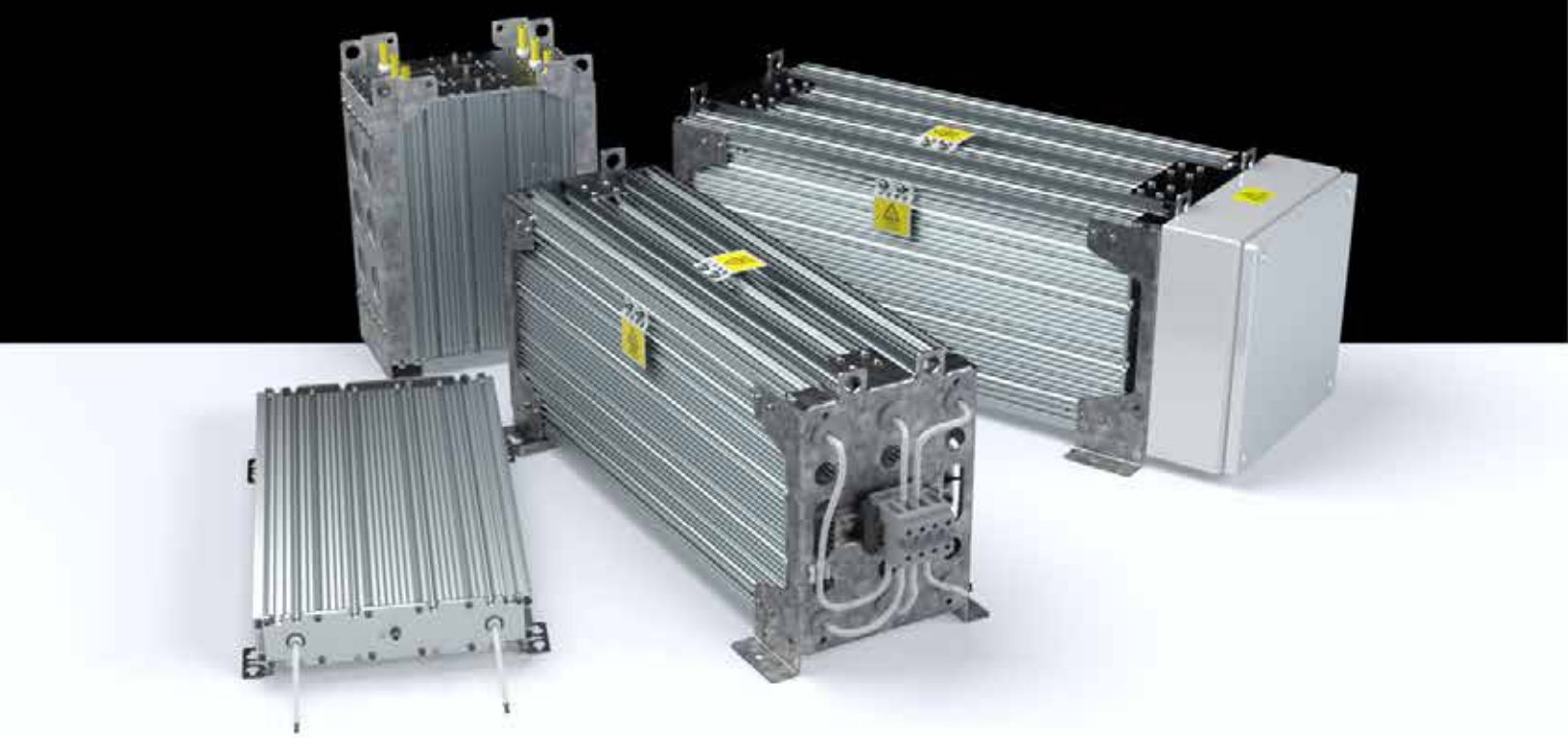
DANOTHERM™



The ALPHA Resistor Collection Catalogue

- Resistors for Filter, Brake and High Energy Dump applications

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

DANOTHERM™

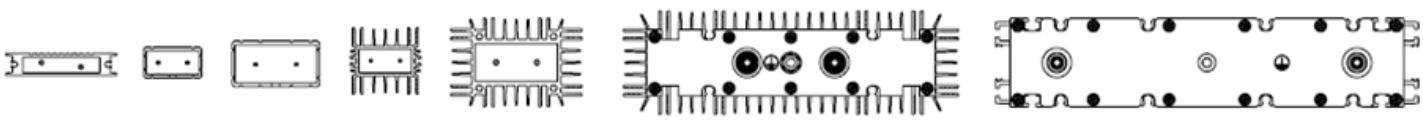
Welcome to the world of power resistors

Content

Danotherm support your request. The very start is your specification of the application, the load and environmental conditions. Ideally, a power-time graph is presented which forms the basis of the thermal simulation. If such graph is not available, the electrical circuit of the application is build in the simulation software. It is also possible to use a data file as input for the load. Such file can be build by measurements on the site or they come from another simulation software program.
Each resistor which its physical properties gets its own, unique, thermal model. The next step is to feed the generated power losses into the thermal model. With simulations the temperatures inside the resistor and of the outside housing surface, are computed. Here, the maximum temperature values are observed and at the same time care is taken not to over dimension the resistor.
When the type and internal construction of the resistor is defined, the resistor will be further tailored to the customers needs. Connection boxes, connection cable sizes, cable glands, IP ratings, mounting brackets, metal surface treatment, auxiliary circuits, such as Pt100 sensors and thermal switches, are all considered.
Finally, packing and shipping is an important topic. The resistors should be safely packed to prevent damage during transport and at the same time the costs for shipping and packing must be considered. Together with our customers the best option is chosen.

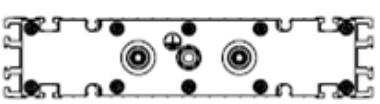
Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW Temp.amb 40°C cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
Page 8-19								
CCH 110	100	260	2 - 1000	2.5	1.2	0.8	0.5	0.3
CCH 166	160	265	4 - 1200	5.7	2.4	1.6	0.9	0.5
CCH 216	200	275	6 - 1500	10.5	3.8	2.4	1.2	0.6
CCH 270	260	280	9 - 1700	14.2	5.1	3.1	1.5	0.8
CCH 320	300	285	10 - 2000	18.6	6.3	3.6	1.8	0.9
CCH 420	390	295	13 - 2000	24.7	8.4	4.6	2.3	1.2
CCH 520	480	305	16 - 2000	30.3	9.7	5.8	2.9	1.4
CCH 620	570	315	20 - 2000	38.1	11.9	6.9	3.4	1.7
CCH 145 CT	80	210	2 - 1000	2.5	1.2	0.9	0.6	0.3
CCH 201 CT	120	215	4 - 1200	5.8	2.5	1.7	0.9	0.5
CCH 251 CT	160	220	6 - 1500	10.6	3.9	2.3	1.1	0.6
CCH 305 CT	200	225	9 - 1700	14.5	5.2	2.8	1.4	0.7
CCH 355 CT	230	230	10 - 2000	19.1	6.6	3.3	1.6	0.8
CCH 455 CT	300	235	13 - 2000	25.3	8.3	4.2	2.1	1
CCH 555 CT	370	245	16 - 2000	30.9	10	5.2	2.6	1.3
CCH 655 CT	440	250	20 - 2000	38.8	11.8	5.9	3	1.5
CAH / CAV 120 C	70	260	0.15 - 300	1.1	0.4	0.3	0.2	0.2
CAH / CAV 150 C	90	260	0.3 - 600	2.4	0.8	0.6	0.4	0.3
CAH / CAV 165 C	100	265	0.3 - 800	3.6	1.1	0.8	0.5	0.3
CAH / CAV 210 C	125	270	0.6 - 1200	7	1.8	1.1	0.8	0.4
CAH / CAV 240 C	145	275	0.7 - 1500	9.5	2.4	1.4	0.9	0.4
CAH / CAV 300 C	185	290	1 - 1200	12.8	3.2	1.9	1.1	0.6
CAH / CAV 360 C	220	305	1.2 - 2500	16.7	4.1	2.5	1.3	0.7
CAR 85 C	115	260	0.1 - 300	1.1	0.4	0.3	0.3	0.2
CAR 115 C	150	265	0.25 - 600	2.5	0.9	0.6	0.5	0.3
CAR 130 C	170	265	0.3 - 800	3.8	1.2	0.8	0.6	0.4
CAR 175 C	225	275	0.5 - 1200	7.4	1.9	1.2	0.8	0.6
CAR 205 C	260	285	0.7 - 1400	10.2	2.5	1.6	1.1	0.7
CAR 265 C	335	300	1.0 - 2000	13.8	3.5	2.1	1.4	0.9
CAR 325 C	410	320	1.2 - 2500	18.1	4.5	2.8	1.8	1.2
CAH / CAV 145 CT	60	210	0.15 - 300	1.1	0.4	0.3	0.2	0.2
CAH / CAV 175 CT	75	210	0.3 - 600	2.4	0.8	0.6	0.4	0.2
CAH / CAV 190 CT	80	215	0.3 - 800	3.6	1.1	0.8	0.5	0.2
CAH / CAV 235 CT	100	220	0.6 - 1200	7	1.8	1.1	0.6	0.3
CAH / CAV 265 CT	110	220	0.7 - 1500	9.5	2.4	1.3	0.7	0.3
CAH / CAV 325 CT	140	230	1 - 1200	12.8	3.2	1.7	0.8	0.4
CAH / CAV 385 CT	165	235	1.2 - 2500	16.7	4	2	1	0.5

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW Temp.amb 40°C cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CAR 110 C/K/D T	105	210	0.1 - 300	1.1	0.4	0.3	0.3	0.2
CAR 140 C/K/D T	135	210	0.25 - 600	2.5	0.9	0.7	0.5	0.3
CAR 155 C/K/D T	150	215	0.3 - 800	3.8	1.2	0.8	0.6	0.4
CAR 200 C/K/D T	190	220	0.5 - 1200	7.4	1.9	1.2	0.9	0.6
CAR 230 C/K/D T	210	225	0.7 - 1400	10.2	2.6	1.6	1.1	0.6
CAR 290 C/K/D T	265	235	1.0 - 2000	13.8	3.5	2.2	1.4	0.8
CAR 350 C/K/D T	310	250	1.2 - 2500	18.1	4.5	2.8	1.8	0.9
CCR-V 116 C	185	250	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 172 C	260	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 222 C	330	255	6 - 1500	7.1	3.1	2.2	1.5	1
CCR-V 276 C	400	260	9 - 1700	10.8	5.1	3.5	2.3	1.4
CCR-V 326 C	500	265	10 - 2000	18.1	7.4	4.9	3.1	1.7
CCR-V 426 C	635	275	13 - 2000	29.7	11.1	7	4.3	2.3
CCR-V 526 C	815	285	16 - 2000	30.6	12	7.7	4.8	2.9
CCR-V 626 C	1045	290	20 - 2000	46.3	16.3	10.2	6.2	3.7
CCR-V 145 CT	140	230	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 201 CT	190	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 251 CT	250	255	6 - 1500	7.1	3.2	2.2	1.5	0.9
CCR-V 305 CT	300	260	9 - 1700	13.8	5.9	3.9	2.2	1.1
CCR-V 355 CT	380	265	10 - 2000	18.3	7.5	4.9	2.8	1.4
CCR-V 455 CT	480	275	13 - 2000	29.7	11.1	7	3.5	1.8
CCR-V 555 CT	620	285	16 - 2000	17.8	7.1	4.7	2.9	1.9
CCR-V 655 CT	790	290	20 - 2000	40.6	15.9	10.5	6.6	4.1
Page 19-26								
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



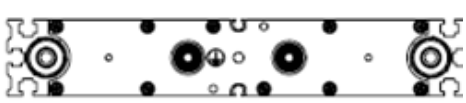
CCH CAH CBH CAR CBR CBT CVS

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW Temp.amb 40°C cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
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
Page 27-34								
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
Page 35-48								
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	0.07 - 35		23	16	11	8
CMQ 260 C	1100	280	0.07 - 50		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



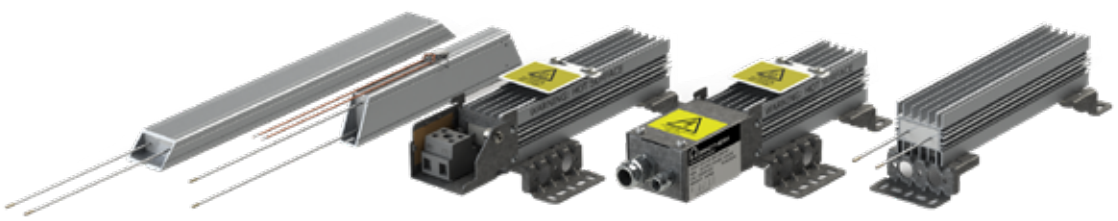
CBS

CMQ/HVBS



CBW

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW Temp.amb 40°C cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
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
Page 49-55								
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



CAH C CAV C CAR K CAR DT CAR C

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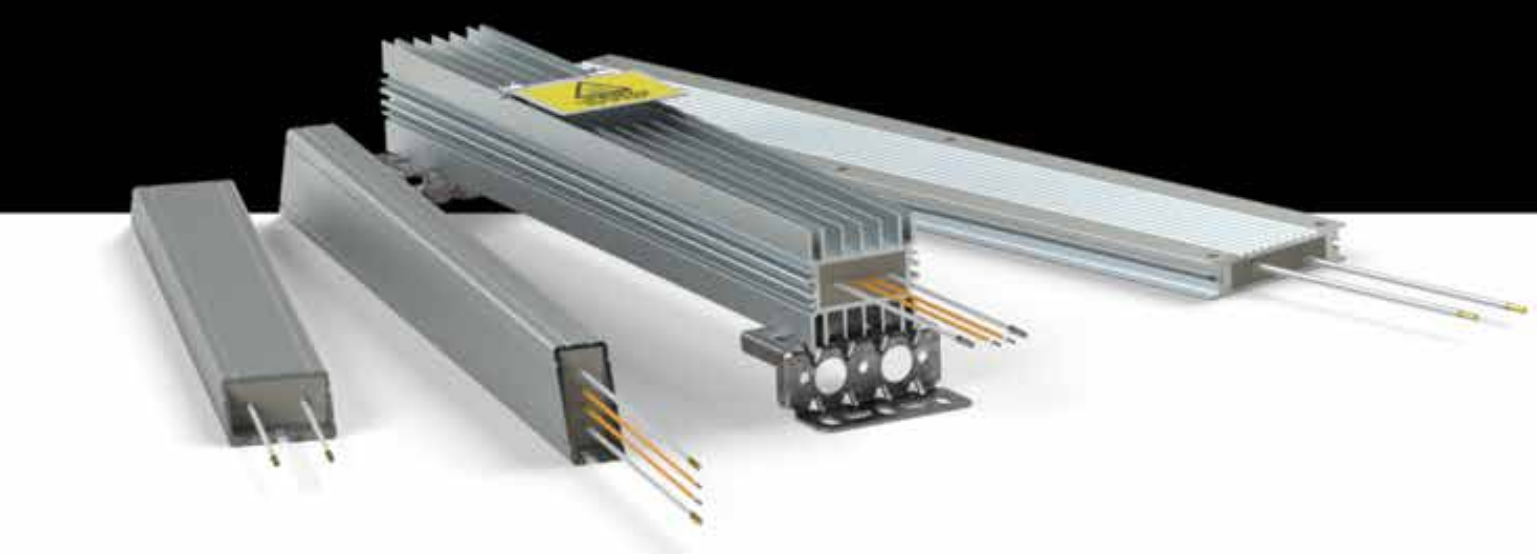


CCH / CAH / CAV / CAR / CCR

CCH without thermal switch

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load W, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
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 60W–1045W
- Energy levels from 2kJ-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 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 (CAR type)
- Optional thermal switch for thermal protection
- Cable 300mm (AWG 18–AWG10) with sleeves or box connection up to 10mm2
- Customized to your needs and application (OEM versions available)

CCH 110 C

CAH/CAV/CAR cable connection

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load W, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CAH / CAV 120 C	55	260	0.15 - 300	1070	410	320	240	170
CAH / CAV 150 C	65	260	0.3 - 600	2420	820	600	435	255
CAH / CAV 165 C	75	265	0.3 - 800	3630	1120	780	540	285
CAH / CAV 210 C	100	270	0.6 - 1200	7030	1800	1120	750	375
CAH / CAV 240 C	120	275	0.7 - 1500	9530	2350	1440	850	435
CAH / CAV 300 C	155	290	1 - 1200	12800	3150	1920	1100	550
CAH / CAV 360 C	190	305	1.2 - 2500	16700	4080	2460	1320	660
CAR 85 C	110	260	0.1 - 300	1090	420	330	250	180
CAR 115 C	155	265	0.25 - 600	2480	860	640	470	330
CAR 130 C	175	265	0.3 - 800	3750	1170	830	600	405
CAR 175 C	240	275	0.5 - 1200	7420	1910	1230	830	570
CAR 205 C	280	285	0.7 - 1400	10200	2540	1590	1050	700
CAR 265 C	367	300	1.0 - 2000	13800	3460	2140	1420	940
CAR 325 C	450	320	1.2 - 2500	18100	4460	2750	1810	1170

Cable and connection box
with and without thermal switch

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load W, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CAH / CAV 145 CT	42	230	0.15 - 300	1070	410	320	240	170
CAH / CAV 175 CT	50	230	0.3 - 600	2420	820	600	435	255
CAH / CAV 190 CT	57	230	0.3 - 800	3630	1120	780	540	285
CAH / CAV 235 CT	76	230	0.6 - 1200	7030	1800	1120	750	375
CAH / CAV 265 CT	92	240	0.7 - 1500	9530	2350	1440	850	435
CAH / CAV 325 CT	118	250	1 - 1200	12800	3150	1920	1100	550
CAH / CAV 385 CT	145	270	1.2 - 2500	16700	4080	2460	1320	660
CAR 110 CT/K/DT	100	260	0.1 - 300	1090	420	330	250	180
CAR 140 CT/K/DT	125	270	0.25 - 600	2480	860	640	470	330
CAR 155 CT/K/DT	130	272	0.3 - 800	3750	1170	830	600	405
CAR 200 CT/K/DT	165	265	0.5 - 1200	7420	1910	1230	830	570
CAR 230 CT/K/DT	190	265	0.7 - 1400	10200	2540	1590	1050	700
CAR 290 CT/K/DT	230	268	1.0 - 2000	13800	3460	2140	1420	940
CAR 350 CT/K/DT	275	270	1.2 - 2500	18100	4460	2750	1810	1170

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.

