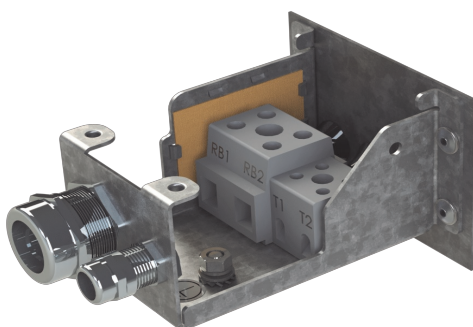
Other cable gland sizes on request



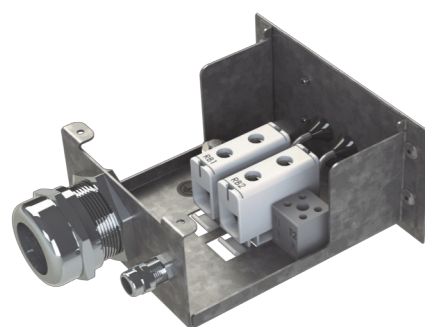
B-box
Single-body



B-box
Multiple-housings

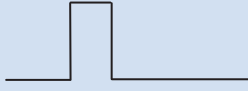



D-box



G-box

Pulse load table

CBT-H Cx(T)	Square pulse each 120 seconds, ambient temp. = 40°C									
		duty 1 second [kW]	Max temp. [°C]	duty 5 second [kW]	Max temp. [°C]	duty 10 second [kW]	Max temp. [°C]	duty 20 second [kW]	Max temp. [°C]	duty 40 second [kW]
CBT-H 180 15R	18.4	110	5.1	140	3	160	1.9	180	1.1	220
CBT-H 210 100R	24.7	110	6.1	130	3.8	150	2.5	190	1.7	240
CBT-H 260 60R	44	130	10.7	150	6.4	180	4	210	2.7	270
CBT-H 330 40R	71	140	22	190	13	220	8	260	4.3	280
CBT-H 400 30R	105	160	30	210	18	250	10.7	290	5.4	280
CBT-H 460 20R	128	170	36	220	21	250	12	290	6.2	290
CBT-H 560 15R	190	200	50	250	28	280	15	300	7.6	300
CBT-H 660 14R	257	230	64	270	36	300	18	300	9.2	310
CBT-H 760 12R	315	240	78	290	43	310	21.5	310	10.7	310
CBT-H 860 10R	370	250	89	300	50	320	25	320	12.4	320
CBT-H 960 9R0	480	290	110	330	56	330	28	330	14	330
	Triangle pulse each 120 seconds, ambient temp. = 40°C									
	duty 1 second [kW]	Max temp. [°C]	duty 5 second [kW]	Max temp. [°C]	duty 10 second [kW]	Max temp. [°C]	duty 20 second [kW]	Max temp. [°C]	duty 40 second [kW]	Max temp. [°C]
CBT-H 180 15R	39	110	10.7	140	6.3	160	3.8	190	2.3	220
CBT-H 210 100R	50	110	12.7	130	7.7	150	4.9	180	3.2	230
CBT-H 260 60R	90	140	22	160	13	180	8	210	5	250
CBT-H 330 40R	148	140	46	200	27	230	16	260	8.5	280
CBT-H 400 30R	217	160	63	220	37	250	21	280	10.6	280
CBT-H 460 20R	265	170	74	230	44	260	25	290	12.3	290
CBT-H 560 15R	390	200	103	260	58	290	30	300	15	300
CBT-H 660 14R	530	230	134	280	73	310	37	310	18	310
CBT-H 760 12R	645	240	160	290	86	310	43	310	22	310
CBT-H 860 10R	578	260	183	300	98	320	50	320	25	320
CBT-H 960 9R0	983	290	226	330	113	330	57	330	28	330

The table above shows pulse power ratings for typical resistor sizes/lengths and typical Ohm values.

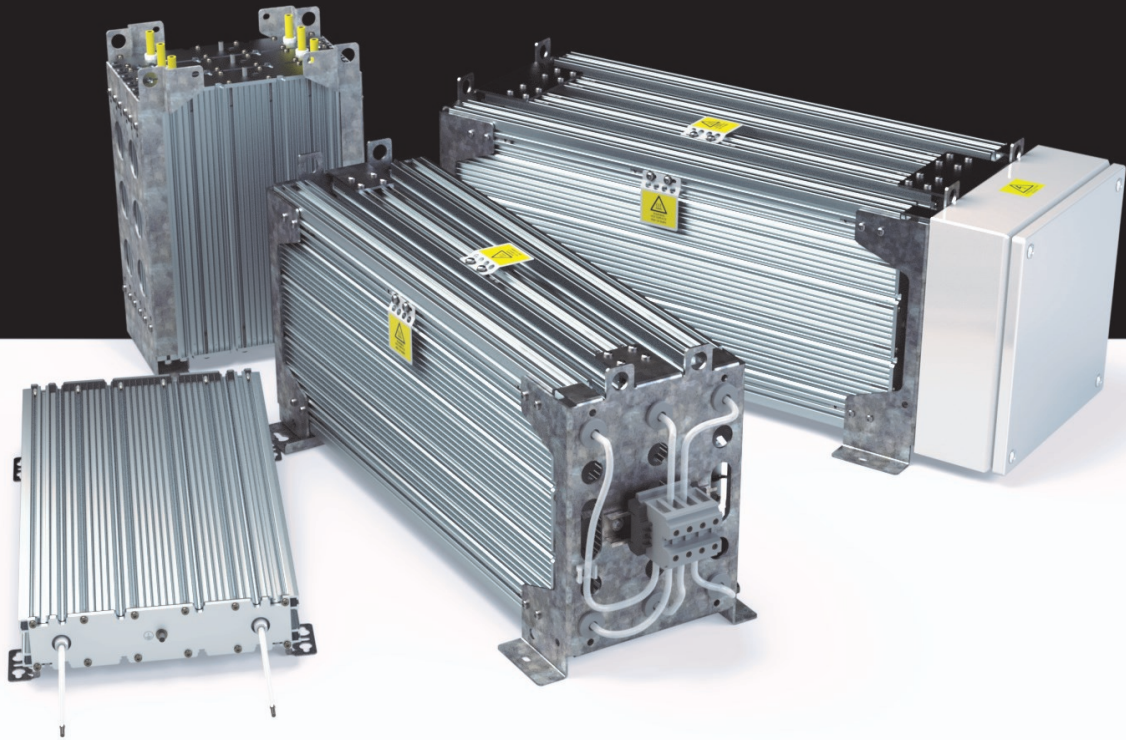
Pulse load

The ability to withstand pulse-loads varies according to resistor size, length and diameter of the internal resistor wire. As such, it is impossible to create standard graphs that would apply to all customer applications. In some cases, the load-profile will be the combination of a square and a triangular pulse, such as is the case with Low Voltage Ride Through (LVRT) and Emergency Brake situations, as encountered in the Wind Power industry.

On request, Danotherm performs simulations based on the actual application and for guidance, has produced tables for various load-profiles for resistors with standard wire. The above table shown is based on a resistor with indicated ohm value and standard wire thickness. Depending on the application, resistor construction can be adapted to optimally match the application. In the tables above, the peak powers of trains of rectangular and triangular pulses of 120 second periods are shown for durations of 1 to 40 seconds.



DANOTHERM™



CBS / CMQ / CVS (1000V)

HVBS (3000V)

General specifications

In this brochure the standard overview of four different aluminium case style resistors is given. Selecting the correct resistor type and options involves many considerations. Danotherm would very much like to support your choice. Together we can select the optimum resistor where all technical and commercial aspects are reviewed. Customer specific request for OEM solutions are very well possible, giving you an attractive solution.

Please, consult Danotherm. Our goal is to be a part of your success.

CBS / CMQ / CVS - 1000VAC/1400VDC

Nominal power [W] @ 40°C ambient / Ohm range min and max									
housing length	1 housing			1 housing			Ohm value		
	no Thermal switch			with Thermal switch			min -max Ω		
	CBS	CMQ	CVS	CBS	CMQ	CVS	CBS	CMQ	CVS
210	580	800	-	445	555	-	0.05-20	-	-
260	850	1100	-	685	855	-	0.07-35	-	-
330	1135	1500	-	870	1090	-	0.09-50	0.07-80	-
400	1375	1900	1995	1055	1320	1390	0.11-65	0.10-110	0.10-70
460	1585	2200	2310	1215	1520	1600	0.14-85	0.12-130	0.12-85
560	1925	2700	2830	1480	1850	1940	0.18-110	0.15-160	0.15-105
660	2270	3100	3250	1745	2180	2290	0.22-130	0.19-200	0.19-130
760	2770	3500	3670	2130	2660	2790	0.27-150	0.23-240	0.23-150
860	3190	3850	4040	2450	3060	3210	0.31-180	0.27-280	0.27-180
960	3565	4150	4350	2740	3420	3590	0.35-220	0.30-320	0.30-210

housing length	2 housings			3 housings			4 housings		
	no Thermal switch			no Thermal switch			no Thermal switch		
	CBS	CMQ	CVS	CBS	CMQ	CVS	CBS	CMQ	CVS
400	2340	2925	3070	3300	4350	4560	4400	5500	5830
460	2700	3375	3540	3800	5000	5250	5000	6500	6820
560	3270	4090	4290	4620	6050	6350	6100	8000	8400
660	3860	4825	5050	5500	7100	7450	7300	9100	9550
760	4700	5875	6160	6650	8500	8900	8800	11000	11500
860	5400	6750	7080	7660	10000	10500	10200	13000	13650
960	6060	7575	7950	8500	11200	11750	11300	14000	14700

HVBS - 3000VAC/4200VDC

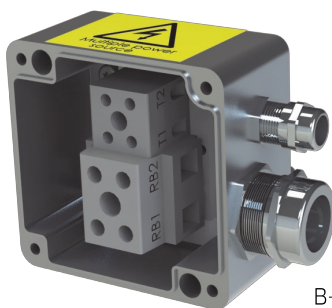
HVBS-CH-XXX	Pn [W] @ 40°C According UL508	R [Ω] min - max ± 10%	double housings	triple housings	quadruple housings
HVBS 300	850	0.05 - 30	1500		
HVBS 370	1050	0.07 - 50	1800		
HVBS 440	1250	0.09 - 70	2100	2900	3500
HVBS 520	1365	0.10 - 90	2500	3700	5000
HVBS 620	1950	0.13 - 110	3200	4800	6400
HVBS 720	2500	0.15 - 140	3600	5400	7200
HVBS 820	2900	0.19 - 170	4800	7100	9600
HVBS 920	3200	0.22 - 200	5300	7900	10600
HVBS 1000	3500	0.25 - 220	6000	8800	12000

Temperature Coefficient:		100 ppm/K
Dielectric strength	HVBS	7000VAC @ 1 minute
	Other types	3500 VAC @ 1 minute
Insulation Resistance:		> 20M Ω / case housing
Overload:@ 1 sec pulse / hour		70 - 250 x (depending on resistor)
Overload:@ 5 sec pulse / hour		20 - 60 x (depending on resistor)
Environmental:		- 40 °C - 70 °C
De-rating cable version		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating TW 200°C version		Linear: 40°C = Pn to 70°C = 0.65 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of neighbouring components.
		If two or more brake resistors are mounted next to each other the distance between these should be 400mm. If this is less then the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with PWM brake pattern.
Resistance tolerance		± 10% (optional 5%)
Working voltage CBS / CMQ / CVS	Cable version	UL: 1000VAC. IEC: 1000VAC / 1400VDC
	Conn. Box	UL: 600VAC. IEC: 690VAC / 1100VDC
Working voltage HVBS	Cable version	IEC: 3000VAC / 4200VDC
Time constant for heating up resistor		1000 - 3000s
Thermal switch *	Thermal switch	130 / 160 / 180 / 200 °C. 2.5A. 250 VAC NC
Minimum measuring voltage		2V
Minimum measuring current		10mA
Rated current / voltage		2.5A @ 250 VAC cos ϕ =1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