CCR-V cable connection

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CCR-V 116 C	185	250	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 172 C	260	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 222 C	330	255	6 - 1500	7.1	3.1	2.2	1.5	1
CCR-V 276 C	400	260	9 - 1700	10.8	5.1	3.5	2.3	1.4
CCR-V 326 C	500	265	10 - 2000	18.1	7.4	4.9	3.1	1.7
CCR-V 426 C	635	275	13 - 2000	29.7	11.1	7	4.3	2.3
CCR-V 526 C	815	285	16 - 2000	30.6	12	7.7	4.8	2.9
CCR-V 626 C	1045	290	20 - 2000	46.3	16.3	10.2	6.2	3.7

Cable connection
with thermal switch

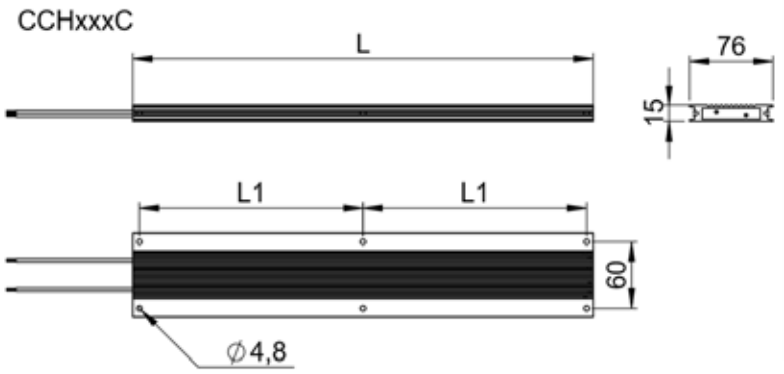
Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CCR-V 135 CT	140	230	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 191 CT	190	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 241 CT	250	255	6 - 1500	7.1	3.2	2.2	1.5	0.9
CCR-V 295 CT	300	260	9 - 1700	13.8	5.9	3.9	2.2	1.1
CCR-V 345 CT	380	265	10 - 2000	18.3	7.5	4.9	2.8	1.4
CCR-V 445 CT	480	275	13 - 2000	29.7	11.1	7	3.5	1.8
CCR-V 545 CT	620	285	16 - 2000	17.8	7.1	4.7	2.9	1.9
CCR-V 645 CT	790	290	20 - 2000	40.6	15.9	10.5	6.6	4.1

Box connection
with thermal switch

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 20 seconds	duty 40 seconds
CCR-V 135 B/D T	140	230	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 191 B/D T	190	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 241 B/D T	250	255	6 - 1500	7.1	3.2	2.2	1.5	0.9
CCR-V 295 B/D T	300	260	9 - 1700	13.8	5.9	3.9	2.2	1.1
CCR-V 345 B/D T	380	265	10 - 2000	18.3	7.5	4.9	2.8	1.4
CCR-V 445 B/D T	480	275	13 - 2000	29.7	11.1	7	3.5	1.8
CCR-V 545 B/D T	620	285	16 - 2000	17.8	7.1	4.7	2.9	1.9
CCR-V 645 B/D T	790	290	20 - 2000	40.6	15.9	10.5	6.6	4.1

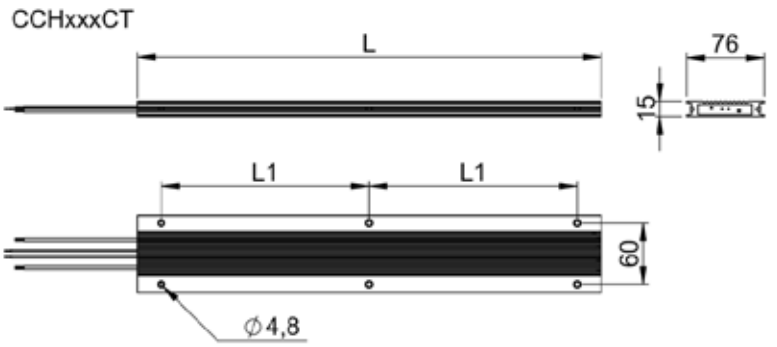
Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		10 - 100 x (depending on resistor)
Overload: @ 5 sec pulse / hour		4 - 25 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable 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	± 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 / 850VDC ; IEC: 690VAC / 975VDC
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 @ 250VAC cos **φ=1**
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

Mechanical drawings



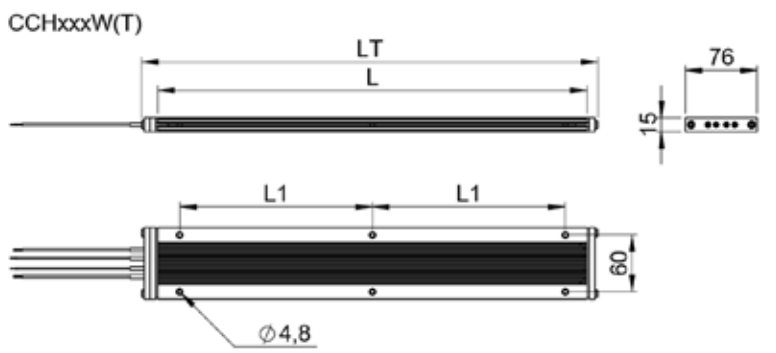
CCH cable connection IP54

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



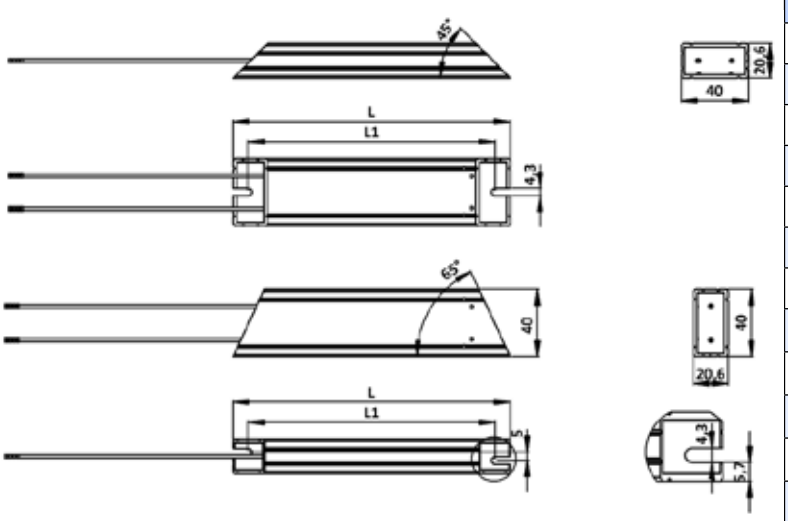
CCH with thermal switch, cable connection IP54

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 with thermal switch, cable connection 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

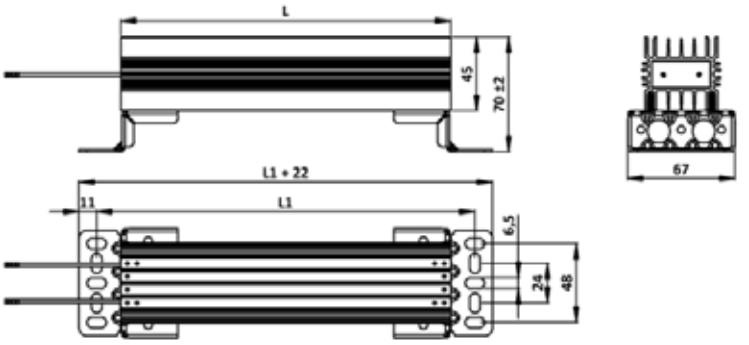


CCH cable connection IP54

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

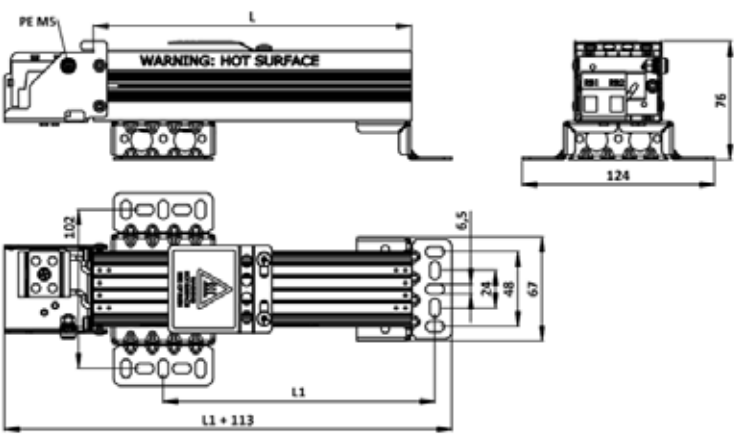
CAR cable connection IP54

Type	L ± 2 mm	L1 ± 2 mm	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



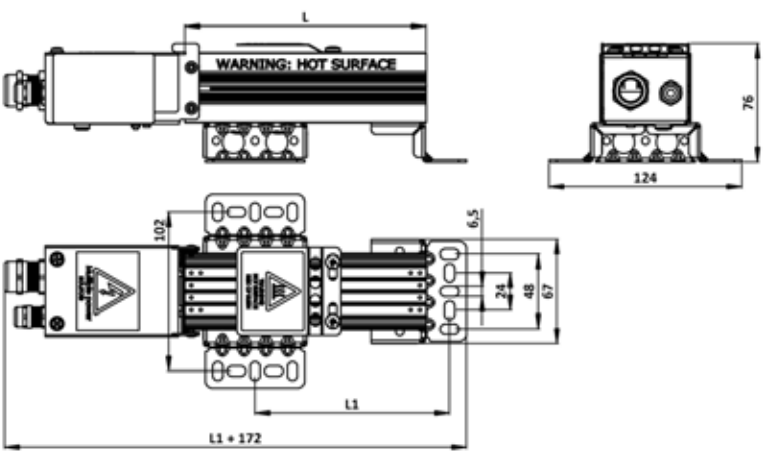
CAR box connection IP00/IP20/IP21

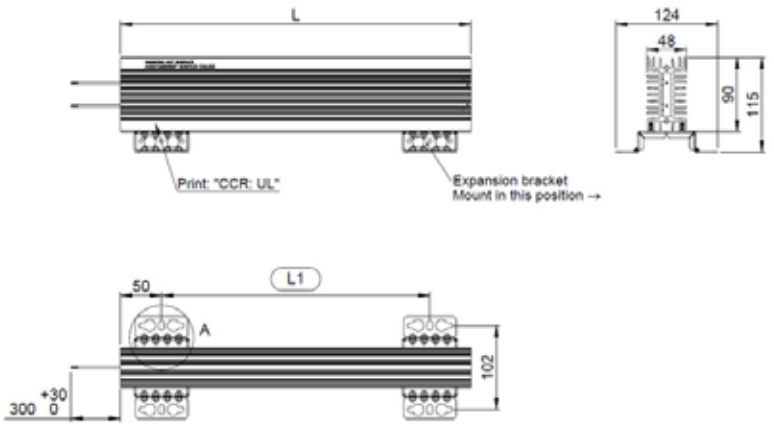
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAR 115 K/-D	115	85	450/650
CAR 130 K/-D	130	100	470/700
CAR 175 K/-D	175	145	550/750
CAR 205 K/-D	205	175	700/900
CAR 265 K/-D	265	235	800/950
CAR 325 K/-D	325	195	900/1100



CAR with thermal switch, box connection IP00/IP20/IP21

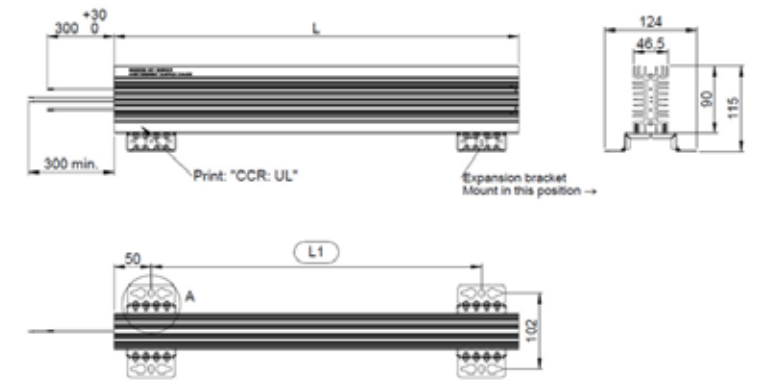
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAR 140 KT/-DT	140	110	510/720
CAR 155 KT/-DT	155	125	540/760
CAR 200 KT/-DT	200	170	610/810
CAR 230 KT/-DT	230	200	760/960
CAR 290 KT/-DT	290	260	860/1010
CAR 350 KT/-DT	350	320	970/1160





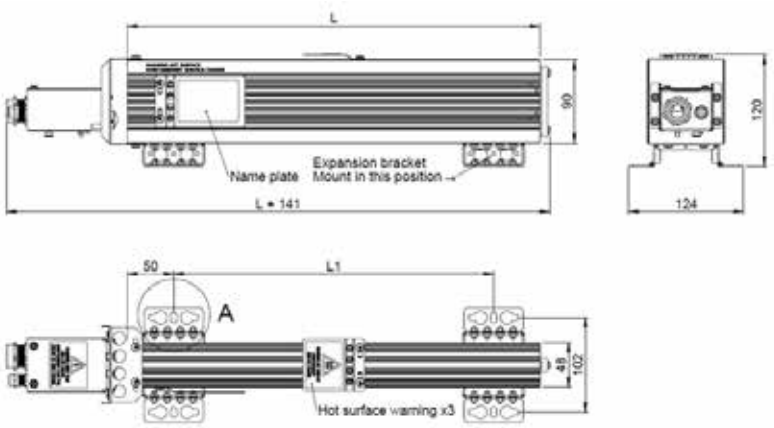
CCR xxx C, cable connection IP54

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCR-V 116 C	116	-	0.85
CCR-V 172 C	172	72	1.15
CCR-V 222 C	222	122	1.35
CCR-V 276 C	276	176	1.65
CCR-V 326 C	326	226	1.95
CCR-V 426 C	426	326	2.45
CCR-V 526 C	526	426	2.95
CCR-V 626 C	626	526	3.45



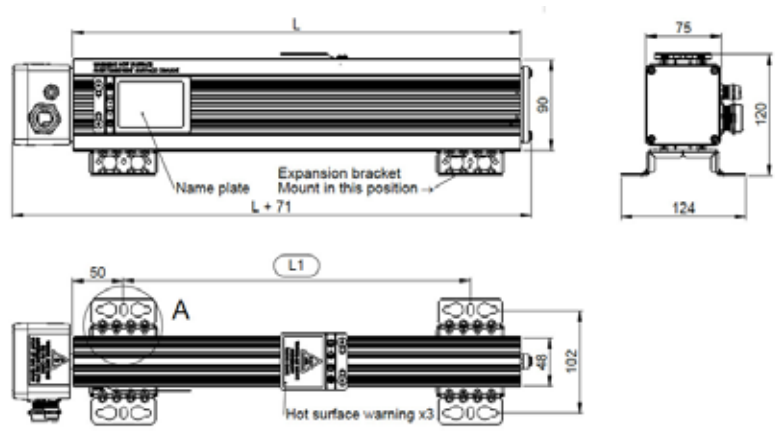
CCR xxx CT, cable connection IP54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCR-V 145 CT	145	-	0.95
CCR-V 201 CT	201	91	1.25
CCR-V 251 CT	251	141	1.45
CCR-V 305 CT	305	195	1.75
CCR-V 355 CT	355	245	2.05
CCR-V 455 CT	455	345	2.55
CCR-V 555 CT	555	445	3.05
CCR-V 655 CT	655	545	3.55



CCR-V xxx DT, box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCR-V 145 DT	145	-	1.45
CCR-V 201 DT	201	91	1.75
CCR-V 251 DT	251	141	1.95
CCR-V 305 DT	305	195	2.25
CCR-V 355 DT	355	245	2.55
CCR-V 445 DT	455	345	3.05
CCR-V 555 DT	555	445	3.55
CCR-V 665 DT	655	545	4.05

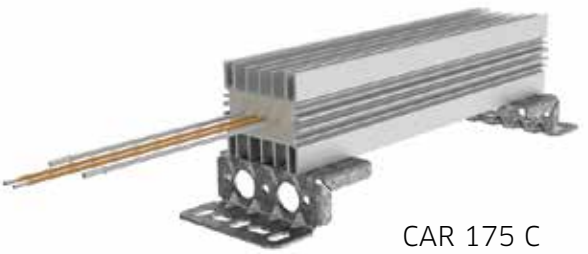


CCR-V xxx BT, box connection IP54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCR-V 145 BT	145	-	1.46
CCR-V 201 BT	201	91	1.76
CCR-V 251 BT	251	141	1.96
CCR-V 305 BT	305	195	2.26
CCR-V 355 BT	355	245	2.56
CCR-V 455 BT	455	345	3.06
CCR-V 555 BT	555	445	3.56
CCR-V 655 BT	655	545	4.06

CCH 110 C

CAH 120 C



CAR 175 C

CCR 355 CT

Connection box	IP rating	Cable gland	Clamping mm	Braid mm	Connection	TS gland	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
B-box*	IP65	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4

Connection boxes (optional)

D-box

B-box*

K-box

* Only for CCR type available

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

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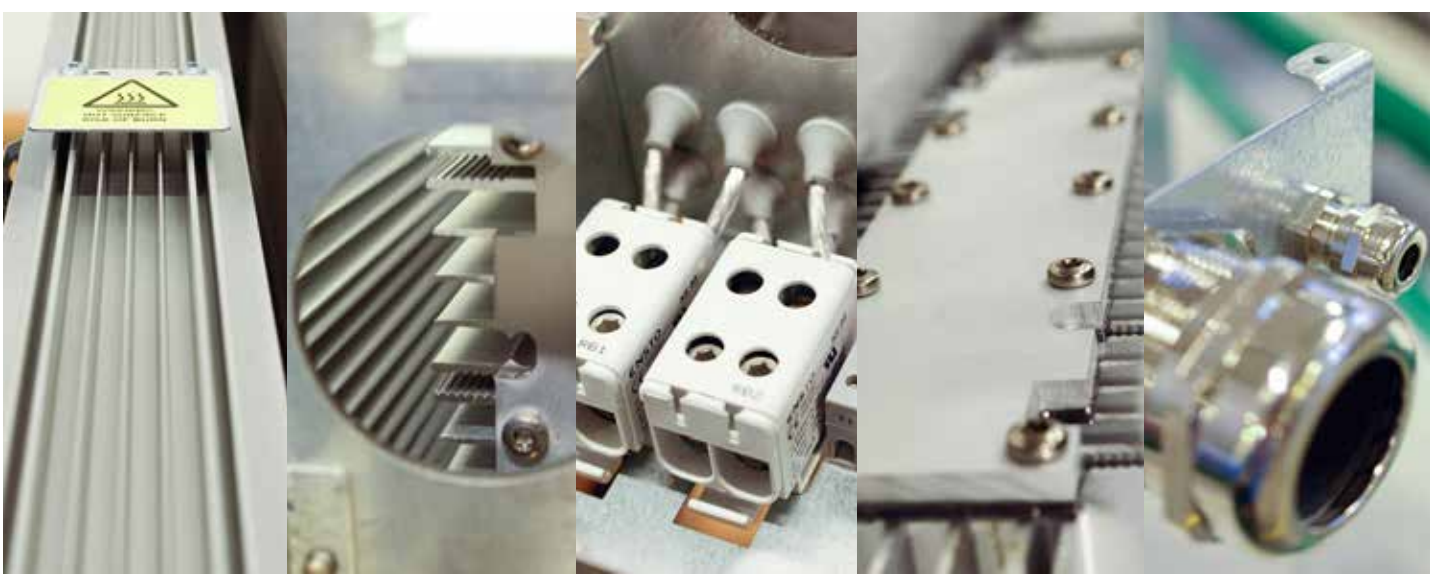


DANOTHERM™

CBH / CBV / CBR-H / CBR-V

CBH / CBV / CBR Cable cable connection IP54

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s			
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 40 seconds
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
- 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 (CAR type)
- Optional thermal switch or PT100 element for thermal protection
- Cable 300mm (AWG 18–AWG10) with sleeves or box connection up to 10mm2
- Customized to your needs and application (OEM versions available)

CBR-V 225 KT

CBH / CBV / CBR Cable cable connection IP54, with thermal switch

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW*, Temp. amb 40°C, cycle 120s			
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 40 seconds
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	160	210	0.5 - 1000	5.4	1.5	1	0.5
CBR-V / H 210 xT	230	210	0.8 - 1500	10.6	2.8	1.8	0.9
CBR-V / H 260 xT	300	225	1.5 - 2000	18.4	4.6	2.8	1.3
CBR-V / H 330 xT	390	230	1.8 - 2000	30	7.1	4.2	1.7
CBR-V / H 400 xT	490	230	2.0 - 2000	38.8	11.4	6.8	2.1
CBR-V / H 460 xT	740	240	2.4 - 2000	39.4	12.9	8	2.4
CBR-V / H 560 xT	920	250	3.0 - 2000	49.4	16.2	10	3.1
CBR-V / H 660 xT	1110	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

CBRK 1000V, without thermal switch cable connection IP54

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW*, Temp. amb 40°C, cycle 120s			
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 40 seconds
CBRK 125 C	135	210	0.5 - 1000	5.4	1.5	1	0.5
CBRK 175 C	210	210	0.8 - 1500	10.6	2.8	1.8	0.9
CBRK 225 C	280	225	1.5 - 2000	18.4	4.6	2.8	1.3
CBRK 295 C	400	230	1.8 - 2000	30	7.1	4.2	1.7
CBRK 365 C	500	230	2.0 - 2000	38.8	11.4	6.8	2.1
CBRK 426 C	650	240	2.4 - 2000	39.4	12.9	8	2.4
CBRK 526 C	800	250	3.0 - 2000	49.4	16.2	10	3.1
CBRK 626 C	1000	260	3.5 - 2000	60.6	19.7	12.1	3.8
CBRK 726 C	1200	260	4.0 - 2000	73.8	23.3	14.2	4.3

CBRK 1000V, with thermal switch cable or box connection

Type	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW*, Temp. amb 40°C, cycle 120s			
				duty 1 second	duty 5 seconds	duty 10 seconds	duty 40 seconds
CBRK 160 xT	180	210	0.5 - 1000	5.4	1.5	1	0.5
CBRK 210 xT	250	210	0.8 - 1500	10.6	2.8	1.8	0.9
CBRK 260 xT	330	225	1.5 - 2000	18.4	4.6	2.8	1.3
CBRK 330 xT	440	230	1.8 - 2000	30	7.1	4.2	1.7
CBRK 400 xT	540	230	2.0 - 2000	38.8	11.4	6.8	2.1
CBRK 460 xT	610	240	2.4 - 2000	39.4	12.9	8	2.4
CBRK 560 xT	780	250	3.0 - 2000	49.4	16.2	10	3.1
CBRK 660 xT	950	260	3.5 - 2000	60.6	19.7	12.1	3.8
CBRK 760 xT	1100	260	4.0 - 2000	73.8	23.3	14.2	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:		> 20MΩ / 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	± 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 / 850VDC ; IEC: 690VAC / 975VDC
	On request	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 @ 250VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

Connection box	IP rating	Cable gland	Clamping mm	Braid mm	Connection mm^2	TS gland	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*

Connection boxes (optional)

*Thermal switch with K-box optional

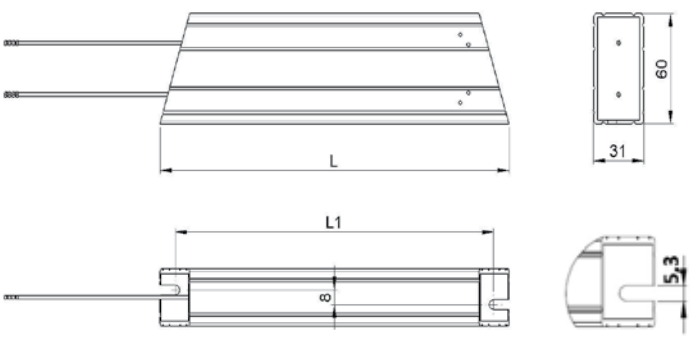
D-box

B-box

K-box

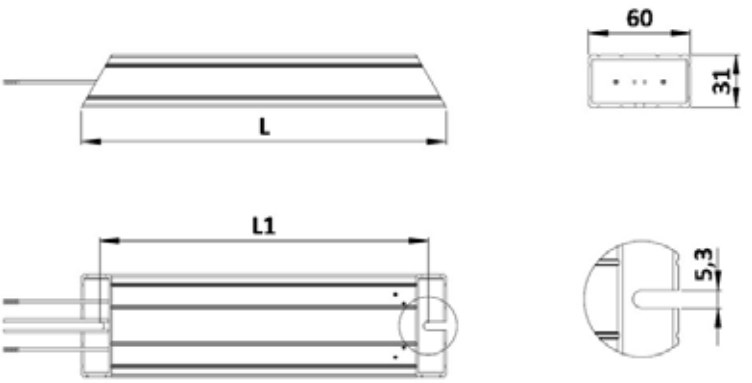
CBH / CBV with cable connection IP 54

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

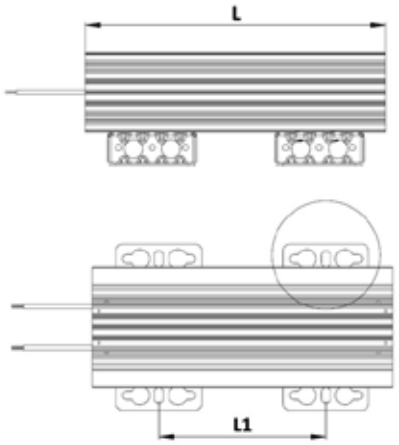


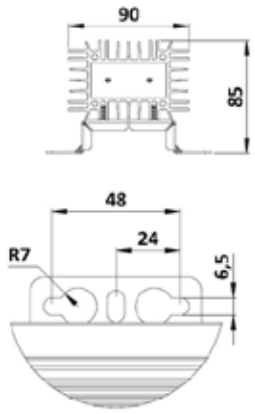
CBH / CBV with cable connection IP 54
with thermal switch

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



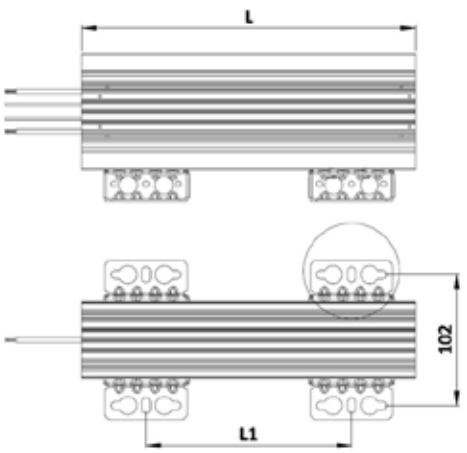
Mechanical drawings

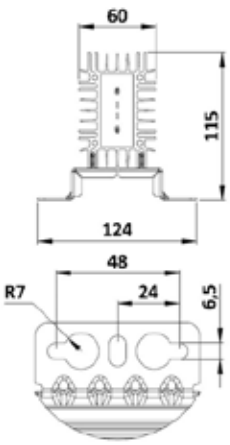




CBR-H … C … cable connection IP54

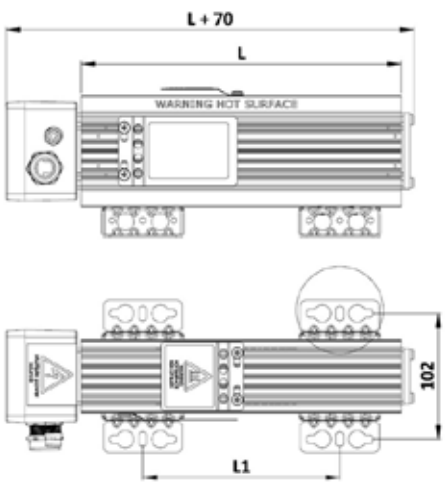
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBR-V/CBR-H 175 C 001	175	75	1.5
CBR-V/CBR-H 225 C 001	225	125	1.8
CBR-V/CBR-H 295 C 001	295	195	2.3
CBR-V/CBR-H 365 C 001	365	265	2.8
CBR-V/CBR-H 426 C 001	426	326	3.2
CBR-V/CBR-H 526 C 001	526	426	3.8
CBR-V/CBR-H 626 C 001	626	526	4.5
CBR-V/CBR-H 726 C 001	726	626	5.2

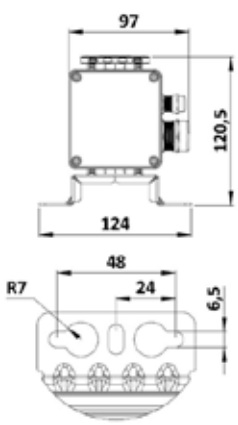




CBR-V … CT … cable connection IP 54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
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



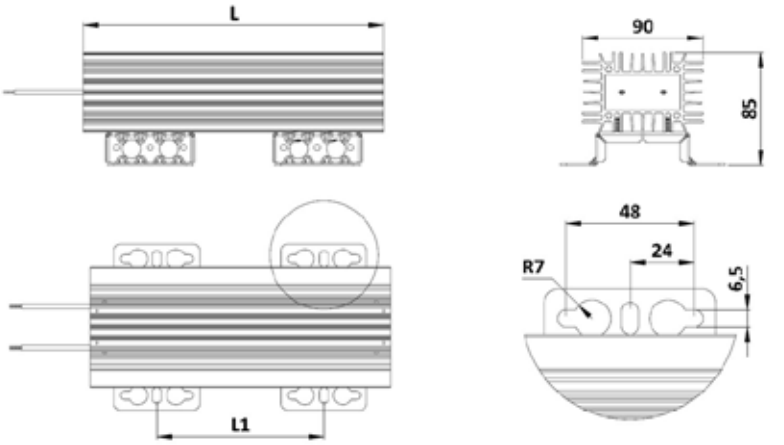


CBR-V … BT … box connection IP 54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
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

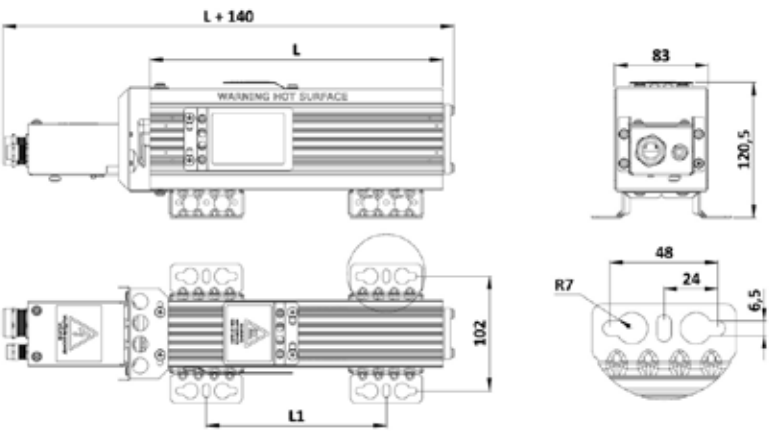
CBR-V … W … cable connection IP65 with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
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



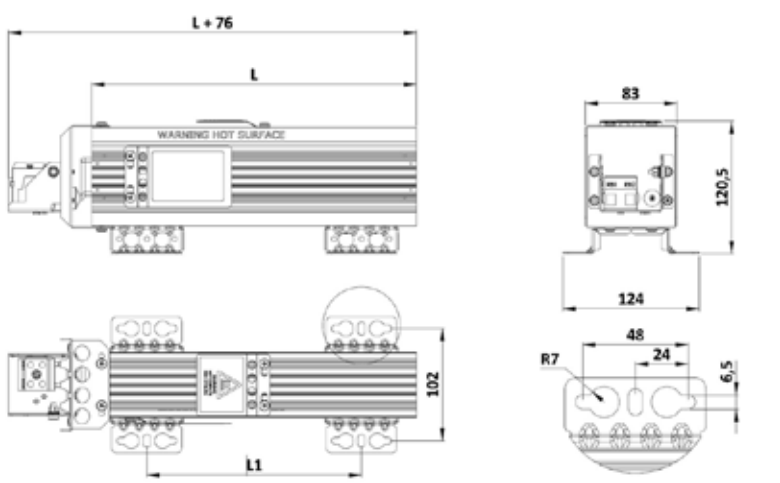
CBR-V … DT … box connection IP 20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
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



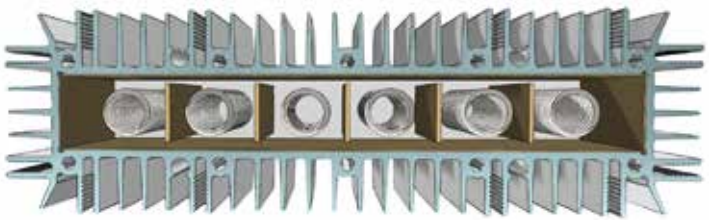
CBR-V … KT … box connection IP 00

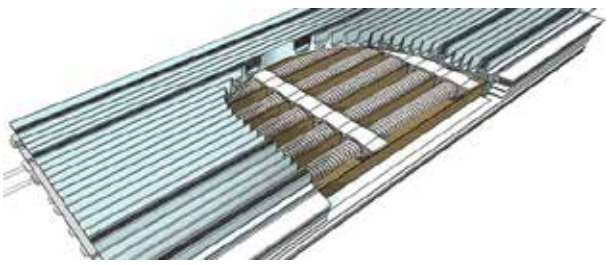
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBR-V 175 K 201	175	75	1.3
CBR-V 225 K 201	225	125	1.8
CBR-V 295 K 201	295	195	2.4
CBR-V 365 K 201	365	265	3.0
CBR-V 426 K 201	426	326	3.5
CBR-V 526 K 201	526	426	3.9
CBR-V 626 K 201	626	526	4.6
CBR-V 726 K 201	726	626	5.4