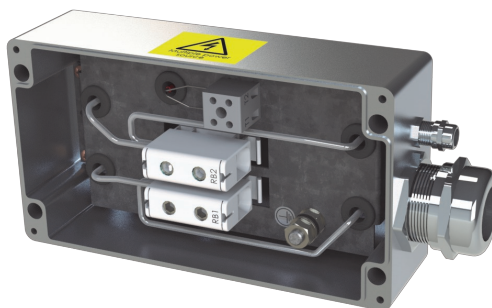
* optionally in CBS / CMQ / CVS

Construction and properties

- Compact dimensions
- Nominal power range from 455W–4070W
- Energy levels from 80kJ-2.5MJ per case housing (5s single pulse), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- Al_2O_3 or SiO_2 filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optionally thermal switch or PT100 element for thermal protection guard.
- Cable (AWG 10–AWG4) or box connection up to 50mm²
- Multiple case housings (from 2-4 housings)
- Customized to your needs and application (OEM versions available)



B-box
Single-body



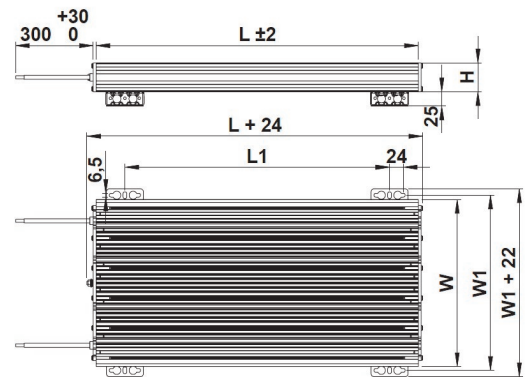
B-box
Multiple-housings

connection boxes	IP rating	cable gland	clamping range [mm]	braid diameter (min.) [mm]	elec. connection [mm ²]
B-box (single housing)	IP65	M25	9-16.6	7.5	0.75-10
D-box	IP21	M25	9-16.6	7.5	0.75-10
G-box	IP21	M40	19-28	15	2.5-50
B-box (multiple housings)	IP65	M32	11-21	9	2.5-50
B-box (multiple housings)	IP65	M40	19-28	15	2.5-50
thermal switch (optional)	-	M12	3-7	-	0.5-4

Mechanical drawings

Cable connection type IP50 CBS / CMQ / CVS -H ..C..

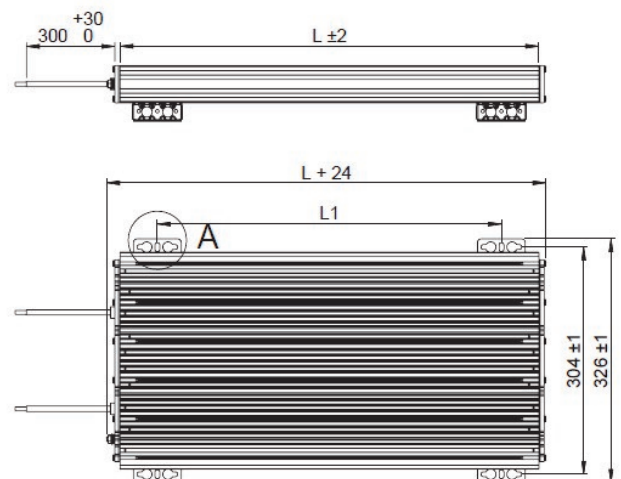
Length/type $L \pm 2$ mm	CBS		CMQ		CVS	
	5s load* kW	Weight kg	5s load* kW	Weight kg	5s load* kW	Weight kg
210 CH 001 22R	16	3.6	23	5.2	-	-
260 CH 001 18R	27	4.5	46	6.5	-	-
330 CH 001 13R	45	5.7	71	8.3	-	-
400 CH 001 10R	68	7.0	120	10.3	135	12.3
460 CH 001 6R5	92	8.2	150	12.0	190	14.5
560 CH 001 6R0	120	10.0	210	14.9	265	17.9
660 CH 001 4R5	160	12.0	260	17.7	340	21.4
760 CH 001 3R5	205	14.2	350	20.2	440	25.2
860 CH 001 2R5	185	16.3	350	23.0	500	28.7
960 CH 001 2R0	255	17.6	460	26.3	510	31.6
housing case dimensions						
Type	H	$W \pm 1$		$W1 \pm 1$		
CBS	47	218		230		
CMQ	50	290		304		
HVBS	50	290		304		
CVS	60	290		304		



* Pulse rating depends on resistance value

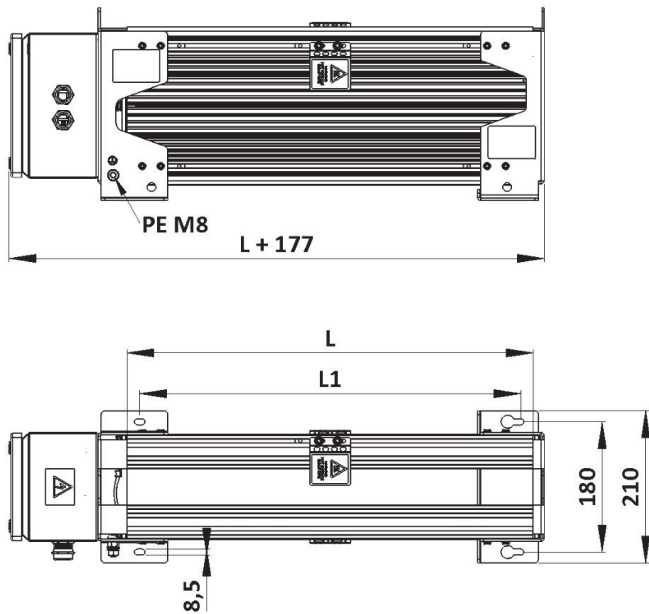
Cable connection type IP50 HVBS -H ... CH... (3000VAC)

$L \pm 2$ mm	5s load* kW	Weight kg
HVBS 300 CH 001 15R	22.4	7.5
HVBS 370 CH 001 12R	41.3	9.3
HVBS 440 CH 001 10R	66	11.3
HVBS 520 CH 001 8R0	81	13.5
HVBS 620 CH 001 6R0	120	16.5
HVBS 720 CH 001 5R0	155	19.3
HVBS 820 CH 001 4R0	185	21.8
HVBS 920 CH 001 3R5	270	24.6
HVBS 1000 CH 001 3R0	300	27.4



* Pulse rating depends on resistance value

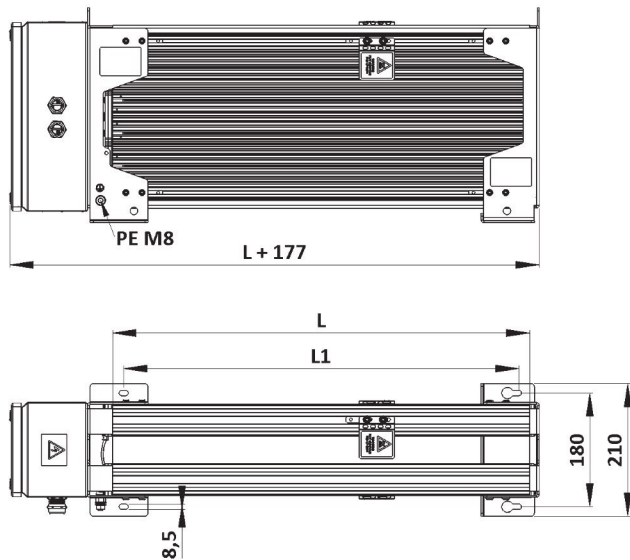
HVBS High Voltage dump resistors are only offered with HV cable connection leads and no thermal switch



CBS Double housings, connection B-Box type,

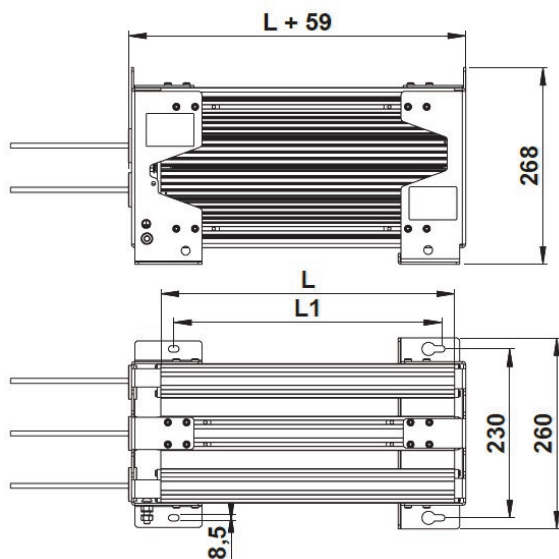
$L \pm 2$ mm	5s load* kW	Weight kg
CBS 210 BGH 202 11R	32	9.2
CBS 260 BGH 202 9R0	54	11.0
CBS 330 BGH 202 6R5	90	13.4
CBS 400 BGH 202 5R0	136	16.0
CBS 460 BGH 202 3R3	184	18.4
CBS 560 BGH 202 3R0	240	22.0
CBS 660 BGH 202 2R3	320	26.0
CBS 760 BGH 202 1R8	410	30.4
CBS 860 BGH 202 1R3	510	34.6
CBS 960 BGH 202 1R0	510	37.2

CMQ Double housings, connection B-Box type, IP54–IP65



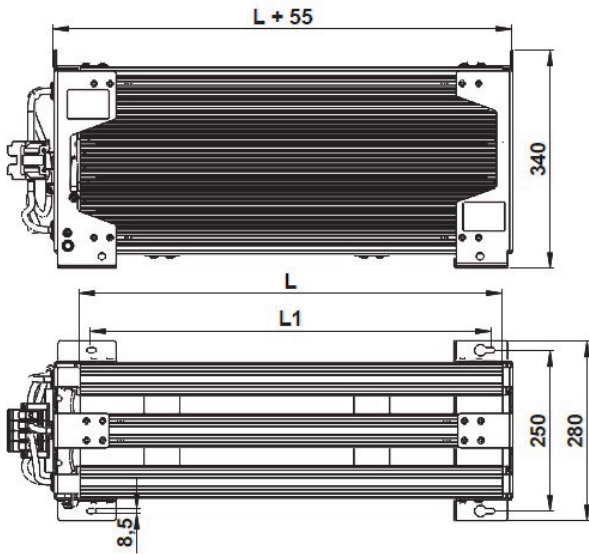
$L \pm 2$ mm	5s load* kW	Weight kg
CMQ 210 BHT 2x2 11R	46	12.4
CMQ 260 BHT 2x2 9R0	92	15.0
CMQ 330 BHT 2x2 6R5	142	18.6
CMQ 400 BHT 2x2 5R0	240	22.6
CMQ 460 BHT 2x2 3R3	300	26.0
CMQ 560 BHT 2x2 3R0	420	31.8
CMQ 660 BHT 2x2 2R3	520	37.4
CMQ 760 BHT 2x2 1R8	700	42.4
CMQ 860 BHT 2x2 1R3	700	48.0
CMQ 960 BHT 2x2 1R0	920	55