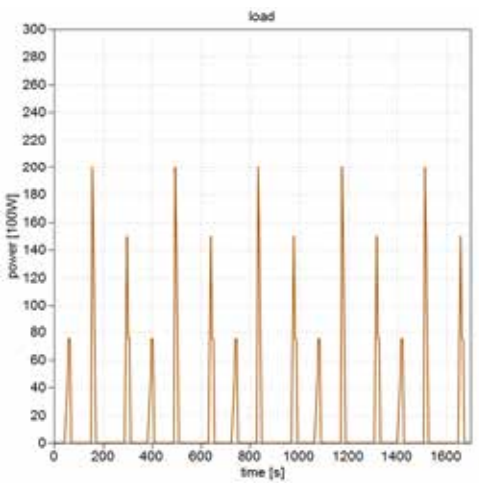


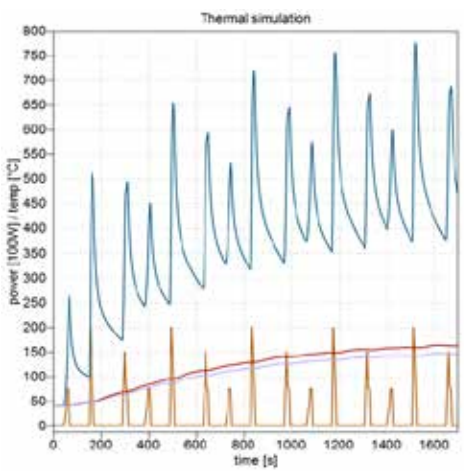
Danotherm has developed a thermal simulation method by which it is possible to optimize a resistor to a specified application. This gives following benefits:

- 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







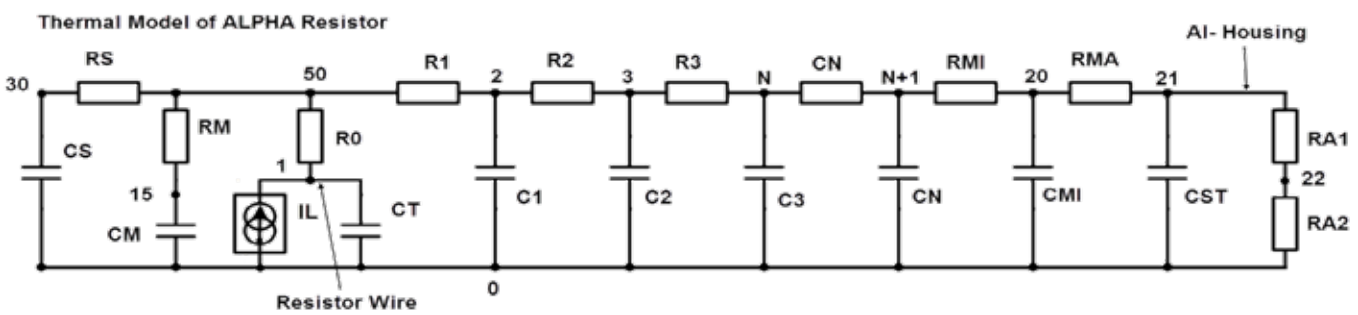


Measured on site: Brake Power saved in .cvs file.

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.



DANOTHERM™

CBT-H / CBT-V

# Housings	Nominal power [W] @ 40°C according UL0508							
	Single housing				2 housings	3 housings	4 housings	Single housing
	no thermal switch		thermal switch		no thermal switch			
Length / Type	CBT *	CBT	CBT *	CBT	CBT	CBT	CBT	R [Ω] min-max
CBT 180	380	455	380	380				0.04 - 13
CBT 210	520	585	520	520				0.05 - 2000
CBT 260	760	850	750	750				0.07 - 2000
CBT 330	1100	1350	1100	1100				0.09 - 2000
CBT 400	1440	1650	1440	1440	1920	2610	3490	0.11 - 2000
CBT 460	1730	1900	1725	1725	2540	3810	5080	0.14 - 2000
CBT 560		2310		2095	3170	4710	6250	0.18 - 110
CBT 660		2720		2470	3810	5720	7620	0.22 - 130
CBT 760		3200		2905	4530	6530	8710	0.27 - 150
CBT 860		3640		3305	4990	7260	9800	0.31– 180
CBT 960		4070		3695	6260	8170	10890	0.35 - 220

* CBT for high Ohm values

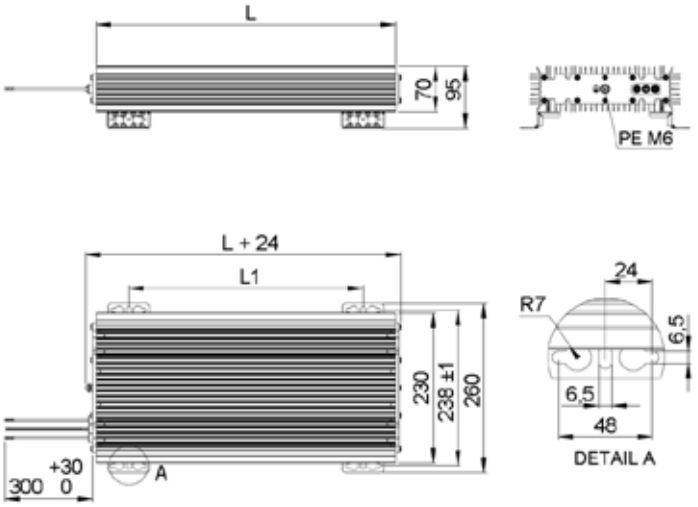
See nomenclature page 64

Construction and salient properties

- Compact dimensions
- Nominal power range from 380W–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
- 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
- Cable 300mm (AWG 14–AWG4) with cable sleeves 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

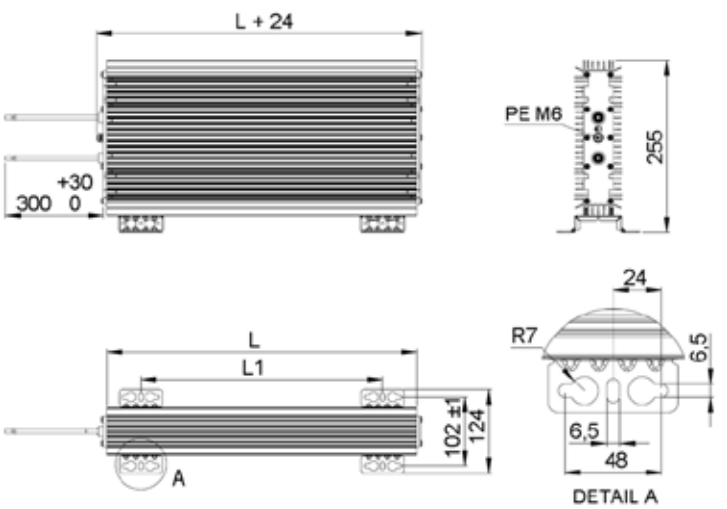
Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		10 - 100 x (depending on resistor)
Overload: @ 5 sec pulse / hour		4 - 25 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable 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	± 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 / 850VDC ; IEC: 690VAC / 975VDC
	On request	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 @ 250VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

CBT-H … CT … cable connection IP50
with and without thermal switch



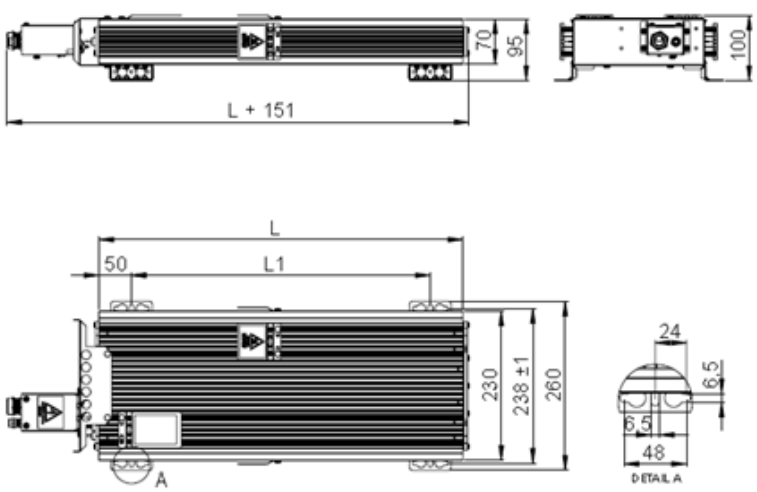
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-H 180 C(H/E)(T) 0X1	180	70	3.1
CBT-H 210 C(H/E)(T) 0X1	210	110	3.6
CBT-H 260 C(H/E)(T) 0X1	260	160	4.5
CBT-H 330 C(H/E)(T) 0X1	330	230	5.9
CBT-H 400 C(H/E)(T) 0X1	400	300	7.3
CBT-H 460 C(H/E)(T) 0X1	460	360	8.5
CBT-H 560 C(H/E)(T) 0X1	560	460	10
CBT-H 660 C(H/E)(T) 0X1	660	560	12
CBT-H 760 C(H/E)(T) 0X1	760	660	13.8
CBT-H 860 C(H/E)(T) 0X1	860	760	16
CBT-H 960 C(H/E)(T) 0X1	960	860	17.8

CBT-V … CT … cable connection IP50
with and without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 180 C(H/E)(T) 0X1	180	70	3.1
CBT-V 210 C(H/E)(T) 0X1	210	110	3.6
CBT-V 260 C(H/E)(T) 0X1	260	160	4.5
CBT-V 330 C(H/E)(T) 0X1	330	230	5.9
CBT-V 400 C(H/E)(T) 0X1	400	300	7.3
CBT-V 460 C(H/E)(T) 0X1	460	360	8.5
CBT-V 560 C(H/E)(T) 0X1	560	460	10
CBT-V 660 C(H/E)(T) 0X1	660	560	12
CBT-V 760 C(H/E)(T) 0X1	760	660	13.8
CBT-V 860 C(H/E)(T) 0X1	860	760	16
CBT-V 960 C(H/E)(T) 0X1	960	860	17.8

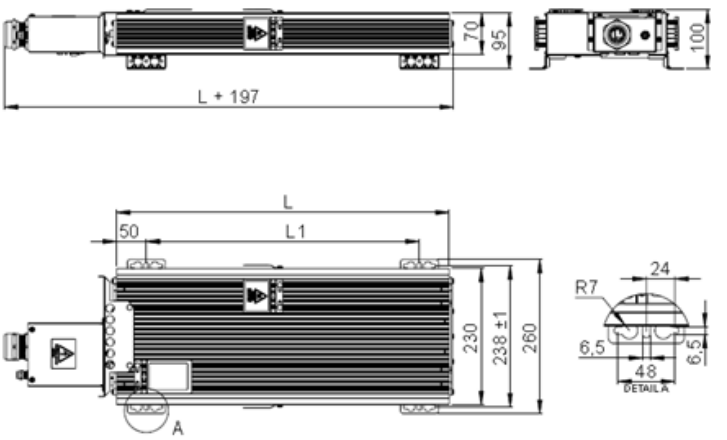
CBT-H … D … box connection IP54
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-H 180 D(H/E)(T) 2X1	180	70	3.9
CBT-H 210 D(H/E)(T) 2X1	210	110	4.2
CBT-H 260 D(H/E)(T) 2X1	260	160	5.1
CBT-H 330 D(H/E)(T) 2X1	330	230	6.7
CBT-H 400 D(H/E)(T) 2X1	400	300	8.2
CBT-H 460 D(H/E)(T) 2X1	460	360	9.2
CBT-H 560 D(H/E)(T) 2X1	560	460	11
CBT-H 660 D(H/E)(T) 2X1	660	560	12.8
CBT-H 760 D(H/E)(T) 2X1	760	660	14.6
CBT-H 860 D(H/E)(T) 2X1	860	760	16.8
CBT-H 960 D(H/E)(T) 2X1	960	860	18.6

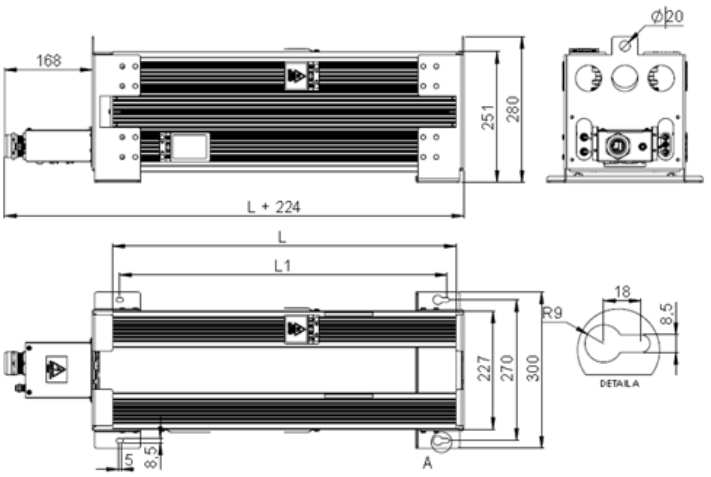
CBT-H … G … box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-H 180 G(H/E)(T) 2X1	180	70	3.9
CBT-H 210 G(H/E)(T) 2X1	210	110	4.2
CBT-H 260 G(H/E)(T) 2X1	260	160	5.1
CBT-H 330 G(H/E)(T) 2X1	330	230	6.7
CBT-H 400 G(H/E)(T) 2X1	400	300	8.2
CBT-H 460 G(H/E)(T) 2X1	460	360	9.2
CBT-H 560 G(H/E)(T) 2X1	560	460	11
CBT-H 660 G(H/E)(T) 2X1	660	560	12.8
CBT-H 760 G(H/E)(T) 2X1	760	660	14.6
CBT-H 860 G(H/E)(T) 2X1	860	760	16.8
CBT-H 960 G(H/E)(T) 2X1	960	860	18.6



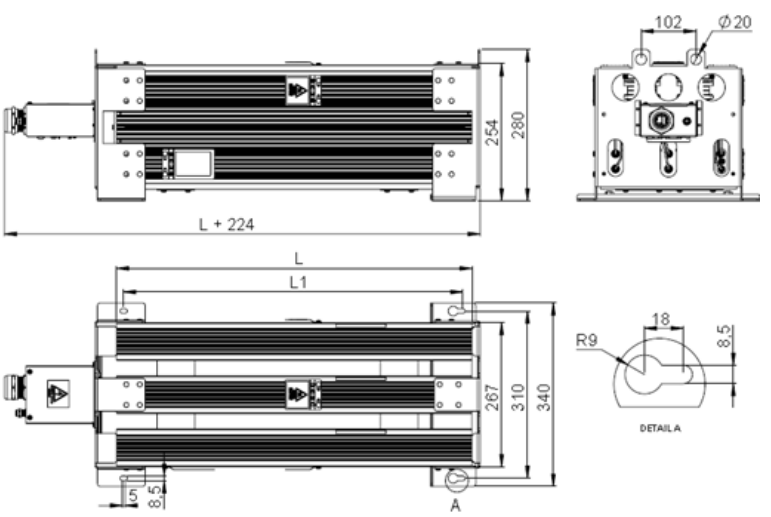
CBT-V … G … box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 400 G(H/E)(T) 2X2	400	370	18
CBT-V 460 G(H/E)(T) 2X2	460	430	20.5
CBT-V 560 G(H/E)(T) 2X2	560	530	23.5
CBT-V 660 G(H/E)(T) 2X2	660	630	27
CBT-V 760 G(H/E)(T) 2X2	760	730	30.5
CBT-V 860 G(H/E)(T) 2X2	860	830	34.0
CBT-V 960 G(H/E)(T) 2X2	960	930	37.5

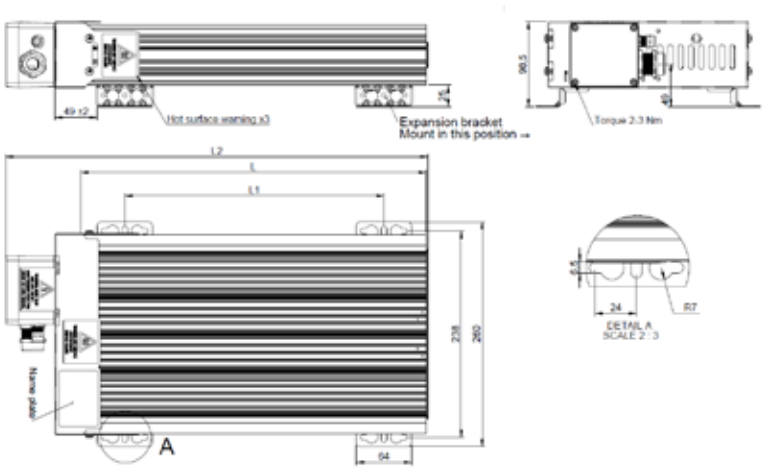


CBT-V … G … box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 400 G(H/E)(T) 2X3	400	370	25.5
CBT-V 460 G(H/E)(T) 2X3	460	430	29
CBT-V 560 G(H/E)(T) 2X3	560	530	33.5
CBT-V 660 G(H/E)(T) 2X3	660	630	39
CBT-V 760 G(H/E)(T) 2X3	760	730	44.5
CBT-V 860 G(H/E)(T) 2X3	860	830	51
CBT-V 960 G(H/E)(T) 2X3	960	930	57

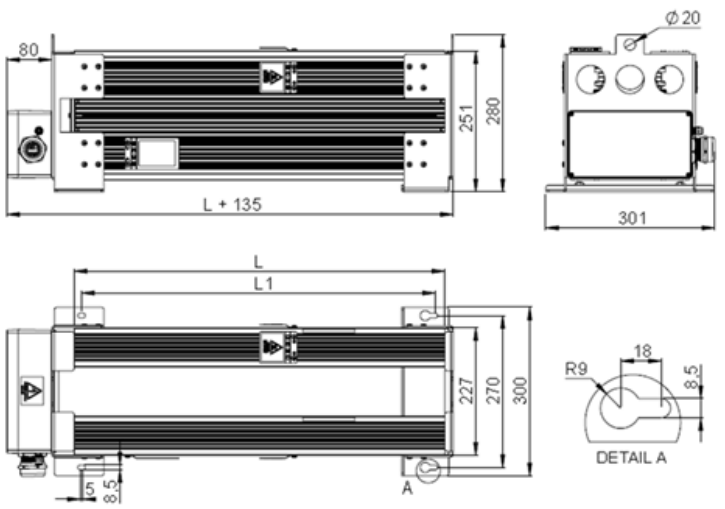


CBT-H … B 2.1 cable connection IP65
with thermal switch



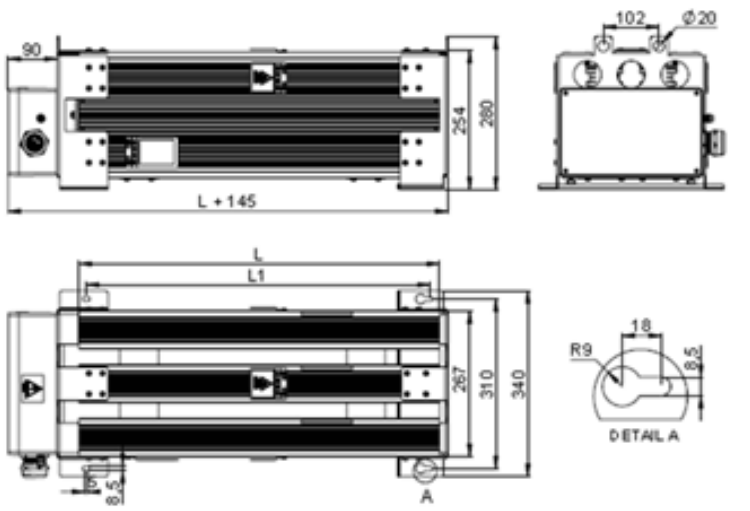
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-H 180 B(H)(T) 2X1	180	70	3.9
CBT-H 210 B(H)(T) 2X1	210	110	4.2
CBT-H 260 B(H)(T) 2X1	260	160	5.1
CBT-H 330 B(H)(T) 2X1	330	230	6.7
CBT-H 400 B(H)(T) 2X1	400	300	8.2
CBT-H 460 B(H)(T) 2X1	460	360	9.2
CBT-H 560 B(H)(T) 2X1	560	460	11.0
CBT-H 660 B(H)(T) 2X1	660	560	12.8
CBT-H 760 B(H)(T) 2X1	760	660	14.6
CBT-H 860 B(H)(T) 2X1	860	760	16.8
CBT-H 960 B(H)(T) 2X1	960	860	18.6

CBT-V … B 2.2 cable connection IP65
with thermal switch



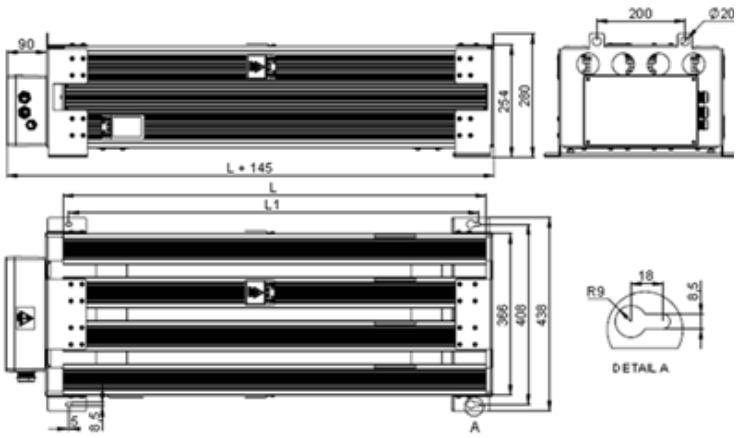
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 400 B(H)(T) 2X2	400	370	18.0
CBT-V 460 B(H)(T) 2X2	460	430	20.5
CBT-V 560 B(H)(T) 2X2	560	530	23.5
CBT-V 660 B(H)(T) 2X2	660	630	27.0
CBT-V 760 B(H)(T) 2X2	760	730	30.5
CBT-V 860 B(H)(T) 2X2	860	830	35.5
CBT-V 960 B(H)(T) 2X2	960	930	39.0

CBT-V … B 2.3 box connection IP65
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 400 B(H/E(T) 2X3	400	370	25.5
CBT-V 460 B(H/E)(T) 2X3	460	430	29.0
CBT-V 560 B(H/E)(T) 2X3	560	530	33.5
CBT-V 660 B(H/E)(T) 2X3	660	630	39.0
CBT-V 760 B(H/E)(T) 2X3	760	730	44.5
CBT-V 860 B(H/E)(T) 2X3	860	830	51.0
CBT-V 960 B(H/E)(T) 2X3	960	930	57.0

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBT-V 400 B(H/E)(T) 2X4	400	370	25.5
CBT-V 460 B(H/E)(T) 2X4	460	430	29.0
CBT-V 560 B(H/E)(T) 2X4	560	530	33.5
CBT-V 660 B(H/E)(T) 2X4	660	630	39.0
CBT-V 760 B(H/E)(T) 2X4	760	730	44.5
CBT-V 860 B(H/E)(T) 2X4	860	830	51.0
CBT-V 960 B(H/E)(T) 2X4	960	930	57.0



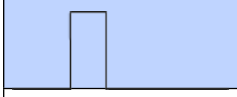
Connection box	IP rating	Cable gland	Clamping mm	Braid mm	Connection mm²	TS gland	Clamping mm	Connection mm²
B-box single	IP65	M25	9-16.6	7.5	1.5-50	M12	3-7	0.5-4
B-box multiple	IP65	M40	19-28	15	1.5-50	M12	3-7	0.5-4
D-box	IP21	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4
G-box	IP21	M40	19-28	15	1.5-50	M12	3-7	0.5-4
K-type	IP00	-	-	-	0.75-10	-	-	-

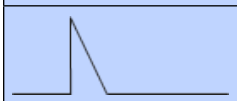
B-box

B-box multiple housings

D-box

G-box

Type	Square pulse each 120seconds, ambient temperature 40°C.									
	duty 1 second kW	Max temp °C	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
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

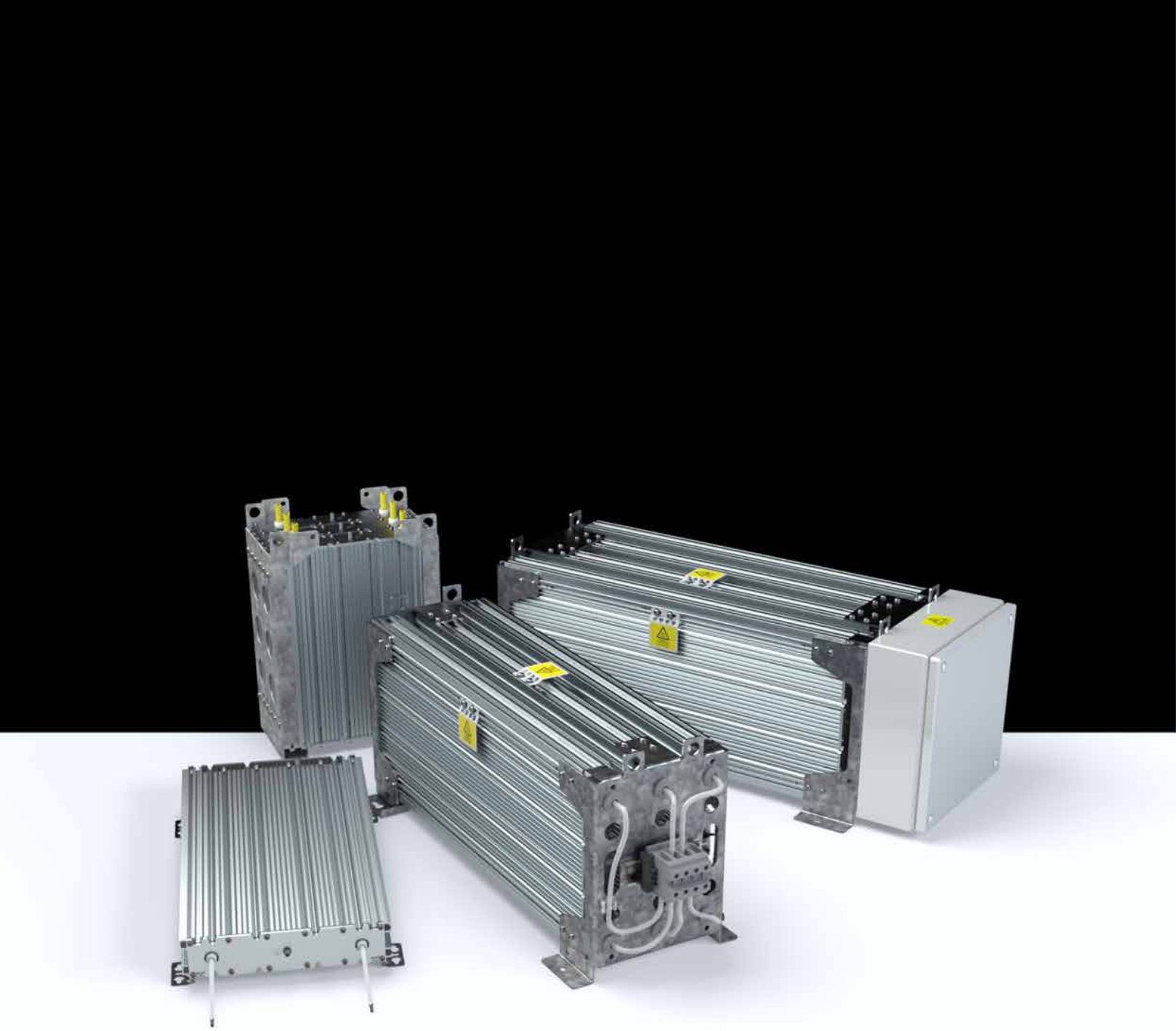
Type	Triangular pulse each 120seconds, ambient temperature 40°C.									
	duty 1 second kW	Max temp °C	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CBT-H 180 15R	39	110	10.7	140	6.3	160	3.8	190	2.3	220
CBT-H 210 100R	50	110	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.



CBS / CMQ / CVS / HVBS / HVS

Nominal power [W] @ 40°C										
Housing length	Single housing without thermal switch cable version				Single housing with thermal switch and/or box version			Ohm range R [Ω] min-max		
	CBS*	CBS	CMQ	CVS	CBS	CMQ	CVS	CBS	CMQ	CVS
210	450	580	800	-	445	555	-	0.05-20	0.07-35	-
260	610	850	1100	-	610	855	-	0.07-35	0.07-50	-
330	840	1135	1500	-	840	1090	-	0.09-50	0.07-80	-
400	1060	1375	1900	1995	1055	1320	1390	0.11-65	0.10-110	0.10-12
460	1260	1585	2200	2310	1215	1520	1600	0.14-85	0.12-130	0.12-14
560		1925	2700	2830	1480	1850	1940	0.18-110	0.15-160	0.15-20
660		2270	3100	3250	1745	2180	2290	0.22-130	0.19-200	0.19-24
760		2770	3500	3670	2130	2660	2790	0.27-150	0.23-240	0.23-28
860		3190	3850	4040	2450	3060	3210	0.31-180	0.27-280	0.27-32
960		3565	4150	4350	2740	3420	3590	0.35-220	0.30-320	0.30-36
Housing length	Double housing				Triple housing			Quadruple housing		
	without thermal switch, cable version									
	CBS*	CBS	CMQ	CVS	CBS	CMQ	CVS	CBS	CMQ	CVS
400		2340	2970	3070	2850	4350	4560	3800	5500	5830
460		2700	3370	3540	3400	5000	5250	4600	6500	6820
560		3270	4090	4290	4750	6050	6350	6300	8000	8400
660		3860	4820	5050	5400	7100	7450	7200	9100	9550
760		4700	5870	6160	6700	8500	8900	9000	11000	11500
860		5400	6750	7080	7660	10000	10500	10200	13000	13650
960		6060	7570	7950	8500	11200	11750	11300	14000	14700
Housing length	Double housing				Triple housing			Quadruple housing		
	with thermal switch and/or connection box									
	CBS*	CBS	CMQ	CVS	CBS	CMQ	CVS	CBS	CMQ	CVS
400		1790	1630	1710	2180	2390	2530	2910	3020	4430
460		2060	1980	1960	2600	2940	3000	3520	3820	5180
560		2510	2310	2450	3650	3420	4060	4840	4530	6380
660		2960	2680	3230	4150	3940	4470	5530	5050	7250
760		3610	3350	3690	5150	4850	5590	6920	6280	8740
860		4140	3790	4450	5880	5620	6580	7830	7310	10370
960		4650	4340	4960	6530	6420	7310	8680	8030	11170

Type	Pn [W] @ 40°C	Ohm range R [Ω] min-max	Double housing	Triple housing	Quadruple housing
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

*High Ohm values

Temperature Coefficient:		100 ppm/K
Dielectric strength	HVBS	7000 VAC @ 1 minute
	HVS	10000 VAC @ 1 minute
	other types	3500 VAC @ 1 minute
Insulation Resistance:		> 20MΩ / 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 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	box version	UL: 600VAC / 850VDC ; IEC: 690VAC / 975VDC
	cable version	1000VAC / 1400VDC
	HVBS cable version	IEC: 3000VAC / 4200VDC
	HVS cable and box	IEC: 3000VAC / 4200VDC
Time constant for heating up resistor		1000-3000s
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 @ 250VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

*Optional for CBS / CMQ and CVS

Construction and salient 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 300mm (AWG 10–AWG4) with sleeves or box connection up to 50mm^2
- Multiple case housings (from 2-4 housings)
- Customized to your needs and application (OEM versions available)

B-box single housings

B-box multiple housings

Connection box	IP rating	Cable gland	Clamping mm	Braid mm	Connection mm^2	TS gland	Clamping mm	Connection mm^2
B-box single	IP56	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4
B-box multiple	IP56	M40	19-28	15	1.5-50	M12	3-7	0.5-4
K-type	IP00	-	-	-	0.75-10	-	-	0.5-4*

CVS-V 560 KH 003 xxR

Type	IP rating	Cable gland	No. cable glands	clamping range mm	Braid min Ø mm	Electrical connection mm^2
CBS-H1C	IP50	-	-	-	-	-
CBS-H-1B	IP54	M25	1	9-16.6	7.5	0.75-10*
CBS-H-2B/3B/4B	IP54	M25	2	9-16.6	7.5	0.75-10*
CMQ-H1C	IP50	-	-	-	-	-
CMQ-V1B	IP54	M25	1	9-16.6	7.5	0.75-10*
CMQ-V2B/3B/4B	IP54	M25	2	9-16.6	7.5	0.75-10*
CVS-H1C	IP50	-	-	-	-	-
CVS-H1B	IP54	M25	1	9-16.6	7.5	0.75-10*
CVS-V2B/3B/4B	IP54	M25	2	9-16.6	7.5	0.75-10*
thermal switch (optional)	-	M12	1	3-7	-	0.5-4

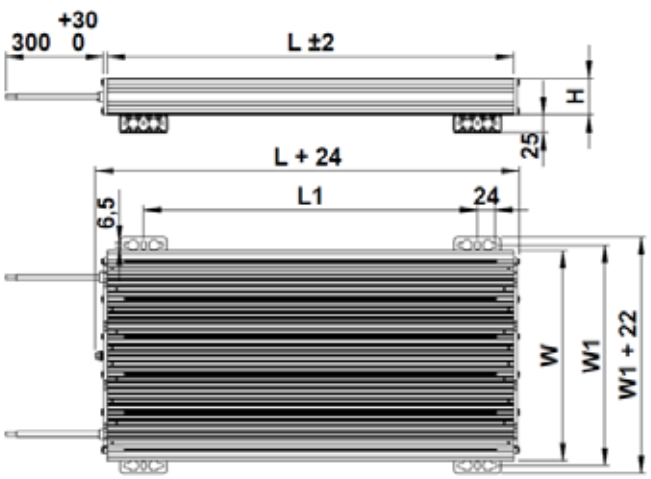
* Maximum current 40A continous
* 60A with ED 40%, cycle time 30s

CBS/CMQ/CVS/HVS -H ... C ... cable connection IP50/IP54/65

with and without thermal switch

	L ± 2	L1 ± 2	Weight [g]		
Type/Length	mm	mm	CBS	CMQ	CVS
210 CH 001	210	110	3.6	5.2	-
260 CH 001	260	160	4.5	6.5	-
330 CH 001	330	230	5.7	8.3	-
400 CH 001	400	300	7.0	10.3	12.3
460 CH 001	460	360	8.2	12.0	14.5
560 CH 001	560	460	10.0	14.9	17.9
660 CH 001	660	560	12.0	17.7	21.4
760 CH 001	760	660	14.2	20.2	25.2
860 CH 001	860	760	16.3	23.0	28.7
960 CH 001	960	860	17.6	26.3	31.6

Type	H	W ± 1	W1 ± 1
CBS	47	218	230
CMQ	50	290	304
HVBS	50	290	304
CVS/HVS	60	290	304

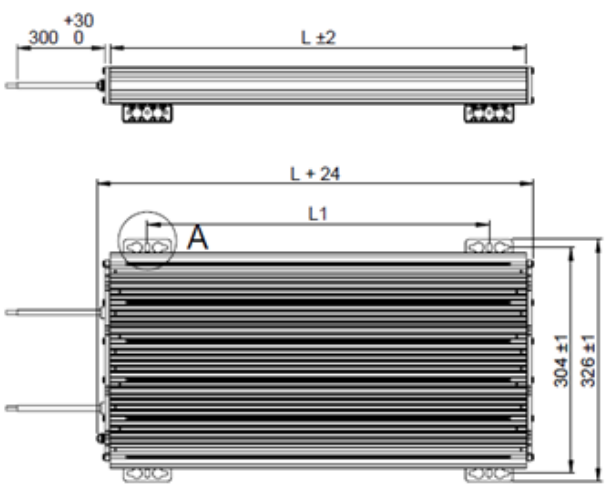


All tables show standard lentghs.
Customer specific lengths are available.