CBS Triple housings, cable type, IP50



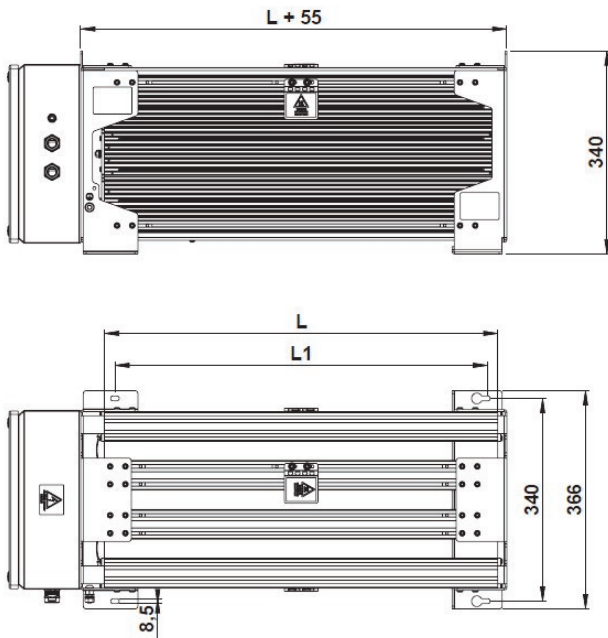
$L \pm 2$ mm	5s load* kW	Weight kg
CBS 210 CH 003 7R3	48	11.8
CBS 260 CH 003 6R0	81	14.5
CBS 330 CH 003 4R3	135	18.1
CBS 400 CH 003 3R3	204	22.0
CBS 460 CH 003 2R2	276	25.6
CBS 560 CH 003 3R0	360	31.0
CBS 660 CH 003 1R5	480	37.0
CBS 760 CH 003 1R2	615	43.6
CBS 860 CH 003 0R8	555	50
CBS 960 CH 003 0R7	765	54

CMQ Triple housings, DIN rail terminals K-type, IP00



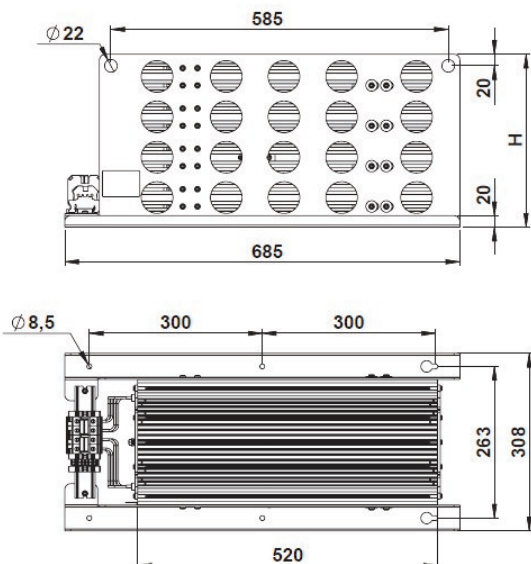
$L \pm 2$ mm	5s load* kW	Weight kg
CMQ 210 KH 203 7R3	69	11.8
CMQ 260 KH 203 6R0	138	14.5
CMQ 330 KH 203 4R3	213	18.1
CMQ 400 KH 203 3R3	360	22.0
CMQ 460 KH 203 2R2	450	25.6
CMQ 560 KH 203 3R0	630	31.0
CMQ 660 KH 203 1R5	780	37.0
CMQ 760 KH 203 1R2	1000	43.6
CMQ 860 KH 203 0R8	1000	49.9
CMQ 960 KH 203 0R7	1380	53.8

CMQ Quadruple housings, connection B-Box type, IP54



$L \pm 2$ mm	5s load* kW	Weight kg
CMQ 210 BHT 2x4 7R3	92	17.4
CMQ 260 BHT 2x4 6R0	180	21.0
CMQ 330 BHT 2x4 4R3	284	25.8
CMQ 400 BHT 2x4 3R3	480	31.0
CMQ 460 BHT 2x4 2R2	600	35.8
CMQ 560 BHT 2x4 3R0	840	43.0
CMQ 660 BHT 2x4 1R5	1000	51
CMQ 760 BHT 2x4 1R2	1400	60
CMQ 860 BHT 2x4 0R8	1400	68.
CMQ 960 BHT 2x4 0R7	1800	73

CBS Single to Quadruple housings 420/520mm, DIN rail terminals K-type, IP00

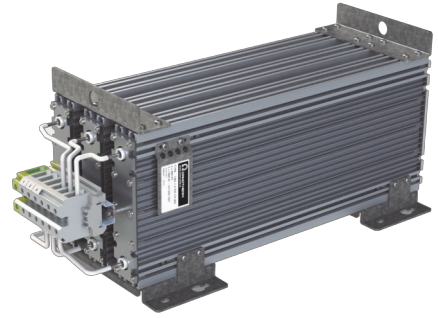


$L \pm 2$ mm	No. cases	$L \pm 2$ mm	H mm	Weight kg
CBS-H 420 KH 201 xxR	1	420	160	13.0
CBS-H 520 KH 201 xxR	1	520	160	13.5
CBS-H 420 KH 202 xxR	2	420	160	20.5
CBS-H 520 KH 202 xxR	2	520	160	22.5
CBS-H 420 KH 203 xxR	3	420	300	32.5
CBS-H 520 KH 203 xxR	3	520	300	34.5
CBS-H 420 KH 204 xxR	4	420	300	40.5
CBS-H 520 KH 204 xxR	4	520	300	42.5

All above tables are showing standard lengths.
Customer specified lengths are available.



CMQ / HVBS type with cable leads, IP50



Quadruple CMQ type with DIN rail terminals, IP00



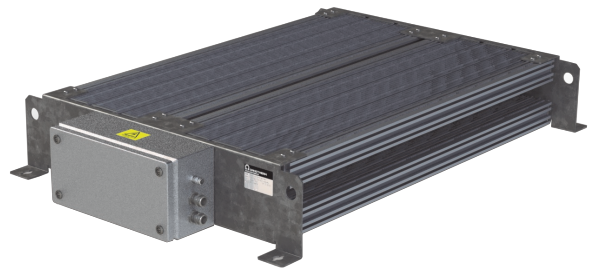
CMQ type with long connection box, IP54



Double CMQ type with connection box, IP54




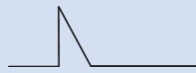

Double CMQ type with DIN rail terminals, IP00



Quadruple CMQ type with connection box, IP54




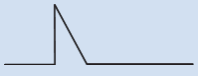
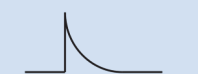
CMQ types with B-box IP54, quadruple, triple and double housings
2 cable glands M25 for resistor connection, 1 cable gland M12 for thermal switch


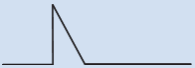

CBS	One single square pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
CBS 210 22R	16	45	11	70	7.6	85	5.5	100
CBS 260 18R	27	65	19	75	13.1	90	9.5	120
CBS 330 13R	45	60	31	85	21.3	100	15.5	130
CBS 400 10R	68	70	44	90	31	110	21.6	140
CBS 460 6R5	92	85	59	100	40	120	28	150
CBS 560 6R0	120	85	77	100	52	120	36	150
CBS 660 4R5	160	70	100	110	66	130	46	160
CBS 760 3R5	205	95	125	110	83	130	56	170
CBS 860 2R5	255	85	155	120	100	140	67	170
CBS 960 2R0	250	95	160	110	105	140	73	170
	One single triangle pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
CBS 210 22R	34	65	23	75	16	85	11.4	110
CBS 260 18R	57	70	40	80	27	95	20	120
CBS 330 13R	96	75	64	85	44	100	32	130
CBS 400 10R	145	80	95	95	64	110	45	140
CBS 460 6R5	195	90	125	100	83	120	57	150
CBS 560 6R0	255	90	160	100	110	120	75	160
CBS 660 4R5	340	95	215	110	140	130	95	170
CBS 760 3R5	440	100	270	120	175	140	120	170
CBS 860 2R5	540	110	330	120	210	140	140	180
CBS 960 2R0	540	100	340	120	225	140	150	180
	One single exponential pulse each 1800 seconds (e-curve)							
	$\tau = 5s$ [kW]	Max surface temp.	$\tau = 10s$ [kW]	Max surface temp.	$\tau = 20s$ [kW]	Max surface temp.	$\tau = 40s$ [kW]	Max surface temp.
CBS 210 22R	42	70	29	80	20	95	14	120
CBS 260 18R	71	75	49	90	34	110	24	140
CBS 330 13R	120	85	80	95	55	120	39	150
CBS 400 10R	180	90	115	110	79	130	55	170
CBS 460 6R5	245	100	155	120	100	140	70	180
CBS 560 6R0	310	100	200	120	135	140	92	180
CBS 660 4R5	410	110	260	130	170	150	115	200
CBS 760 3R5	530	110	330	130	215	160	145	200
CBS 860 2R5	650	120	400	140	260	170	175	210
CBS 960 2R0	670	110	420	130	275	160	190	210

The table above shows pulse power ratings for typical resistor sizes/lengths and typical ohmic values.

Formulas for e-curve :
$$p(t) = P_{max} \cdot e^{-2t/\tau} \quad E = \frac{\tau}{2} \cdot P_{max} \quad \tau = R \cdot C$$

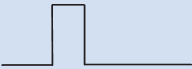


Pulse load table

CMQ	One single square pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max sur- face temp.	Duty 40s [kW]	Max surface temp.
CMQ 210 22R	23	65	16	70	11	85	8	110
CMQ 260 18R	46	75	31	85	21	100	15	130
CMQ 330 13R	71	75	47	90	32	110	23	140
CMQ 400 10R	120	85	75	100	49	120	34	150
CMQ 460 6R5	150	90	93	100	61	120	42	160
CMQ 560 6R0	210	100	130	110	83	130	57	160
CMQ 660 4R5	260	100	160	120	100	140	69	170
CMQ 760 3R5	350	110	210	120	130	150	88	180
CMQ 860 2R5	350	100	215	120	140	140	95	180
CMQ 960 2R0	460	120	275	130	175	150	115	190
	One single triangle pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max sur- face temp.	Duty 40s [kW]	Max surface temp.
CMQ 210 22R	50	65	34	75	23	85	17	110
CMQ 260 18R	100	75	66	85	44	100	31	130
CMQ 330 13R	150	80	99	90	67	110	47	140
CMQ 400 10R	250	90	160	100	105	120	71	160
CMQ 460 6R5	320	95	200	110	130	130	87	160
CMQ 560 6R0	450	100	275	120	175	140	120	170
CMQ 660 4R5	560	100	340	120	215	140	145	180
CMQ 760 3R5	740	120	450	130	280	150	185	190
CMQ 860 2R5	750	110	460	120	295	150	200	180
CMQ 960 2R0	970	120	590	140	370	160	245	200
	One single exponential pulse each 1800 seconds (e-curve)							
	$\tau = 5S$ [kW]	Max surface temp.	$\tau = 10S$ [kW]	Max surface temp.	$\tau = 20S$ [kW]	Max sur- face temp.	$\tau = 40S$ [kW]	Max surface temp.
CMQ 210 22R	62	70	42	80	29	100	21	120
CMQ 260 18R	125	85	81	100	55	120	38	150
CMQ 330 13R	185	90	125	100	83	130	58	160
CMQ 400 10R	310	100	195	120	130	140	87	180
CMQ 460 6R5	390	110	245	120	160	150	110	190
CMQ 560 6R0	540	120	340	130	220	160	145	200
CMQ 660 4R5	680	120	420	140	265	170	180	210
CMQ 760 3R5	900	130	550	150	350	180	225	220
CMQ 860 2R5	910	120	560	140	370	170	245	220
CMQ 960 2R0	1200	140	720	160	450	190	300	240

HVBS	One single square pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
HVBS 300 15R	22.4	60	15.4	65	11	75	8	90
HVBS 370 12R	41.3	65	27.8	75	19.3	85	13.9	110
HVBS 440 10R	66	70	43.6	80	29.3	95	20.6	120
HVBS 520 8R0	81	75	54	85	37.1	100	26.6	130
HVBS 620 6R0	120	80	77	90	51	110	35.8	130
HVBS 720 5R0	155	80	98	90	65	110	45.1	140
HVBS 820 4R0	185	85	115	95	77	110	53	140
HVBS 920 3R5	270	95	165	110	105	120	69	150
HVBS 1000 3R0	300	95	180	110	115	130	77	150
	One single triangle pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
HVBS 300 15R	48	60	33	65	23	75	16	95
HVBS 370 12R	88	65	59	75	41	90	29	110
HVBS 440 10R	145	75	93	85	62	100	43	120
HVBS 520 8R0	175	75	115	85	77	100	54	130
HVBS 620 6R0	255	80	165	90	110	110	74	140
HVBS 720 5R0	330	85	210	95	135	110	94	140
HVBS 820 4R0	400	85	250	95	160	120	110	140
HVBS 920 3R5	570	100	350	110	220	130	145	160
HVBS 1000 3R0	640	100	390	110	245	130	160	160
	One single exponential pulse each 1800 seconds (e-curve)							
	$\tau = 5s$ [kW]	Max surface temp.	$\tau = 10s$ [kW]	Max surface temp.	$\tau = 20s$ [kW]	Max surface temp.	$\tau = 40s$ [kW]	Max surface temp.
HVBS 300 15R	59	65	41	70	28	85	20	100
HVBS 370 12R	110	75	73	85	50	100	35	120
HVBS 440 10R	175	85	115	95	76	120	52	140
HVBS 520 8R0	215	85	140	100	95	120	67	150
HVBS 620 6R0	310	90	200	100	135	120	91	160
HVBS 720 5R0	400	95	255	110	170	130	115	160
HVBS 820 4R0	480	95	300	110	200	130	135	170
HVBS 920 3R5	690	110	420	120	270	150	180	180
HVBS 1000 3R0	770	110	470	130	300	150	200	190

The tables above show pulse power ratings for typical resistor sizes/lengths and typical ohmic values.

Pulse load table

CVS	One single square pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
CVS 400 10R	135	80	83	90	52	100	35	120
CVS 460 6R5	190	90	115	95	71	110	46	130
CVS 560 6R0	265	95	155	100	97	120	63	140
CVS 660 4R5	340	100	200	110	120	120	79	150
CVS 760 3R5	440	100	255	120	155	130	99	160
CVS 860 2R5	500	110	290	120	175	130	115	160
CVS 960 2R0	510	100	300	110	180	130	120	160
	One single triangle pulse each 1800 seconds							
	Duty 5s [kW]	Max surface temp.	Duty 10s [kW]	Max surface temp.	Duty 20s [kW]	Max surface temp.	Duty 40s [kW]	Max surface temp.
CVS 400 10R	290	85	180	95	110	110	74	130
CVS 460 6R5	410	90	245	100	150	120	98	140
CVS 560 6R0	560	95	330	110	205	120	130	150
CVS 660 4R5	720	100	420	110	260	130	165	150
CVS 760 3R5	930	110	550	120	330	140	210	160
CVS 860 2R5	1050	110	620	120	370	140	235	160
CVS 960 2R0	1050	100	630	120	390	130	250	160
	One single exponential pulse each 1800 seconds (e-curve)							
	$\tau = 5s$ [kW]	Max surface temp.	$\tau = 10s$ [kW]	Max surface temp.	$\tau = 20s$ [kW]	Max surface temp.	$\tau = 40s$ [kW]	Max surface temp.
CVS 400 10R	350	95	220	100	140	120	92	150
CVS 460 6R5	490	100	295	120	185	130	120	160
CVS 560 6R0	670	110	410	120	250	140	160	170
CVS 660 4R5	860	110	510	130	320	150	205	180
CVS 760 3R5	1100	120	660	140	400	160	255	190
CVS 860 2R5	1250	120	740	140	460	160	295	200
CVS 960 2R0	1250	120	760	130	480	150	310	190

The table above shows pulse power ratings for typical resistor sizes/lengths and typical Ohm values.

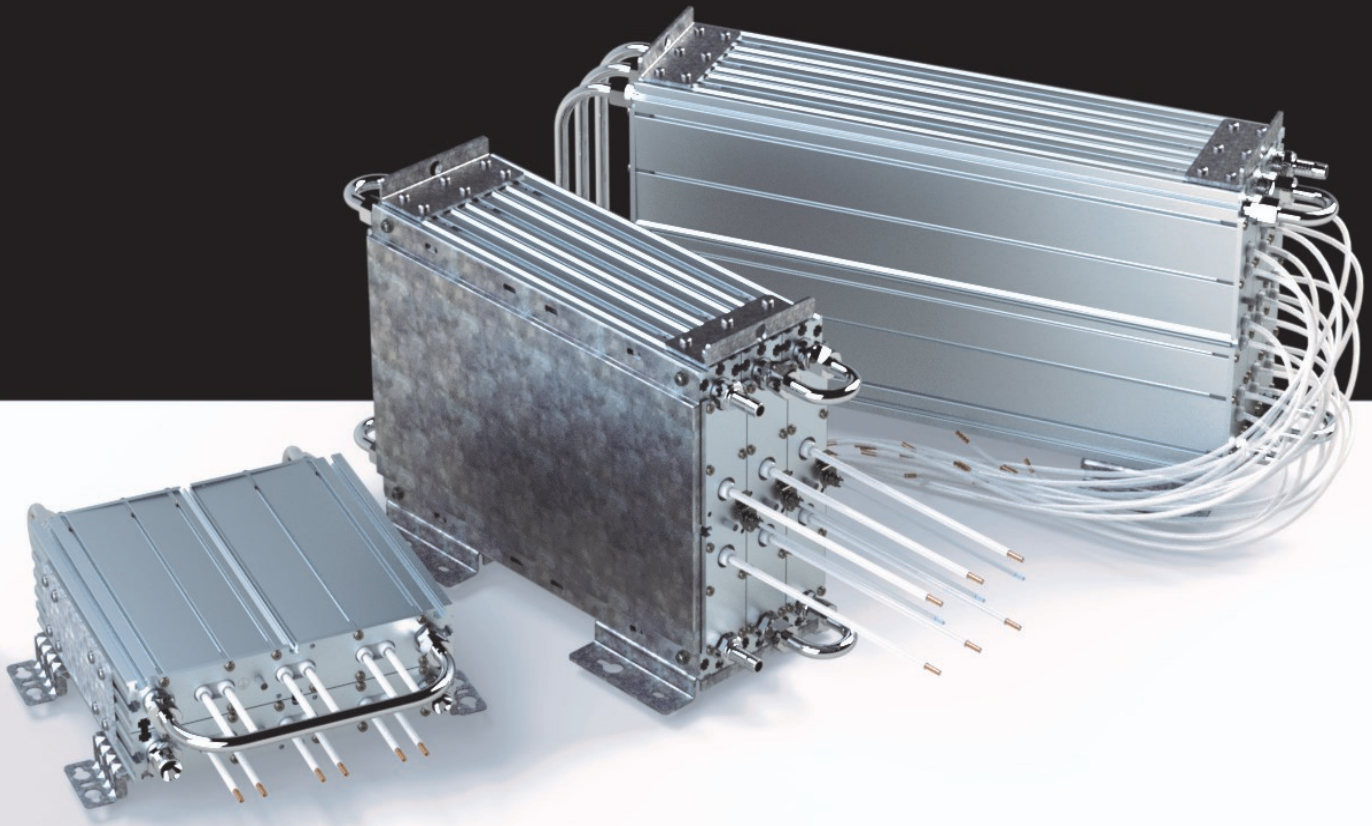
Pulse load

The ability to withstand pulse-loads varies according to resistor size, length and diameter of the internal resistor wire. As such, it is impossible to create standard graphs that would apply to all customer applications. In some cases, the load-profile will be the combination of a square and a triangular pulse, such as is the case with Low Voltage Ride Through (LVRT) and Emergency Brake situations, as encountered in the Wind Power industry.

On request, Danotherm performs simulations based on the actual application and for guidance, has produced tables for various load-profiles for resistors with standard wire. The above table shown is based on a resistor with indicated ohmic value and standard wire thickness. Depending on the application, resistor construction can be adapted to optimally match the application. In the tables above, the peak powers of single rectangular, triangular and exponential pulses durations of 5 to 40 seconds.



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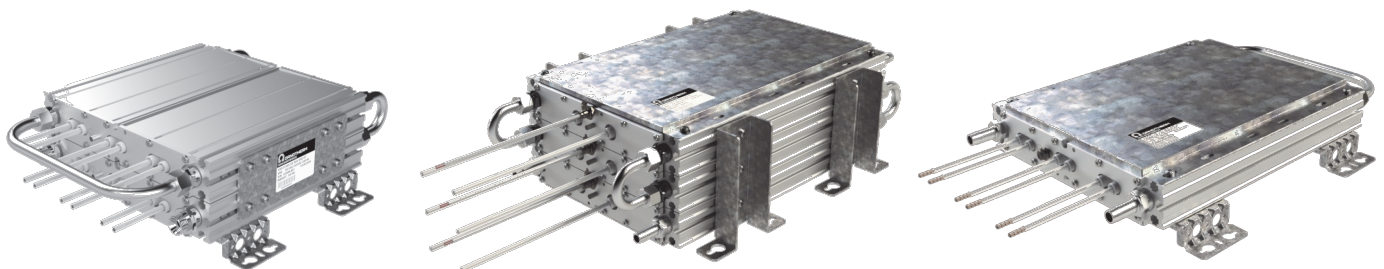
CBW-H / CBW-V

CBW Water cooled

CBW-H C(H)(T)	R [Ω] min - max $\pm 10\%$	Max. nom. Power at Inlet water temperature and delta T. T surface 190°C								
		20°C Inlet temperature delta T coolant:			40°C Inlet temperature delta T coolant:			50°C Inlet temperature delta T coolant:		
		10	20	40	10	20	40	10	20	40
CBW 180	0.04 - 13	1200	1150	1050	1050	1000	930	960	930	860
CBW 210	0.05 - 2000	1650	1600	1500	1450	1400	1300	1350	1300	1200
CBW 260	0.07 - 2000	2350	2300	2150	2050	2000	1850	1950	1850	1700
CBW 330	0.09 - 2000	2950	2850	2700	2600	2500	2300	2400	2300	2150
CBW 400	0.11 - 2000	3550	3450	3200	3100	3000	2800	2900	2800	2550
CBW 460	0.14 - 2000	4100	4000	3750	3600	3500	3250	3400	3250	3000
CBW 560	0.18 - 110	4950	4800	4500	4350	4200	3900	4050	3900	3600
CBW 660	0.22 - 130	5900	5700	5350	5200	5000	4650	4800	4650	4300
CBW 760	0.27 - 150	6700	6500	6100	5900	5700	5300	5500	5300	4900
CBW 860	0.31 - 180	7650	7450	6950	6750	6500	6050	6250	6050	5550
CBW 960	0.35 - 220	8500	8250	7700	7450	7200	6700	6950	6700	6150