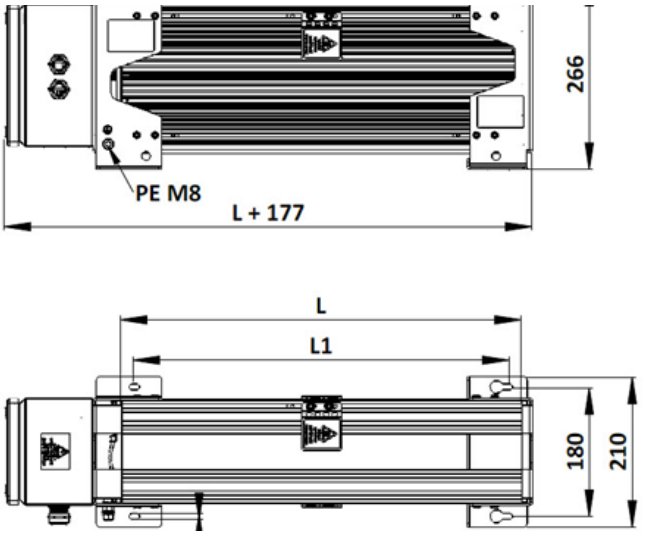
HVBS-H ... C ... cable connection IP50/IP54/65

without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
HVBS 300 CH 001	300	200	7.5
HVBS 370 CH 001	370	270	9.3
HVBS 440 CH 001	440	340	11.3
HVBS 520 CH 001	520	420	13.5
HVBS 620 CH 001	620	520	16.5
HVBS 720 CH 001	720	620	19.3
HVBS 820 CH 001	820	720	21.8
HVBS 920 CH 001	920	820	24.6
HVBS 1000 CH 001	1000	900	27.4

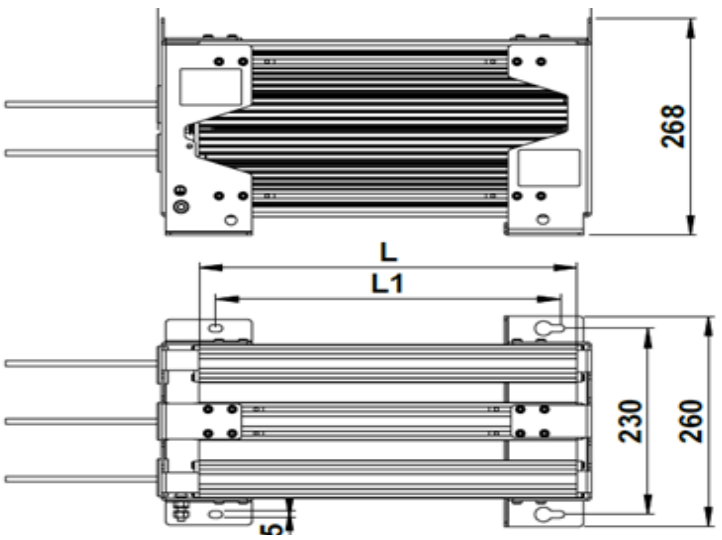


CBS-V … B 2.2 box connection IP54
with and without thermal switch



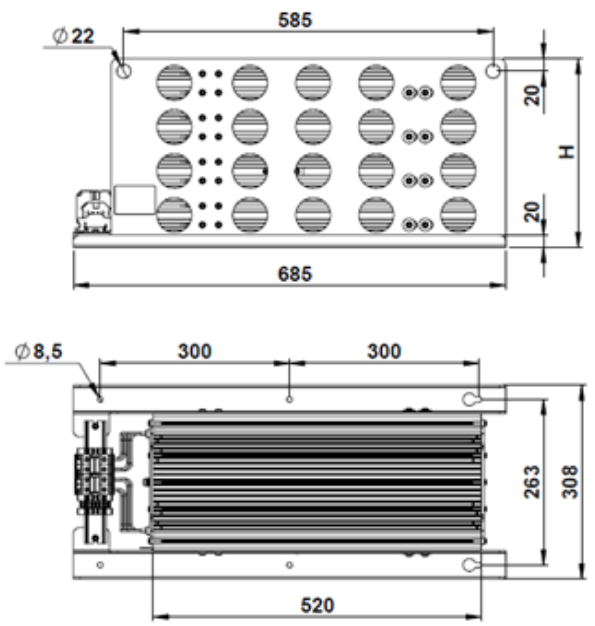
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBS-V 400 BGH 2x2	400	365	16.0
CBS-V 460 BGH 2x2	460	425	18.4
CBS-V 560 BGH 2x2	560	525	22.0
CBS-V 660 BGH 2x2	660	625	26.0
CBS-V 760 BGH 2x2	760	725	30.4
CBS-V 860 BGH 2x2	860	825	34.6
CBS-V 960 BGH 2x2	960	925	37.2

CBS-V … B 2.3 cable connection IP50/IP54
with and without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBS-V 400 C(H/E) 0x3	400	365	22.0
CBS-V 460 C(H/E) 0x3	460	425	25.6
CBS-V 560 C(H/E) 0x3	560	525	31.0
CBS-V 660 C(H/E) 0x3	660	625	37.0
CBS-V 760 C(H/E) 0x3	760	725	43.6
CBS-V 860 C(H/E) 0x3	860	825	50
CBS-V 960 C(H/E) 0x3	960	925	54

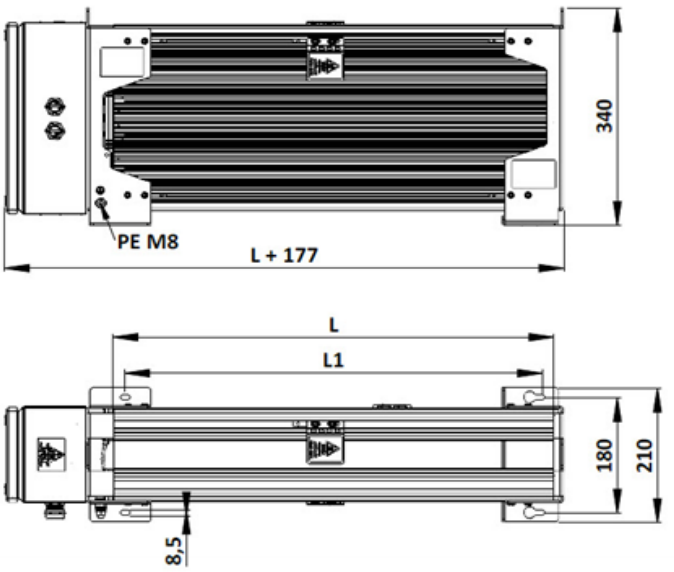
CBS-H … K 2.. box connection IP00
with and without thermal switch



Type	No. hou-sings	L ± 2 mm	H mm	Weight g
CBS-H 420 KH 201	1	420	160	13.0
CBS-H 520 KH 201	1	520	160	13.5
CBS-H 420 KH 202	2	420	160	20.5
CBS-H 520 KH 202	2	520	160	22.5
CBS-H 420 KH 203	3	420	300	32.5
CBS-H 520 KH 203	3	520	300	34.5
CBS-H 420 KH 204	4	420	300	40.5
CBS-H 520 KH 204	4	520	300	42.5

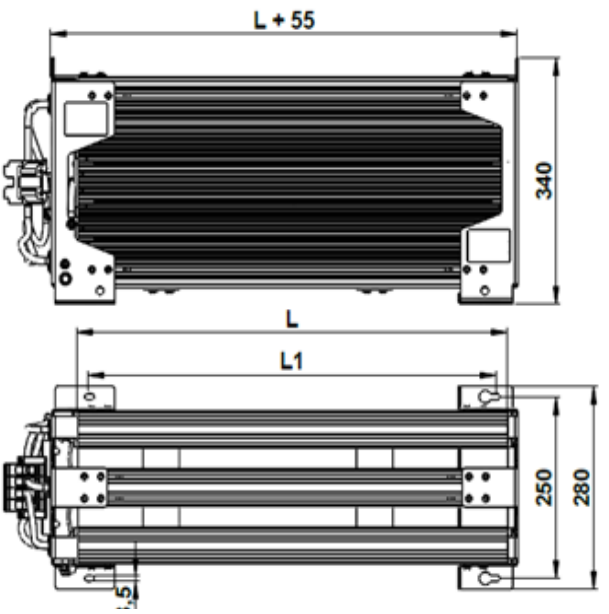
CMQ-V … B 2.2 box connection IP54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CMQ-V 400 B(H/E)T 2x2	400	365	22.6
CMQ-V 460 B(H/E)T 2x2	460	425	26.0
CMQ-V 560 B(H/E)T 2x2	560	525	31.8
CMQ-V 660 B(H/E)T 2x2	660	625	37.4
CMQ-V 760 B(H/E)T 2x2	760	725	42.4
CMQ-V 860 B(H/E)T 2x2	860	825	48.0
CMQ-V 960 B(H/E)T 2x2	960	925	55



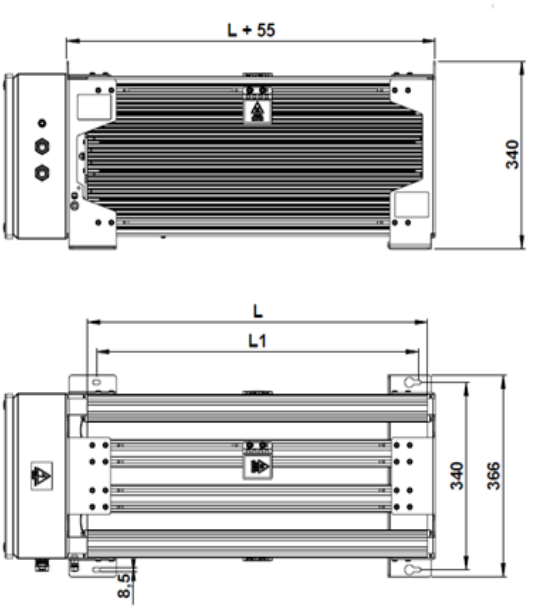
CMQ-V … K 2.3 box connection IP00
with and without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CMQ-V 400 KH 2x3	400	365	22.0
CMQ-V 460 KH 2x3	460	425	25.6
CMQ-V 560 KH 2x3	560	525	31.0
CMQ-V 660 KH 2x3	660	625	37.0
CMQ-V 760 KH 2x3	760	725	43.6
CMQ-V 860 KH 2x3	860	825	49.9
CMQ-V 960 KH 2x3	960	925	53.8

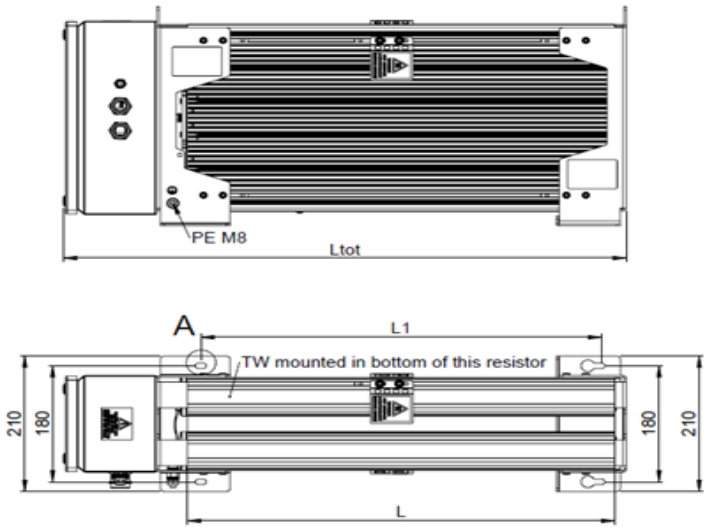


CMQ-V … B 2.4 box connection IP54
with and without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CMQ-V 400 BHT 2x4	400	365	31.0
CMQ-V 460 BHT 2x4	460	425	35.8
CMQ-V 560 BHT 2x4	560	525	43.0
CMQ-V 660 BHT 2x4	660	625	51
CMQ-V 760 BHT 2x4	760	725	60
CMQ-V 860 BHT 2x4	860	825	68.
CMQ-V 960 BHT 2x4	960	925	73

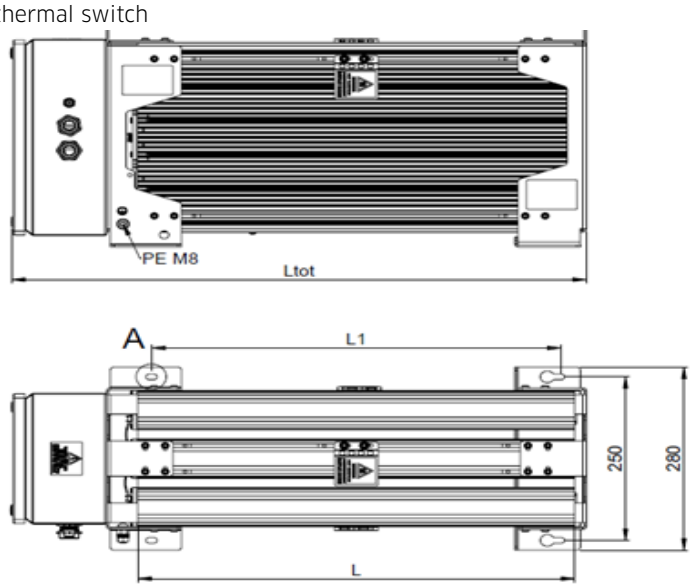


CVS-V ... B 2.2 box connection IP54
with thermal switch



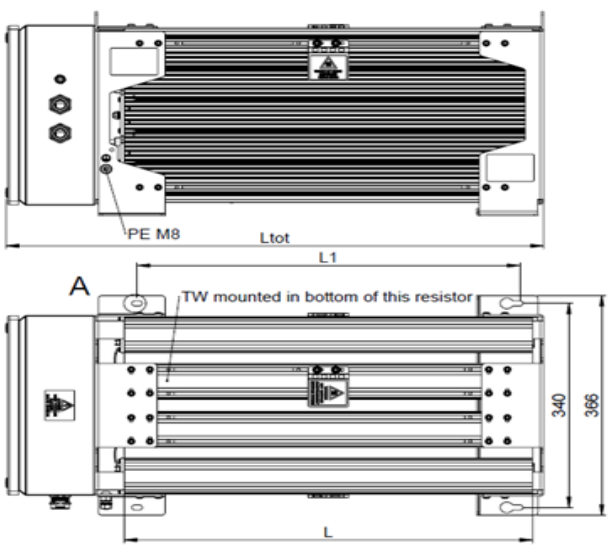
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CVS-V 460 B(H/E)T 2x2	460	425	31.5
CVS-V 560 B(H/E)T 2x2	560	525	37
CVS-V 660 B(H/E)T 2x2	660	625	42
CVS-V 760 B(H/E)T 2x2	760	725	47.5
CVS-V 860 B(H/E)T 2x2	860	825	54
CVS-V 960 B(H/E)T 2x2	960	925	59

CVS-V ... B 2.3 box connection IP54
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CVS-V 460 B(H/E)T 2x3	460	425	47.5
CVS-V 560 B(H/E)T 2x3	560	525	57
CVS-V 660 B(H/E)T 2x3	660	625	65
CVS-V 760 B(H/E)T 2x3	760	725	73
CVS-V 860 B(H/E)T 2x3	860	825	80
CVS-V 960 B(H/E)T 2x3	960	925	89