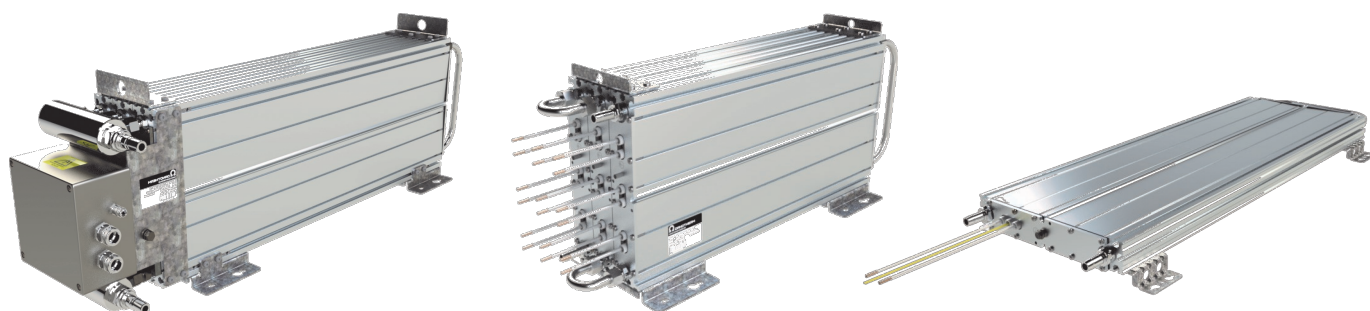
Construction and salient properties

- Compact dimensions
- Nominal power range from 1200W–8500W
- Energy levels from 27kJ-675kJ per case housing (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Internal mica supported wirewound elements for higher ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- Al_2O_3 or SiO_2 filled for high thermal capacity/ high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optional thermal switch or PT100 element for thermal protection guard.
- Cable (AWG 14–AWG4) or box connection up to 50mm²
- Multiple case housings (2 or 3 housings)
- Customized to your needs and application (OEM versions available)
- For UL approval, consult Danotherm



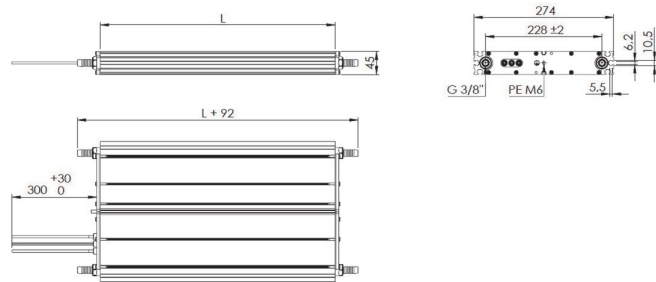
General specifications

Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Insulation Resistance:		> 20M Ω / case housing
Overload:@ 1 sec pulse / hour		70 - 250 x (depending on resistor)
Overload:@ 5 sec pulse / hour		20 - 60 x (depending on resistor)
Environmental:		- 40 °C - 70 °C
Cooling		The nominal power of the resistors refers to cooling conditions as per table 1 with inlet temperature and temperature increase. (delta T)
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	\pm 1mm
	13 - 100 Hz	@ \pm 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		\pm 10% (optional 5%)
Working voltage	Cable version	UL: 1000VAC. IEC: 1000VAC / 1400VDC
	conn. Box	UL: 600VAC. IEC: 690VAC / 1100VDC
Time constant for heating up resistor		1000 - 3000s
Thermal switch (optional)	Thermal switch	130 / 160 / 180 / 200 °C. 2.5A. 250 VAC NC
Minimum voltage		2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250 VAC cos ϕ =1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C



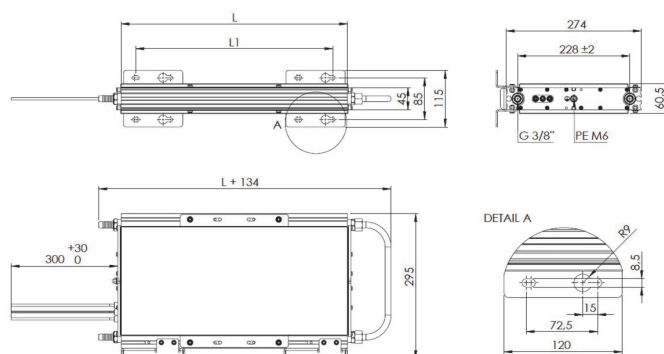
Cable connection type with water nipples

P_n	Pulse* 5/120	Type	$L \pm 2$	Weight (SiO ₂)	Resistance Range
W	kW		mm	kg	Ω
1200	5.5	CBW 180	180	3,1	0.04 - 13
1650	5.3	CBW 210	210	3,6	0.05 - 2000
2350	11.3	CBW 260	260	4,5	0.07 - 2000
2950	24.4	CBW 330	330	5,9	0.09 - 2000
3550	34	CBW 400	400	7,3	0.11 - 2000
4100	41	CBW 460	460	8,5	0.14 - 2000
4950	58	CBW 560	560	10	0.18 - 110
5900	76	CBW 660	660	12	0.22 - 130
6700	92	CBW 760	760	13,8	0.27 - 150
7650	105	CBW 860	860	16	0.31 - 180
8500	135	CBW 960	960	17,8	0.35 - 220



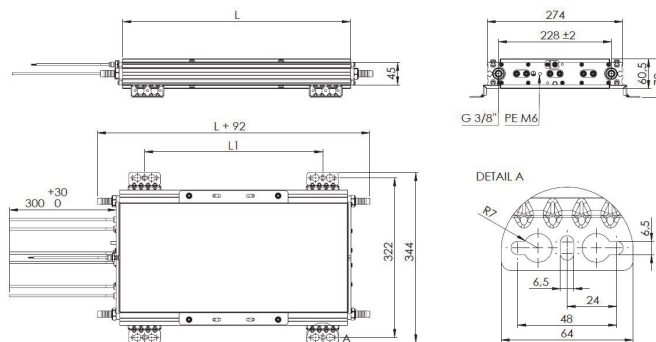
Cable connection type with water return pipe and side isolation plate

P_n	Pulse* 5/120	Type	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
W	kW		mm	mm	kg	Ω
1200	5.5	CBW-V 180	180	120	3,1	0.04 - 13
1650	5.3	CBW-V 210	210	150	3,6	0.05 - 2000
2350	11.3	CBW-V 260	260	200	4,5	0.07 - 2000
2950	24.4	CBW-V 330	330	270	5,9	0.09 - 2000
3550	34	CBW-V 400	400	340	7,3	0.11 - 2000
4100	41	CBW-V 460	460	400	8,5	0.14 - 2000
4950	58	CBW-V 560	560	500	10	0.18 - 110
5900	76	CBW-V 660	660	600	12	0.22 - 130
6700	92	CBW-V 760	760	700	13,8	0.27 - 150
7650	105	CBW-V 860	860	800	16	0.31 - 180
8500	135	CBW-V 960	960	900	17,8	0.35 - 220

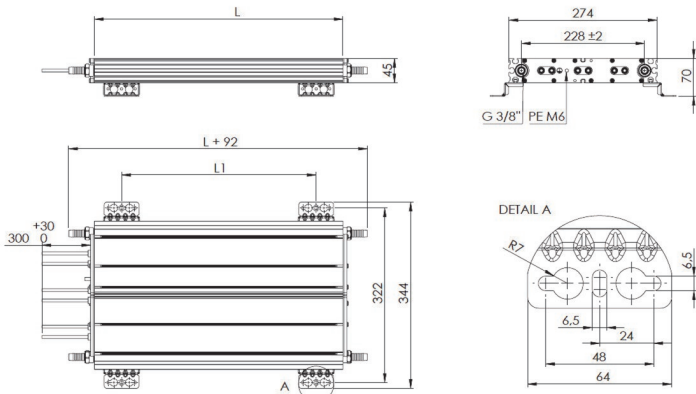


Cable connection type with water nipples and side isolation plate

P_n	Pulse* 5/120	Type	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
W	kW		mm	mm	kg	Ω
1200	5.5	CBW-H 180	180	80	3,9	0.04 - 13
1650	5.3	CBW-H 210	210	110	4,2	0.05 - 2000
2350	11.3	CBW-H 260	260	160	5,1	0.07 - 2000
2950	24.4	CBW-H 330	330	230	6,7	0.09 - 2000
3550	34	CBW-H 400	400	300	8,2	0.11 - 2000
4100	41	CBW-H 460	460	360	9,2	0.14 - 2000
4950	58	CBW-H 560	560	460	11	0.18 - 110
5900	76	CBW-H 660	660	560	12,8	0.22 - 130
6700	92	CBW-H 760	760	660	14,6	0.27 - 150
7650	105	CBW-H 860	860	760	16,8	0.31 - 180
8500	135	CBW-H 960	960	860	18,6	0.35 - 220

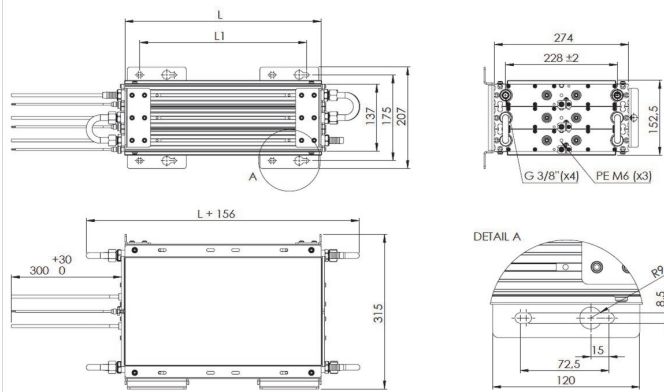


Cable connection type with water connection nipples



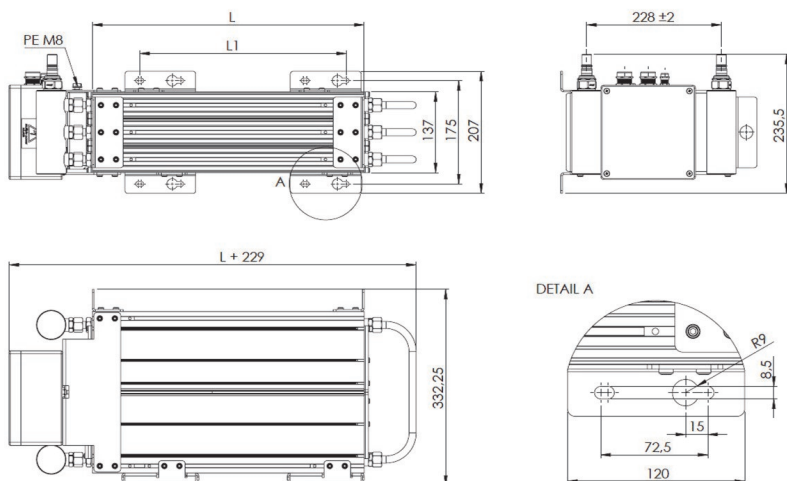
P_n	Pulse *	Type	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range $3 \times R$
W	kW		mm	mm	kg	Ω
1200	5.5	CBW-H 180	180	70	3,9	0.10 - 4
1650	5.3	CBW-H 210	210	110	4,2	0.14 - 500
2350	11.3	CBW-H 260	260	160	5,1	0.20 - 500
2950	24.4	CBW-H 330	330	230	6,7	0.30 - 1000
3550	34	CBW-H 400	400	300	8.2	0.50 - 1000
4100	41	CBW-H 460	460	360	9.2	0.60 - 1000
4950	58	CBW-H 560	560	460	11	0.70 - 35
5900	76	CBW-H 660	660	560	12.8	0.80 - 43
6700	92	CBW-H 760	760	660	14.6	0.95 - 50
7650	105	CBW-H 860	860	760	16.8	1.10 - 60
8500	135	CBW-H 960	960	860	18,6	1.20 - 70

Cable connection type with water series connections and nipples



P_n / housing	Pulse*	Type	$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
W	kW	Type	mm	mm	kg	$3 \times R \Omega$
3550	34	CBW-V 400	400	340	18	0.50 - 1000
4100	41	CBW-V 460	460	400	20.5	0.60 - 1000
4950	58	CBW-V 560	560	500	23.5	0.70 - 35
5900	76	CBW-V 660	660	600	27	0.80 - 43
6700	92	CBW-V 760	760	700	30.5	0.95 - 50
7650	105	CBW-V 860	860	800	35.5	1.10 - 60
8500	135	CBW-V 960	960	900	39	1.20 - 70

Box connection type with water manifold connections and nipples



$L \pm 2$	$L1 \pm 2$	Weight (SiO ₂)	Resistance Range
mm	mm	kg	$R \Omega$
400	340	8.2	0.11 - 2000
460	400	9.2	0.14 - 2000
560	500	11	0.18 - 110
660	600	12.8	0.22 - 130
760	700	14.6	0.27 - 150
860	800	16.8	0.31 - 180
960	900	18,6	0.35 - 220

Applications

CBW water cooled power resistors are used in applications where there are high power pulse loads and or high average power. The resistor elements are embedded in sand. This functions as a high thermal capacitor that can absorb high energy peaks. The energy is conducted by the sand and absorbed into the water. About 90% of the total dissipation will be captured by the water, the rest is expelled into the air. It is very well possible to isolate the aluminium housing and by that forcing almost all power dissipation into the water.

CBW resistors are used in wind turbine applications as filter resistor and on board of medium power traction, like trams, as brake resistor. In some tram systems, the re-generated power is used for heating up the inside of the tram during cold days.

Maximum power dissipation

The maximum continuous power depends on the absolute value of the water inlet temperature and also on the increase of the water temperature which is directly dependent of the water flow. Table 3 shows the maximum continuous power at given water inlet temperatures and different ΔT .

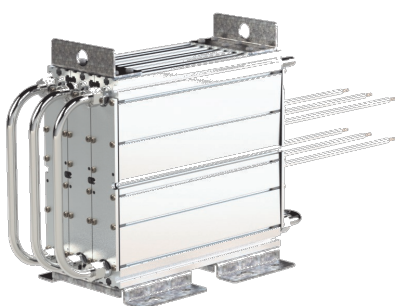
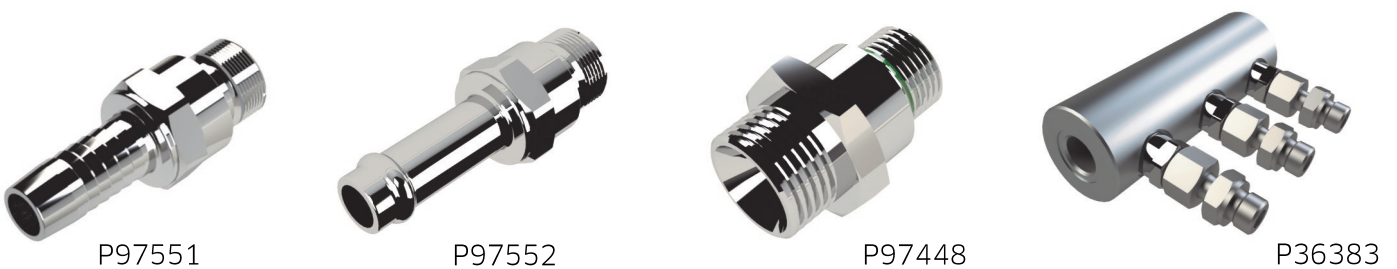
Flow L/h	ΔT water					ΔT water/glycol 60/40				
	10	15	20	25	30	10	15	20	25	30
7 kW	710	470	350	280	240	1070	710	530	420	360
6 kW	610	400	300	240	200	920	600	450	360	300
5 kW	510	340	250	200	170	770	510	380	300	260
4 kW	400	270	200	160	130	600	410	300	240	200
3 kW	300	200	150	120	100	450	300	230	180	150
2 kW	200	130	100	80	70	300	200	150	120	110
1 kW	100	65	50	40	35	150	100	80	60	50

Pressure drop

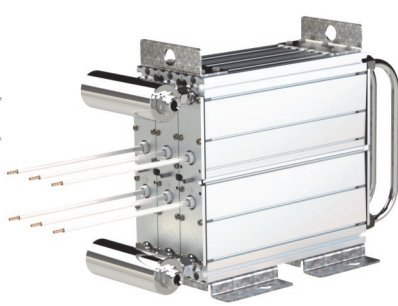
The pressure drop depends strongly on the used water nipples. Many customers use their own water nipples so it is difficult to give standard values. For resistor CBW460 with SW22x45,5 and a flow of 120 liters per hour the pressure drop is 55mBar per channel, 110mBar in total for 2 cooling tubes in series.

Water connections

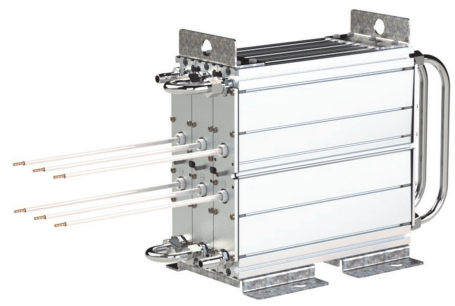
The aluminium housing has treaded wire hole G 3/8" for the water connections. The resistor housing can be fitted with water connection nipples.



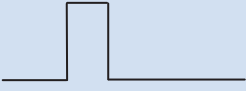
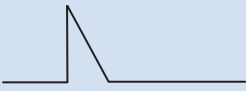
Water return connections back



Water inlet manifold front



Series water connections front

CBW-H Cx(T)	Square pulse each 120 seconds, ambient temp. = 40°C									
	duty 1 second [kW]	Max temp. [°C]	duty 5 second [kW]	Max temp. [°C]	duty 10 second [kW]	Max temp. [°C]	duty 20 second [kW]	Max temp. [°C]	duty 40 second [kW]	Max temp. [°C]
CBW-H 180 13R	17.5	60	5.5	70	3.4	80	2.1	90	1.3	100
CBW-H 210 100R	19.4	55	5.3	60	3.6	70	2.6	85	1.8	100
CBW-H 260 60R	46	65	11.3	75	6.9	80	4.5	95	3	110
CBW-H 330 40R	78	75	24.4	100	15	110	9.3	130	5.7	150
CBW-H 400 30R	115	85	34	110	20.8	120	12.7	140	7.8	160
CBW-H 460 20R	140	90	41	110	25	130	15.4	150	9.4	170
CBW-H 560 15R	215	100	58	120	34	140	20.4	160	12.3	180
CBW-H 660 14R	295	110	76	130	44	150	26.1	170	15.4	190
CBW-H 760 12R	370	120	92	140	52	160	30.7	180	18	200
CBW-H 860 10R	440	120	105	140	61	160	35.5	180	20.8	200
CBW-H 960 9R0	580	140	135	160	75	170	42.4	190	23.2	200
	Triangle pulse each 120 seconds, ambient temp. = 40°C									
	duty 1 second [kW]	Max temp. [°C]	duty 5 second [kW]	Max temp. [°C]	duty 10 second [kW]	Max temp. [°C]	duty 20 second [kW]	Max temp. [°C]	duty 40 second [kW]	Max temp. [°C]
CBW-H 180 13R	37	60	12	75	7	80	4.3	90	2.7	100
CBW-H 210 100R	40	55	11	65	7	70	4.8	80	3.2	95
CBW-H 260 60R	94	70	23	75	14	80	8.8	95	5.7	110
CBW-H 330 40R	165	80	51	100	30.9	120	18.9	130	11.3	150
CBW-H 400 30R	240	90	71	110	43	130	25.9	140	15.5	160
CBW-H 460 20R	295	90	85	110	51	130	30.8	150	18.5	170
CBW-H 560 15R	450	110	120	130	70	140	41.5	160	24.3	180
CBW-H 660 14R	620	120	160	140	91	150	53	170	30.9	190
CBW-H 760 12R	760	120	190	140	110	160	63	180	36.3	200
CBW-H 860 10R	900	130	225	150	125	160	73	180	41.5	200
CBW-H 960 9R0	1200	140	280	160	155	180	87	190	46.1	200

The table above shows pulse power ratings for typical resistor sizes/lengths and typical ohmic values.

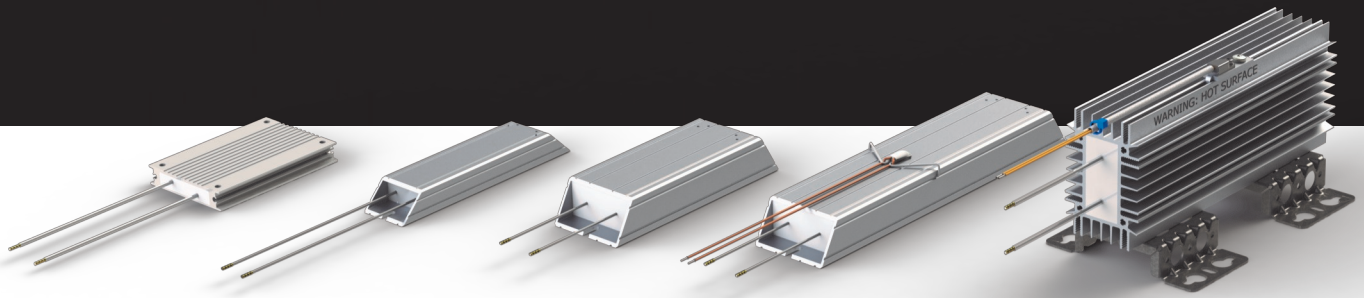
Pulse load

The ability to withstand pulse-loads varies according to resistor size, length and diameter of the internal resistor wire. As such, it is impossible to create standard graphs that would apply to all customer applications. In some cases, the load-profile will be the combination of a square and a triangular pulse, such as is the case with Low Voltage Ride Through (LVRT) and Emergency Brake situations, as encountered in the Wind Power industry.

On request, Danotherm performs simulations based on the actual application and for guidance, has produced tables for various load-profiles for resistors with standard wire. The above table shown is based on a resistor with indicated ohm value and standard wire thickness. Depending on the application, resistor construction can be adapted to optimally match the application. In the tables above, the peak powers of trains of rectangular and triangular pulses of 120 second periods are shown for durations of 1 to 40 seconds.



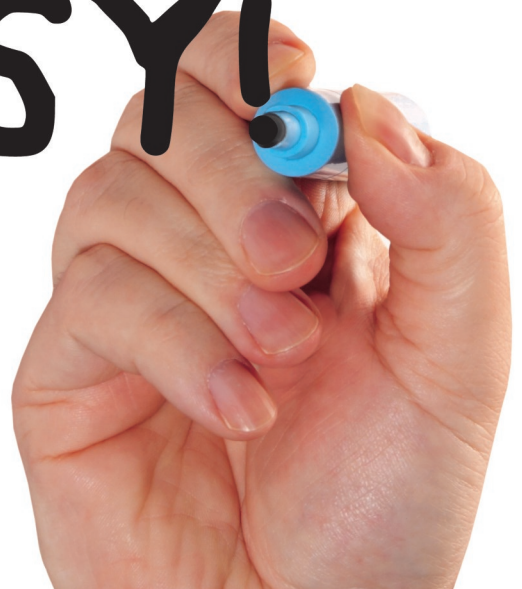
DANOTHERM™



CCH / CAH / CBH / CBR-V

E6 Standard Power resistors

It's EASY!