CVS-V ... B 4. box connection IP54
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CVS-V 460 B(H/E)T 2x4	460	425	60
CVS-V 560 B(H/E)T 2x4	560	525	71
CVS-V 660 B(H/E)T 2x4	660	625	82
CVS-V 760 B(H/E)T 2x4	760	725	85
CVS-V 860 B(H/E)T 2x4	860	825	103
CVS–-V 960 B(H/E)T 2x4	960	925	114

CMQ / HVBS type with cable leads, IP50

CMQ triple type with DIN rail terminals IP00

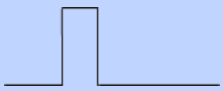
CMQ type with long connection box, IP54

CMQ double type with connection box, IP54

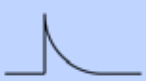
CMQ double type with DIN rail terminals, IP00

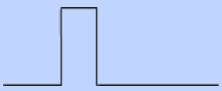
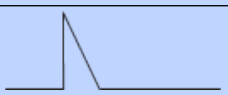
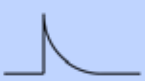
CMQ quadruple type with connection box, IP54

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

Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
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

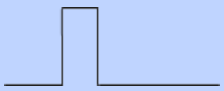
Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CBS 210 22R	34	65	23	75	16	85	11.4	110
CBS 260 18R	57	70	40	80	27	95	20	120
CBS 330 13R	96	75	64	85	44	100	32	130
CBS 400 10R	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

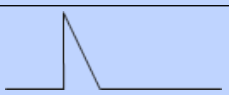
Type	One single exponential pulse each 1800s							
	τ = 5 seconds kW	Max temp °C	τ = 10 seconds kW	Max temp °C	τ = 20 seconds kW	Max temp °C	τ = 40 seconds kW	Max temp °C
CBS 210 22R	34	65	23	75	16	85	11.4	110
CBS 260 18R	57	70	40	80	27	95	20	120
CBS 330 13R	96	75	64	85	44	100	32	130
CBS 400 10R	145	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

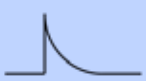
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CMQ 210 22R	23	65	16	70	11	85	8	110
CMQ 260 18R	46	75	31	85	21	100	15	130
CMQ 330 13R	71	75	47	90	32	110	23	140
CMQ 400 10R	120	85	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
Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
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
Type	One single exponential pulse each 1800s							
	τ = 5 seconds kW	Max temp °C	τ = 10 seconds kW	Max temp °C	τ = 20 seconds kW	Max temp °C	τ = 40 seconds kW	Max temp °C
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

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

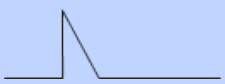
Formulas for e-curve: $p(t) = P_{max.} \cdot e^{-2t/\tau}$ $E = \frac{\tau}{2} \cdot P_{max}$ $\tau = R \cdot C$

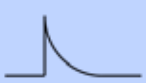
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVBS 300 15R	22.4	60	15.4	65	11	75	8	90
HVBS 370 12R	41.3	65	27.8	75	19.3	85	13.9	110
HVBS 440 10R	66	70	43.6	80	29.3	95	20.6	120
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

Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
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

Type	One single exponential pulse each 1800s							
	τ = 5 seconds kW	Max temp °C	τ = 10 seconds kW	Max temp °C	τ = 20 seconds kW	Max temp °C	τ = 40 seconds kW	Max temp °C
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

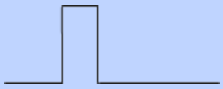
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVS 360 9R0	65	85	39	95	25	110	17	135
HVS 430 8R0	85	85	52	95	33	110	22	135
HVS 490 7R0	121	95	72	105	45	125	30	150
HVS 590 6R0	174	105	102	115	62	130	41	160
HVS 690 5R0	300	130	168	140	98	155	61	185
HVS 790 4R0	320	110	180	115	107	130	67	155
HVS 890 3R5	455	140	252	150	146	165	89	195
HVS 990 3R0	605	155	331	165	189	185	112	210

Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVS 360 9R0	139	90	84	100	52	115	35	140
HVS 430 8R0	181	90	110	100	70	115	46	140
HVS 490 7R0	258	100	153	110	95	125	62	155
HVS 590 6R0	366	105	215	120	133	135	85	165
HVS 690 5R0	621	130	354	145	208	165	128	190
HVS 790 4R0	668	110	381	120	226	135	141	160
HVS 890 3R5	945	140	531	155	307	175	187	200
HVS 990 3R0	1260	160	694	170	396	190	238	220

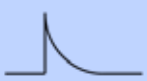
Type	One single exponential pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVS 360 9R0	167	100	102	110	65	130	43	160
HVS 430 8R0	219	100	135	115	85	135	57	165
HVS 490 7R0	307	110	185	125	117	150	77	180
HVS 590 6R0	435	120	262	135	162	155	105	190
HVS 690 5R0	729	150	421	165	250	190	156	225
HVS 790 4R0	778	125	456	135	274	155	173	190
HVS 890 3R5	1088	160	629	175	371	200	229	240
HVS 990 3R0	1429	175	815	195	474	220	289	260

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

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

Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CVS 400 1OR	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

Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CVS 400 1OR	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

Type	One single exponential pulse each 1800s							
	τ = 5 seconds kW	Max temp °C	τ = 10 seconds kW	Max temp °C	τ = 20 seconds kW	Max temp °C	τ = 40 seconds kW	Max temp °C
CVS 400 1OR	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 tables above show 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 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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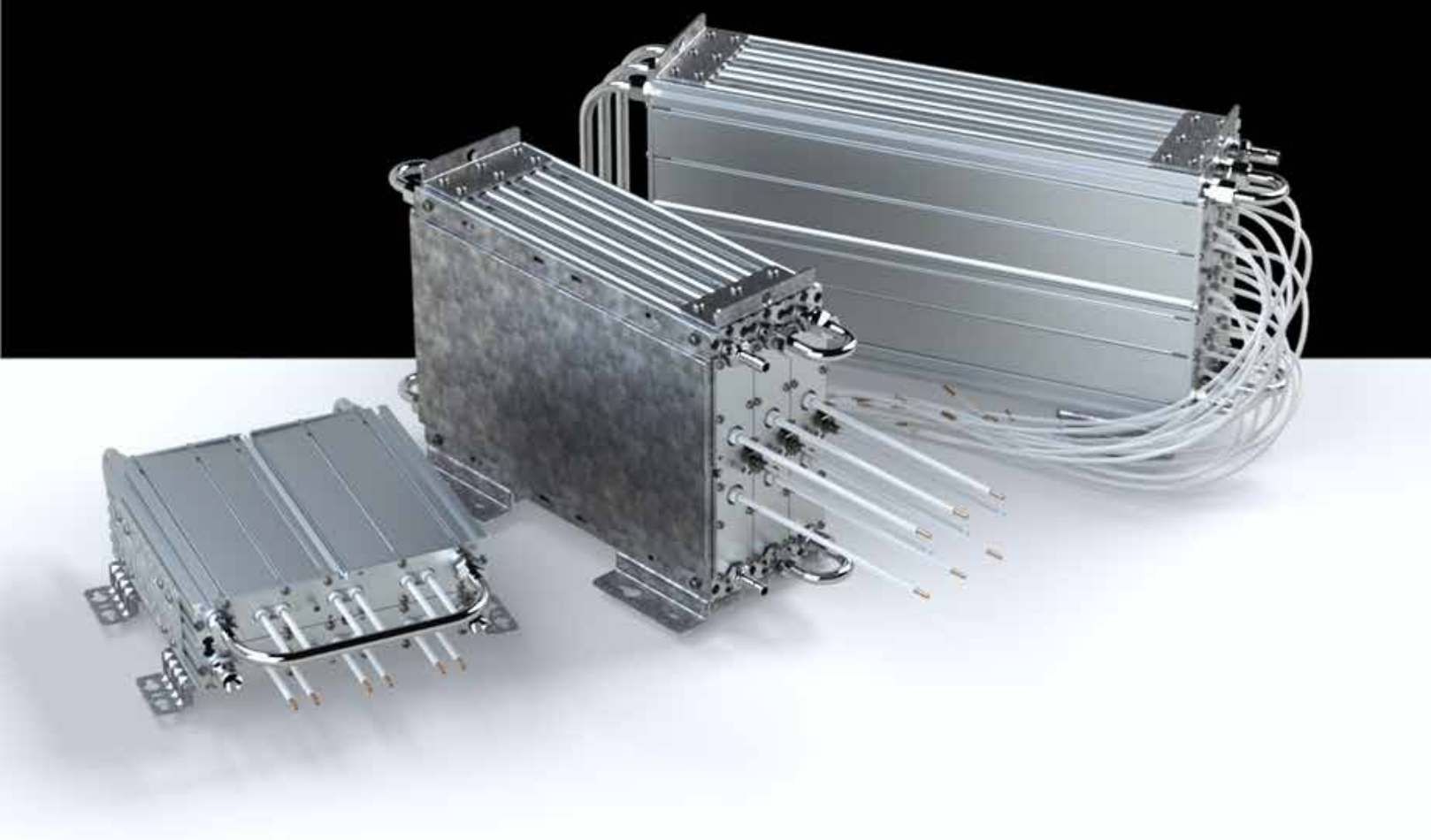
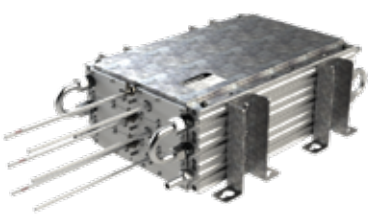


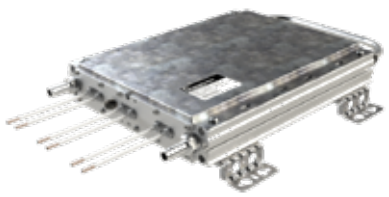
CBW

Type	Ohm range R [Ω] min-max	Nominal power at inlet temperature and delta T, hotspot surface temp 190°C								
		20°C inlet temperature			40°C inlet temperature			50°C inlet temperature		
		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

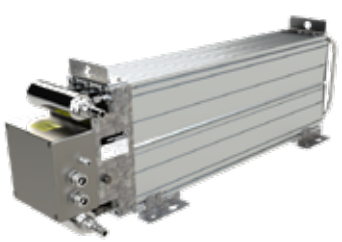
Construction and salient properties

- 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 300mm (AWG 14–AWG4) with sleeves 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



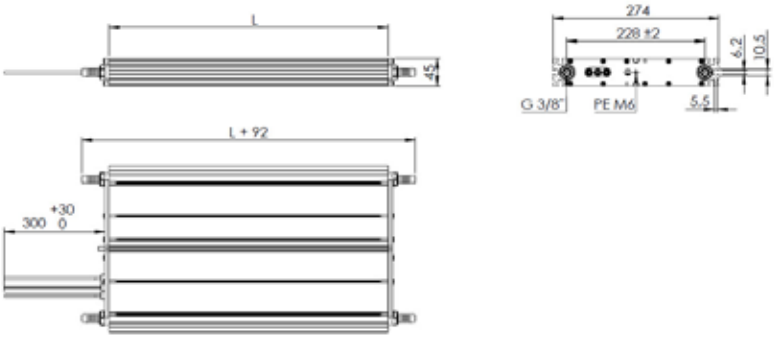


Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Insulation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		70 - 250 x (depending on resistor)
Overload: @ 5 sec pulse / hour		20 - 60 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable 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 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	box version	UL: 600VAC / 850VDC ; IEC: 690VAC / 975VDC
	cable version	1000VAC / 1400VDC
Time constant		1000-3000s
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 @ 250VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C



CBW … with water nipples, IP54

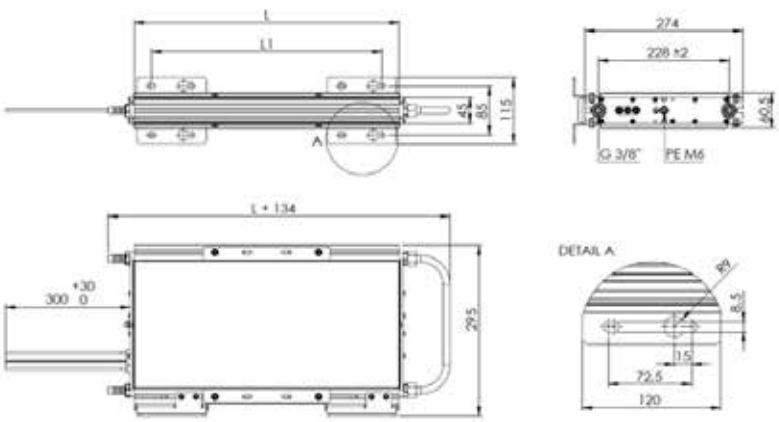
with or without thermal switch



Type	L ± 2 mm	Weight g
CBW 180	180	3,1
CBW 210	210	3,6
CBW 260	260	4,5
CBW 330	330	5,9
CBW 400	400	7,3
CBW 460	460	8,5
CBW 560	560	10
CBW 660	660	12
CBW 760	760	13,8
CBW 860	860	16
CBW 960	960	17,8

CBW-V … with water return pipe and side isolation

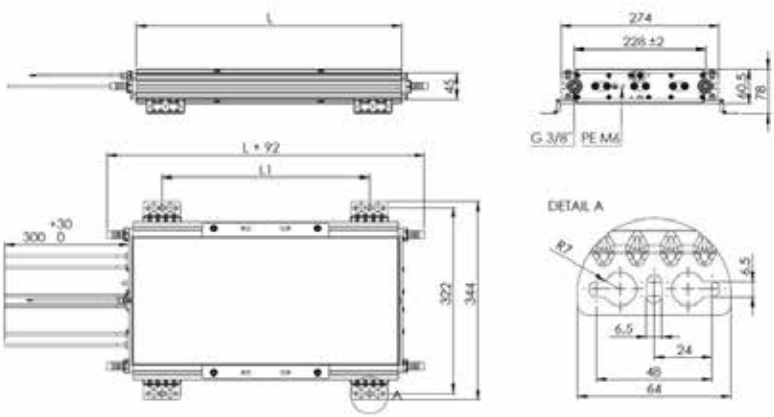
with or without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBW-V 180	180	120	3,1
CBW-V 210	210	150	3,6
CBW-V 260	260	200	4,5
CBW-V 330	330	270	5,9
CBW-V 400	400	340	7,3
CBW-V 460	460	400	8,5
CBW-V 560	560	500	10
CBW-V 660	660	600	12
CBW-V 760	760	700	13,8
CBW-V 860	860	800	16
CBW-V 960	960	900	17,8

CBW-H … with water nipples and side isolation

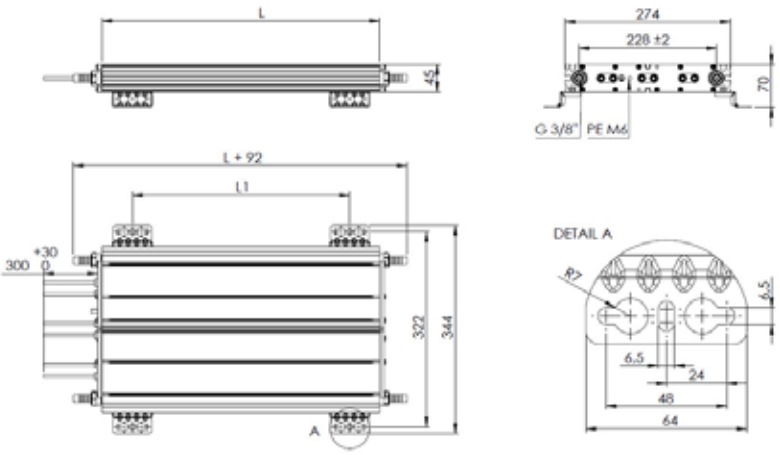
with or without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBW-H 180	180	80	3,9
CBW-H 210	210	110	4,2
CBW-H 260	260	160	5,1
CBW-H 330	330	230	6,7
CBW-H 400	400	300	8.2
CBW-H 460	460	360	9.2
CBW-H 560	560	460	11
CBW-H 660	660	560	12.8
CBW-H 760	760	660	14.6
CBW-H 860	860	760	16.8
CBW-H 960	960	860	18,6

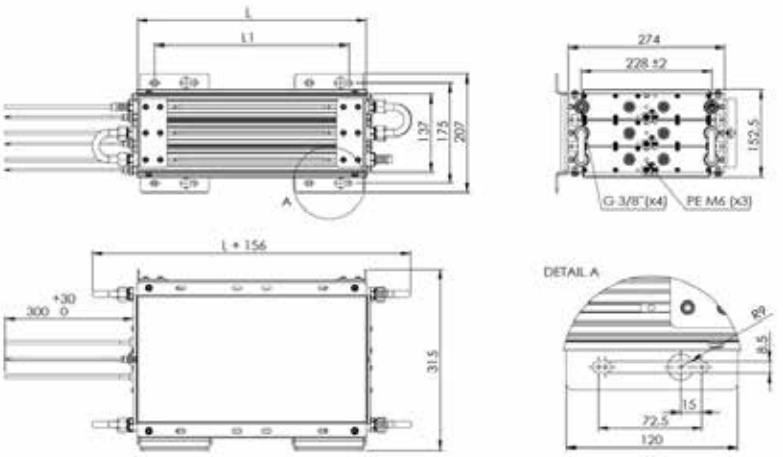
3-in-1 CBW-H cable connection with water nipples
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBW-H 180	180	70	3,9
CBW-H 210	210	110	4,2
CBW-H 260	260	160	5,1
CBW-H 330	330	230	6,7
CBW-H 400	400	300	8.2
CBW-H 460	460	360	9.2
CBW-H 560	560	460	11
CBW-H 660	660	560	12.8
CBW-H 760	760	660	14.6
CBW-H 860	860	760	16.8
CBW-V 960	960	900	17,8