Product Selection table

Type	P _{nom} [W]	Max. housing temp @ 40°C	6R8	10R	15R	22R	33R	47R	68R	100R	150R	220R	330R	470r
CCH 110 C	100	260						X	X	X	X	X	X	X
CAH 165 C	75	270		X	X	X	X	X	X	X	X	X		
CBH 165 C	110	270		X	X	X	X	X	X	X	X	X		
CBH 265 C	200	280		X	X	X	X	X	X	X	X	X		
CBR 225 C	400	280	X	X	X		X		X					
CBR 295 C	525	290	X	X		X		X		X				

Quick Selection table for impulse load applications

Duty time Brake Power	duty time square impulse load / 120s cycle time				
	1 sec [kW]	5 sec [kW]	10 sec [W]	20 sec [W]	40 sec [W]
CCH 110	1.55 - 1.9	0.87 - 0.98	660	460	290
CAH 165	1.5 - 4.3	0.775 - 1.050	630	440	220
CBH 165	2.3 - 6.7	1.0 - 1.6	840	570	330
CBH 265	7.5 - 16.2	2.8 - 4.6	2,200	1,250	620
CBR-V 225	12 - 17.8	3.2 - 5.2	2,800	1,750	1,100
CBR-V 295	22.5 - 30.3	5.6 - 8.3	4,200	2,500	1,550

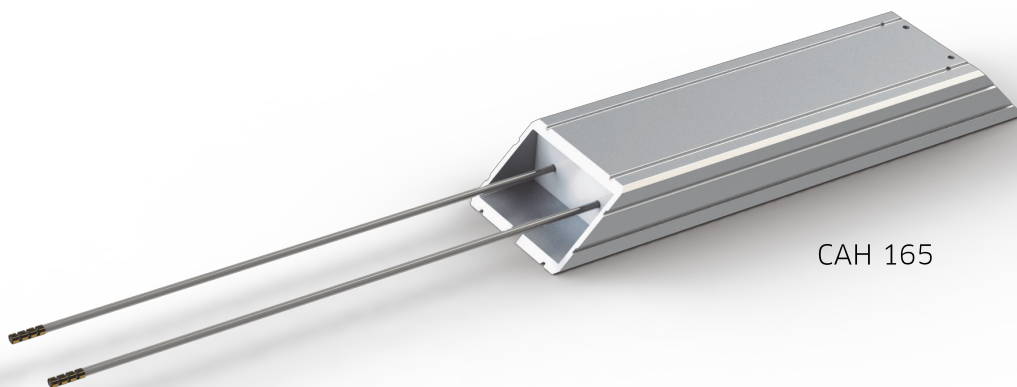
Thermal switch kits

Part number	Part name	Housing type	Temperature [°C]	Mounting concept
P36425	CAH thermostat kit 180 deg.	CAH	180	Clip
P36426	CBH thermostat kit 180 deg.	CBH	180	Clip
P363911	CBR thermostat kit 180 deg.	CBR	180	Screw

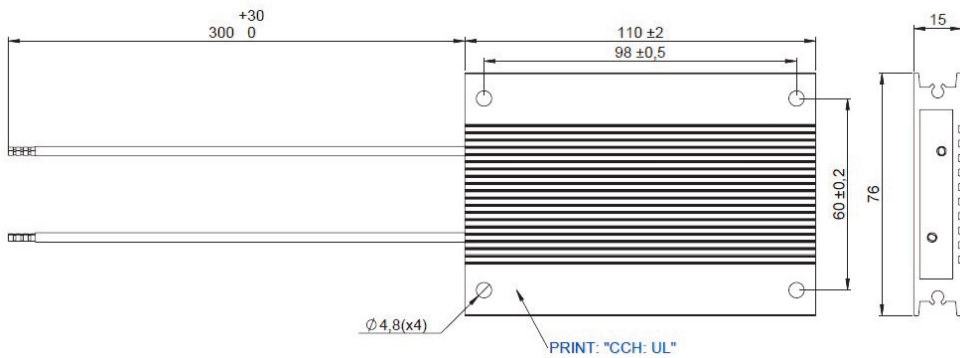
Optionally, an external thermal switch can be mounted on the resistor body. When fixing this thermal switch in the middle (hot spot), the surface temperature will be limited to the thermal switch temperature (180°C). When fixing the thermal switch towards the end of the resistor body, the maximum surface temperature (in the same hot spot) will be higher before tripping. Surface temperature reaching 250°C is technically not a problem for the resistor. All materials used are selected to comply with such a high value. The temperature switch can detect the surface temperature of the resistor. It will not protect the internal active resistor-wire from excessive impulse load.

To protect the internal resistor-wire when applying an impulse load, the thermal model which is available for each resistor can be used to calculate the internal temperature. Consult your Danotherm distributor for assistance.

General specifications		
Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Insulation Resistance:		> 20MΩ / case housing
Environmental:		-40 °C / +70 °C
Surface temperature	At 40°C ambient	260-290°C @ nominal power (depending on housing type) No heatsink is required. When heatsink or forced air is used nominal power can be increased
De-rating		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting	Only CBR	0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of neighboring components.
		If two or more brake resistors are mounted next to each other the distance between should be 400mm. Shorter distance requires de-rating.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling at 40°C ambient.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. EN 60721-2-1: C2 medium
Resistance tolerance		± 10%
Working voltage		UL: 600VAC. IEC: 690VAC / 1100VDC
Time constant for heating up resistor		1000 s
Thermal switch (optional)	Thermal switch	180°C / 2.5A / 250 VAC / NC
Minimum voltage		2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250 VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)

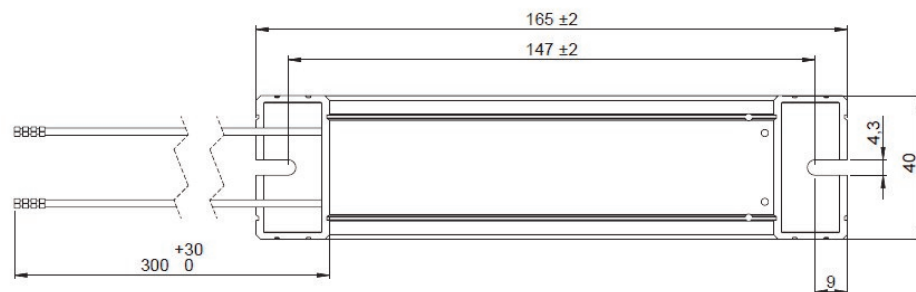
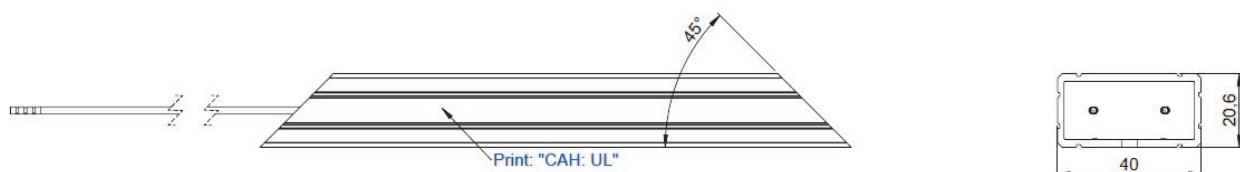


CAH 165



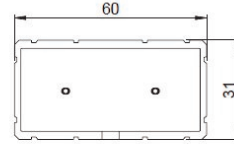
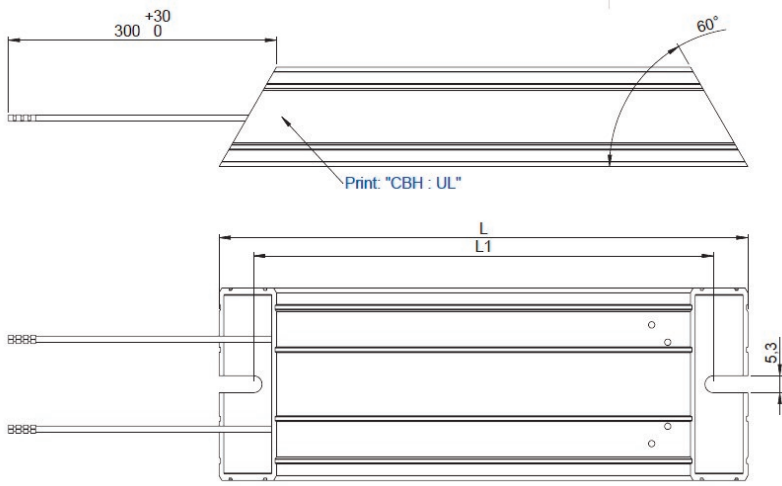
Type	Length mm	Weight g
CCH	110	250

Part number	Part name	Housing length [mm]	Ohm value [Ω]	Power rating [W]	Pulse load [W] T.amb = 40°C, cycle time 120s				
					Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z5113247777	CCH 110 C 777 47R KT	110	47	100	1900	975	700	475	290
Z5113268777	CCH 110 C 777 68R KT	110	68	100	1700	910	660	460	290
Z5113310777	CCH 110 C 777 100R KT	110	100	100	1650	895	660	460	295
Z5113315777	CCH 110 C 777 150R KT	110	150	100	1700	920	665	465	290
Z5113322777	CCH 110 C 777 220R KT	110	220	100	1600	875	645	455	290
Z5113333777	CCH 110 C 777 330R KT	110	330	100	1550	880	645	455	290
Z5113347777	CCH 110 C 777 470R KT	110	470	100	1600	910	660	460	290



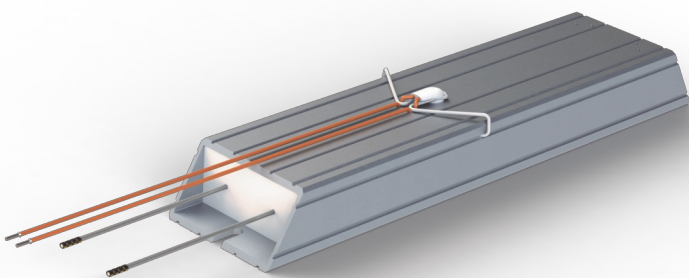
Type	Length mm	Weight g
CAH	165	220

Part number	Part name	Housing length [mm]	Ohm value [Ω]	Power rating [W]	Pulse load [W] T.amb = 40°C, cycle time 120s				
					Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z1163210777	CAH 165 C 777 10R KT	165	10	75	4300	1050	660	435	225
Z1163215777	CAH 165 C 777 15R KT	165	15	75	3600	965	625	420	225
Z1163222777	CAH 165 C 777 22R KT	165	22	75	3800	980	630	425	225
Z1163233777	CAH 165 C 777 33R KT	165	33	75	2900	935	675	440	220
Z1163247777	CAH 165 C 777 47R KT	165	47	75	2200	845	635	445	220
Z1163268777	CAH 165 C 777 68R KT	165	68	75	1850	805	620	445	225
Z1163310777	CAH 165 C 777 100R KT	165	100	75	1700	785	615	440	220
Z1163315777	CAH 165 C 777 150R KT	165	150	75	1650	780	615	445	220
Z1163322777	CAH 165 C 777 220R KT	165	220	75	1500	775	610	440	220