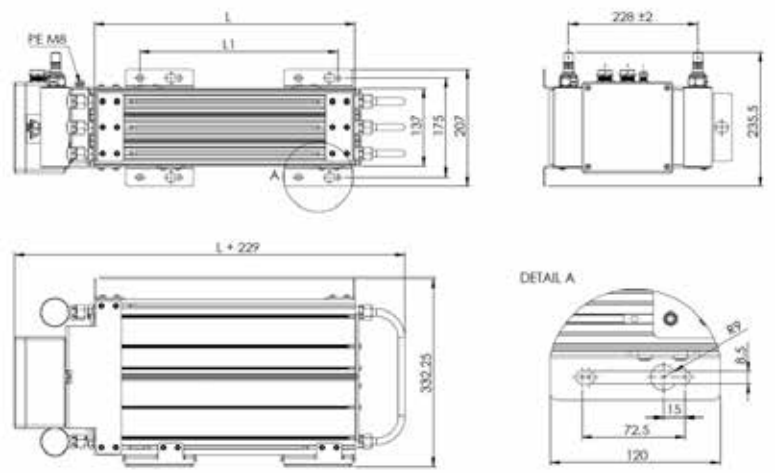
CBW-V … C 0.3 cable connection with water series connection
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBW-V 400	400	340	23.0
CBW-V 460	460	400	26.5
CBW-V 560	560	500	31.0
CBW-V 660	660	600	37.0
CBW-V 760	760	700	42.5
CBW-V 860	860	800	49.0
CBW-V 960	960	900	54.5



CBW-V … B 2.3 box connection, with water manifold and nipples
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBW-V 400	400	340	46.5
CBW-V 460	460	400	50.1
CBW-V 560	560	500	54.6
CBW-V 660	660	600	60.6
CBW-V 760	760	700	66.0
CBW-V 860	860	800	72.6
CBW-V 960	960	900	78.0



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	Δ T water					Δ T 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

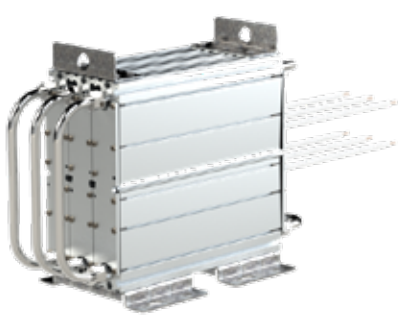
The aluminium housing has treaded wire hole G 3/8” for the water connections. The resistor housing can be fitted with water connection nipples.

P 97551

P97552

P97448

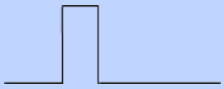
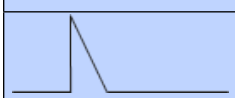
P36383



Water return connection back

Water inlet manifold front

Series water connections front

Type	Square pulse each 120seconds, ambient temperature 40°C.									
	duty 1 second kW	Max temp °C	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds 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
Type	Triangular pulse each 120seconds, ambient temperature 40°C.									
	duty 1 second kW	Max temp °C	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds 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 resistors are used as:

- Pre-charge for DC-link (super) capacitors
- Pre-magnetization of power transformers
- Brake resistors for industrial drive systems
- Emergency stops in (gas) turbines

Danotherm resistors are used in:

- Elevators
- Escalators
- Cranes
- Vessels
- Wind turbines
- (Trolly)busses
- Trams / Metros / Trains (auxiliary circuits)
- Conveyer belts
- Transformers
- Turbines
- Excavation machines

Danotherm supports your request. The very start is your specification of the application, the load and environmental conditions. Ideally, a power-time graph is presented which forms the basis of the thermal simulation. If such graph is not available, the electrical circuit of the application is build in the simulation software. It is also possible to use a data file as input for the load. Such file can be build by measurements on the site or they come from another simulation software program.

The next step is to feed the generated power losses into the thermal model. Each resistor which its physical properties has its own, unique, thermal model. With the simulation the temperatures inside the resistor and of the outside housing surface, are simulated. Here, the maximum temperature values are observed and at the same time care is taken not to over dimension the resistor.

When the type and internal construction of the resistor is defined, the resistor will be further tailored to the customers needs. Connection boxes, connection cable sizes, cable glands, IP ratings, mounting brackets, metal surface treatment, auxiliary circuits, such as PT100 sensors and thermal switches, are all considered.

Finally, packing and shipping is an important topic. The resistors should be safely packed to prevent damage during transport and at the same time the costs for shipping and packing must be considered. Together with our customers the best option is chosen.

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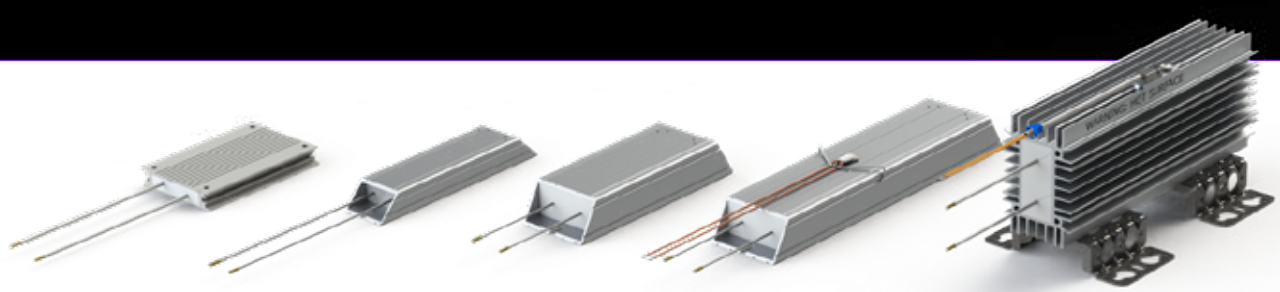


CCH / CAH / CBH / CBR-V

Danotherm Electric A/S designs and manufactures high power resistors for a variety of applications. These products are used in electronic variable speed drives as braking resistors for the control of speed or position in elevators, escalators, cranes and conveyor belts, where re-generated energy needs to be dissipated and also in renewable energy systems, such as wind turbines, solar inverters, wave and tidal generators and kite power systems.

These resistors are also used in electronic circuits for capacitor charging and discharging, voltage balancing, snubbers and filters. The products in this overview are standard parts with fixed ohmic values and flying lead connections. An optional thermal switch is available, to be fitted externally, to monitor the surface temperature of the case.

Provided below are tables with overload durations from 1 to 40 seconds within a cycle period of 120 seconds. When in doubt, please contact your local Danotherm distributor or Danotherm directly for help with the appropriate selection.

Construction and salient properties

- Compact dimensions
- Nominal power range from 75W–525W
- Overload 10–16 x Pnom, (5 seconds pulse, 120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP54
- 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
- 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 for thermal protection
- Cable size AWG 16 (1.3mm2), 300mm long
- UL approved
-

CCH 110

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				

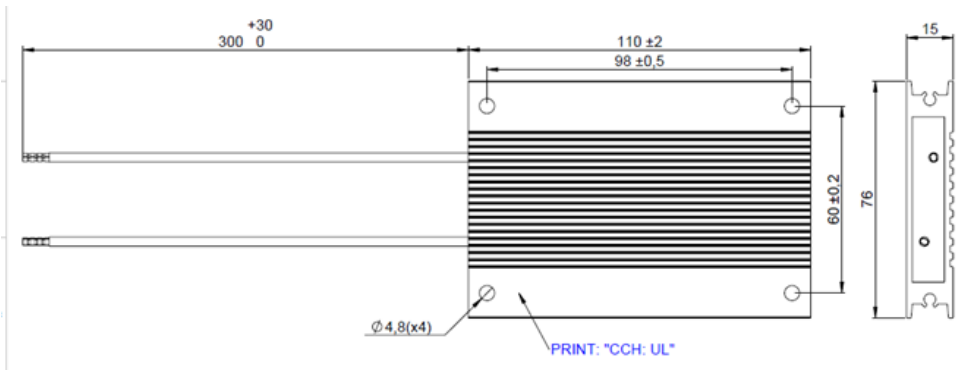
Duty time / Brake power	Duty time square impuls load / 120 s cycle time				
	1s [kW]	5s [kW]	10s [W]	20s [W]	40s [W]
CCH 110	1.55 - 1.9	0.87 - 0.98	660	460	290
CAH 165	1.5 - 4.3	0.775 - 1.050	630	440	220
CBH 165	2.3 - 6.7	1.0 - 1.6	840	570	330
CBH 265	7.5 - 16.2	2.8 - 4.6	2,200	1,250	620
CBR-V 225	12 - 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

Part number	Part description	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.

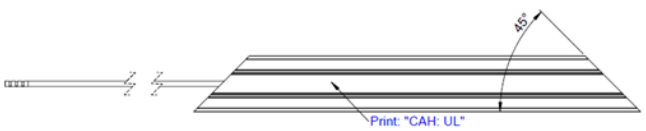
To protect the internal resistor-wire when applying an impulse load, the thermal model which is available for each resistor can be used to calculate the internal temperature. Consult your Danotherm distributor for assistance.

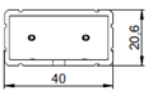
Temperature Coefficient:		100 ppm/K
Dielectric strength		3500 VAC @ 1 minute
Isolation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		10 - 100 x (depending on resistor)
Overload: @ 5 sec pulse / hour		4 - 25 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable 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	± 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		UL: 600VAC / 850VDC IEC: 690VAC / 975VDC
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 @ 250VAC cos **φ=1**
Dielectric voltage		2000VAC (3500VAC between TS and R)

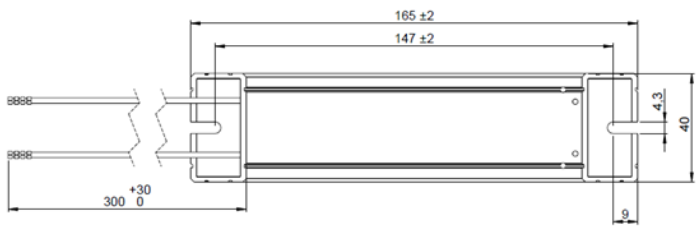


Type	Nominal power [W]	Weight [g]
CCH 110	100	250

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

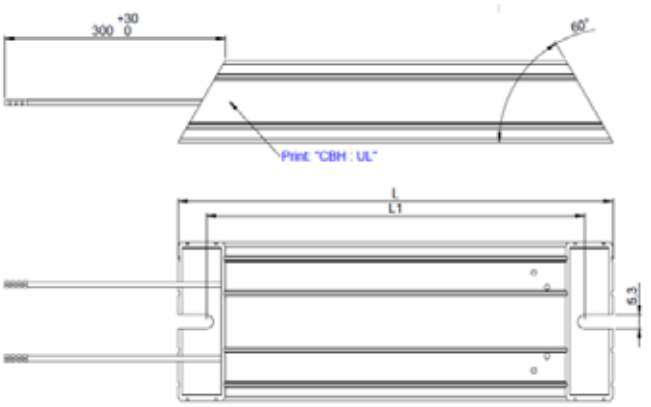


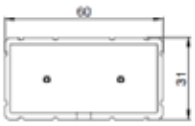




Type	Nominal power [W]	Weight [g]
CAH 165	75	220

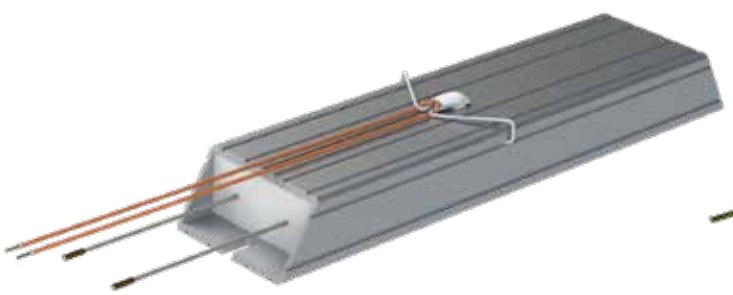
Part number	part description	Ohm value Ω	Pulse load [W] ambient temp 40°C, cycle time 120s				
			Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z1163210777	CAH 165 C 777 10R KT	10	4300	1050	660	435	225
Z1163215777	CAH 165 C 777 15R KT	15	3600	965	625	420	225
Z1163222777	CAH 165 C 777 22R KT	22	3800	980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





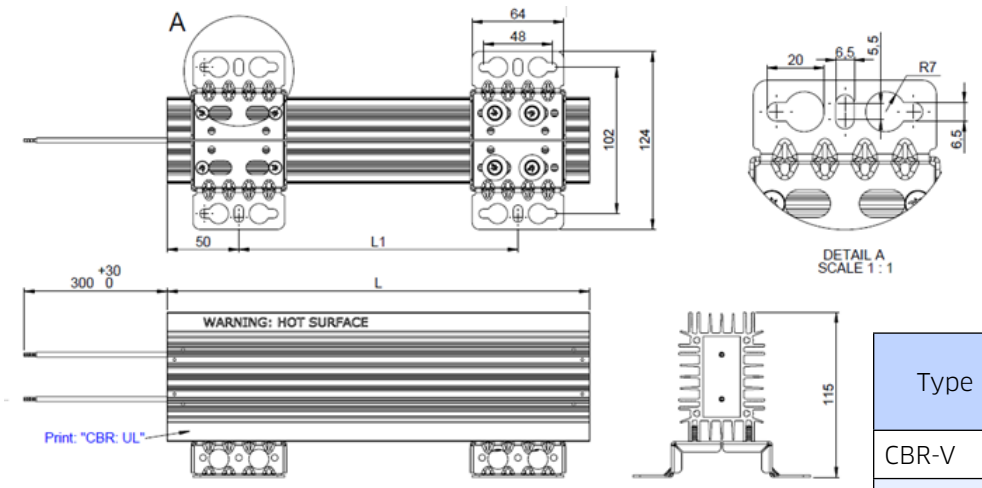
Type	P_{nom} W	L ± 2 mm	L1 ± 2 mm	Weight g
CBH 165	110	165	143.5	390
CBH 265	200	265	243.5	880

Part number	part description	Ohm value Ω	Pulse load [W] ambient temp 40°C, cycle time 120s				
			Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z3163210777	CBH 165 C 777 10R KT	10	6700	1600	940	590	330
Z3163215777	CBH 165 C 777 15R KT	15	6100	1500	895	580	335
Z3163222777	CBH 165 C 777 22R KT	22	5200	1300	835	555	335
Z3163233777	CBH 165 C 777 33R KT	33	4000	1150	760	535	335
Z3163247777	CBH 165 C 777 47R KT	47	3400	1150	840	590	330
Z3163268777	CBH 165 C 777 68R KT	68	3100	1100	825	585	330
Z3163310777	CBH 165 C 777 100R KT	100	2600	1050	805	575	330
Z3163315777	CBH 165 C 777 150R KT	150	2400	1050	800	575	330
Z3163322777	CBH 165 C 777 220R KT	220	2300	1050	790	570	330
ZH3263210777	CBH 265 CH 777 10R KT	10	15900	4600	2400	1200	610
ZH3263215777	CBH 265 CH 777 15R KT	15	15800	4600	2500	1250	615
Z3263222777	CBH 265 C 777 22R KT	22	14600	3500	2100	1200	630
Z3263233777	CBH 265 C 777 33R KT	33	16200	3800	2200	1250	625
Z3263247777	CBH 265 C 777 47R KT	47	13900	3400	2100	1250	620
Z3263268777	CBH 265 C 777 68R KT	68	11200	3000	1900	1250	620
Z3263310777	CBH 265 C 777 100R KT	100	10200	3100	2100	1250	615
Z3263315777	CBH 265 C 777 150R KT	150	8400	2900	2000	1250	615
Z3263322777	CBH 265 C 777 220R KT	220	7500	2800	2000	1200	610



CBH 265 + thermal switch

CBH 165



Type	P_{nom} W	L ± 2 mm	L1 ± 2 mm	Weight g
CBR-V	400	225	125	1800
CBR-V	525	295	195	2300

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

CBR-V 225 + thermal switch

Overview of the ALPHA resistor family (IP00-IP65)

CCH / CAV / CAH / CAR

CBH / CBV / CBR

CBT-V / CBT-H

CBS / CMQ / CVS / HVBS

CBW-V / CBW-H
water cooled

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	- Applications	- Applications	- Applications	- 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 / High Pulse	Charge / High Pulse	Charge / High Pulse	High Pulse

Other resistor types from Danotherm (IP00-IP65)

Sigma

Ohmega - Air

WHHB / WHBS / WHB

TERA

Ohmega
water cooled

Multi purpurse	Outdoor & Marine	Filter	Medium & HV	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, optional, (normally closed)
- H=Helix, Low Ohm values (defined by Danotherm)
- Connection style; C=cable / D=IP20 box / B=IP65 box / K=DIN rail IP00
- Length of resistor housing in mm
- H=horizontal mounting feet / V=vertical mounting feet
- Housing case style; CCH/CAV/CAH/CCR/CAR/CBV/CBH/CBR/CBT/CMQ/HVBS/CVS/CBW

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31MAY2021