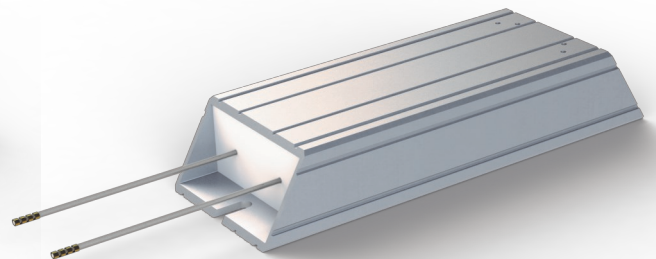


Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBH	165	143.5	390
CBH	265	243.5	880

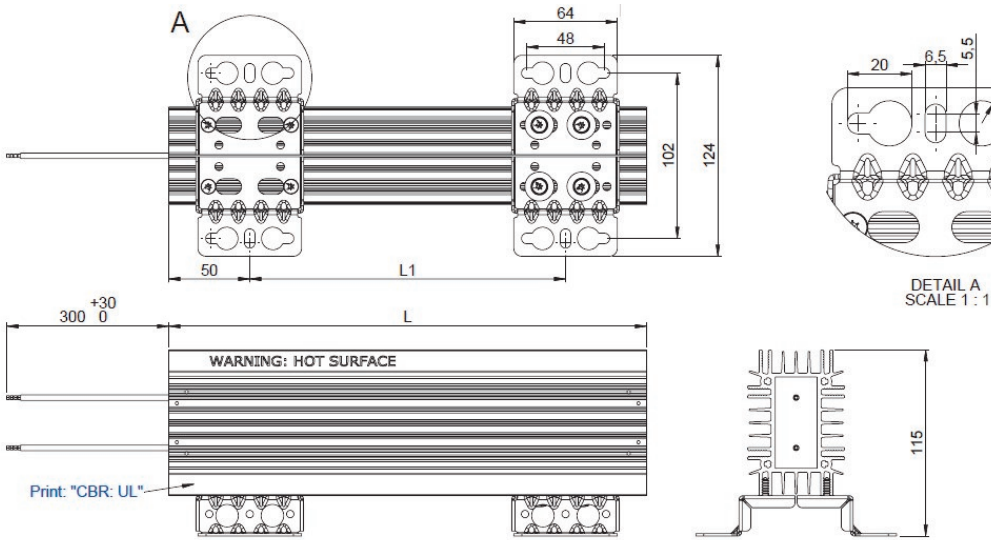
Part number	Part name	Housing length [mm]	Ohm value [Ω]	Power rating [W]	Pulse load [W] T.amb = 40°C, cycle time 120s				
					Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z3163210777	CBH 165 C 777 10R KT	165	10	110	6700	1600	940	590	330
Z3163215777	CBH 165 C 777 15R KT	165	15	110	6100	1500	895	580	335
Z3163222777	CBH 165 C 777 22R KT	165	22	110	5200	1300	835	555	335
Z3163233777	CBH 165 C 777 33R KT	165	33	110	4000	1150	760	535	335
Z3163247777	CBH 165 C 777 47R KT	165	47	110	3400	1150	840	590	330
Z3163268777	CBH 165 C 777 68R KT	165	68	110	3100	1100	825	585	330
Z3163310777	CBH 165 C 777 100R KT	165	100	110	2600	1050	805	575	330
Z3163315777	CBH 165 C 777 150R KT	165	150	110	2400	1050	800	575	330
Z3163322777	CBH 165 C 777 220R KT	165	220	110	2300	1050	790	570	330
ZH3263210777	CBH 265 CH 777 10R KT	265	10	200	15900	4600	2400	1200	610
ZH3263215777	CBH 265 CH 777 15R KT	265	15	200	15800	4600	2500	1250	615
ZH3263222777	CBH 265 CH 777 22R KT	265	22	200	14600	3500	2100	1200	630
Z3263233777	CBH 265 C 777 33R KT	265	33	200	16200	3800	2200	1250	625
Z3263247777	CBH 265 C 777 47R KT	265	47	200	13900	3400	2100	1250	620
Z3263268777	CBH 265 C 777 68R KT	265	68	200	11200	3000	1900	1250	620
Z3263310777	CBH 265 C 777 100R KT	265	100	200	10200	3100	2100	1250	615
Z3263315777	CBH 265 C 777 150R KT	265	150	200	8400	2900	2000	1250	615
Z3263322777	CBH 265 C 777 220R KT	265	220	200	7500	2800	2000	1200	610



CBH 265 + Thermal switch



CBH 165

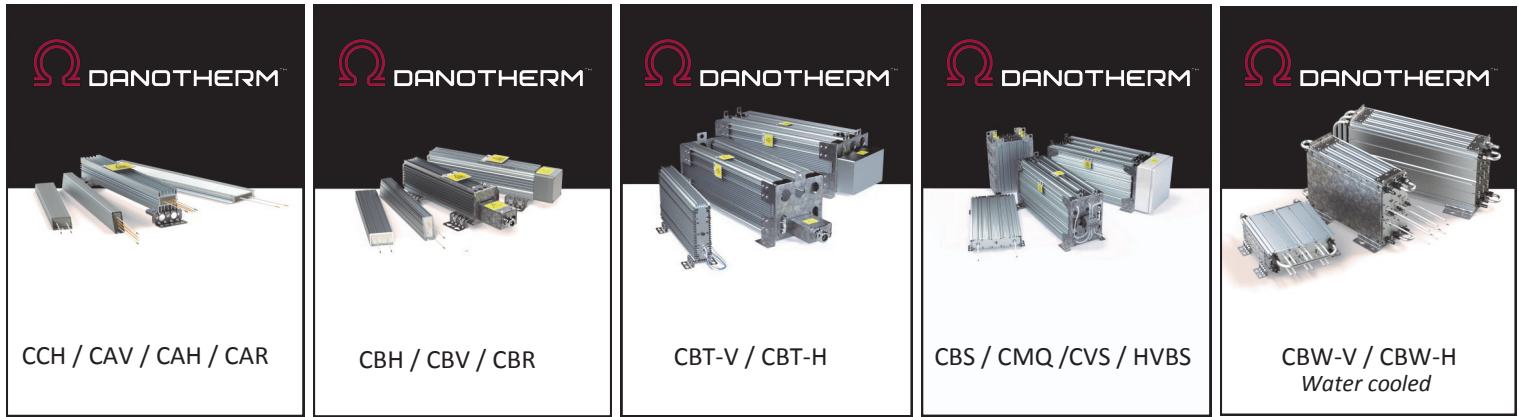


Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBR-V	225	125	1800
CBR-V	295	195	2300

Part number	Part name	Housing length [mm]	Ohm value [Ω]	Power rating [W]	Pulse load [W] T.amb = 40°C, cycle time 120s				
					Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
ZH9223168777	CBR-V 225 CH 777 6R8 KT	225	6.8	400	17200	5200	3100	1900	1150
ZH9223210777	CBR-V 225 CH 777 10R KT	225	10	400	17300	5200	3100	1900	1150
ZH9223215777	CBR-V 225 CH 777 15R KT	225	15	400	17200	5200	3200	1900	1150
Z9223233777	CBR-V 225 C 777 33R KT	225	33	400	17800	4200	2600	1650	1050
Z9223268777	CBR-V 225 C 777 68R KT	225	68	400	12000	3200	2200	1500	1000
ZH9293168777	CBR-V 295 CH 777 6R8 KT	295	6.8	525	30300	8300	4800	2800	1600
ZH9293210777	CBR-V 295 CH 777 10R KT	295	10	525	25000	7400	4500	2700	1600
ZH9293222777	CBR-V 295 CH 777 22R KT	295	22	525	25000	7600	4600	2700	1600
Z9293247777	CBR-V 295 C 777 47R KT	295	47	525	25000	6000	3600	2300	1450
Z9293310777	CBR-V 295 C 777 100R KT	295	100	525	22500	5600	3400	2200	1450

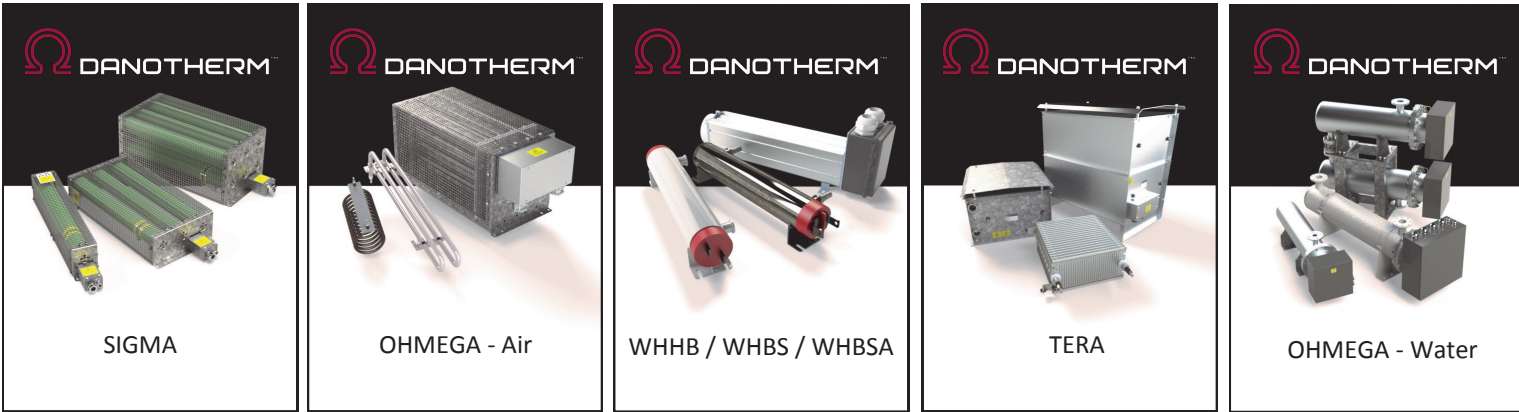


Overview of the ALPHA resistor family (IP00-IP65)



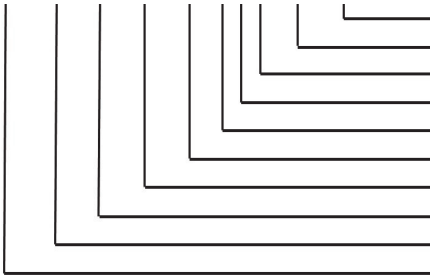
Power: 60-410W	Power: 85W-1.7kW	Power: 410W-12kW	Power: 445W-15kW	Power: 860W-25kW
	9-150kJ @5s	25-550kJ @5s	80kJ-2.5MJ @5s	6.4kJ-1.1MJ @5s
- Applications				
Charge / Discharge	High Pulse load	High Pulse load	High Pulse load	Short recovery time
Brake	Brake	Brake	Brake	Brake
Filter	Filter	Filter	Medium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

Other resistor types from Danotherm (IP00-IP66)



Multi purpose	Outdoor & Marine	Filter	Medium & High voltage	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

CMQ-H 400 CH(T) 281 22R KT



- Thermal drift; standard T=100ppm, Tolerance; standard K=± 10%
- Ohm value (Example 2R2=2.2Ω / 22R = 22Ω)
- Number of case style housings (1, 2, 3 or 4)
- Thermal switch temp; 5=130°C / 6=160°C / 7=180°C / 8=200°C
- 0=cable connection, 2=connection box type
- T=Thermal switch, option, (normally closed)
- Connection style; C=cable / B=IP65 box / K=DIN rail IP00
- Length of resistor housing in mm
- H=horizontal mounting feet / V=vertical mounting feet
- Housing case style; CAV/CAH/CAR/CBV/CBH/CBR/CBT/CMQ/HVBS/CVS/CBW

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DAN EN 16.5053.R1
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