

DANOTHERM

POWER RESISTORS



ALPHA SERIES

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

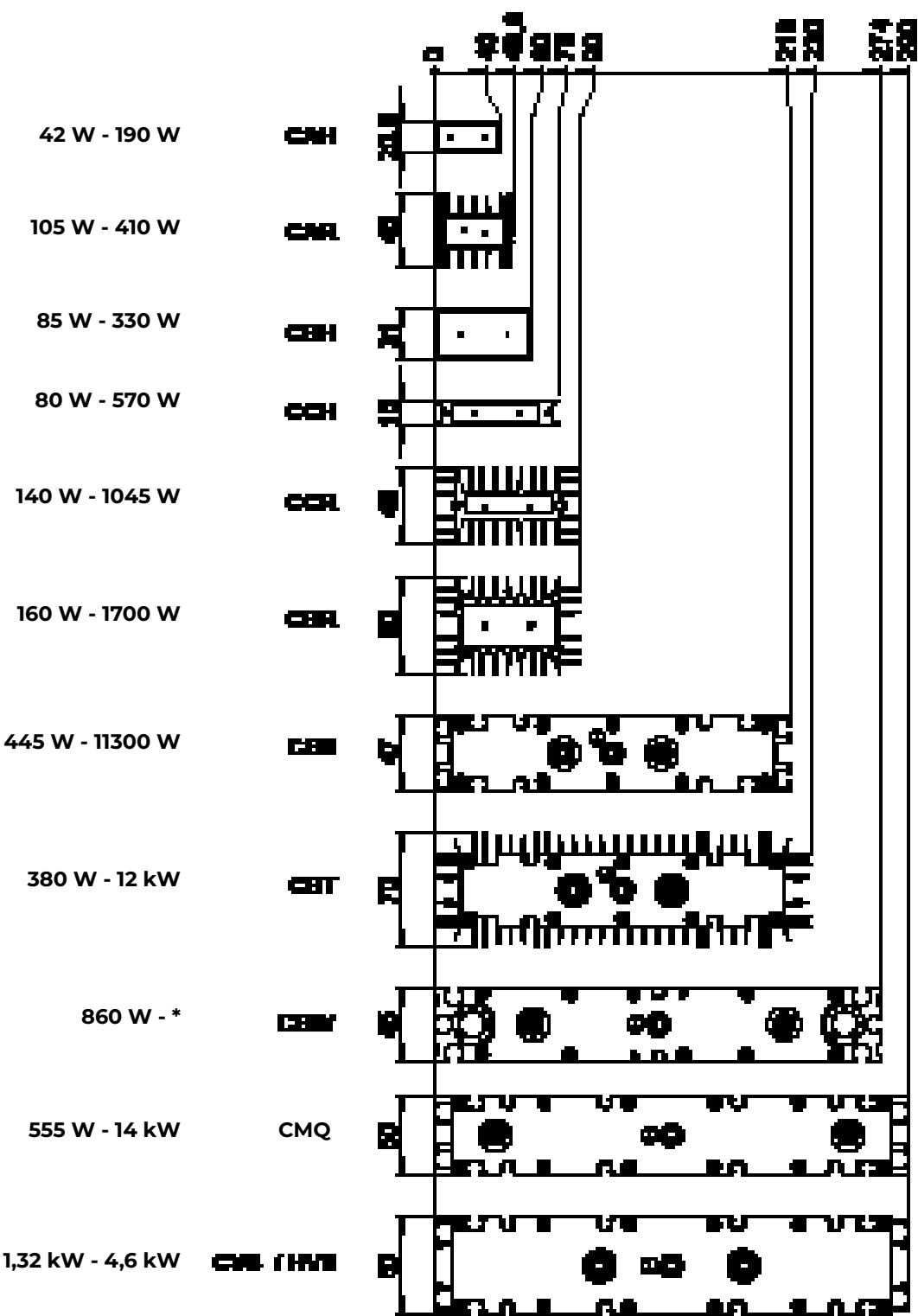
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Alpha profile overview

When selecting a resistor, the width and height of the various Alpha profiles play a significant role in determining which type will best meet your requirements. In the overview below, the width and height of the basic aluminium profiles are visualized, with dimensions provided in millimeters for quick selection and easy comparison.

Please note that the length of the resistor types is not shown in this overview but can be found on the following pages, where each type is explained in detail. The 11 profiles displayed here do not include any add-ons such as mounting feet, nameplates, lifting brackets, or protective cages.



* Max power rating depends on number of profiles.

Images not to scale

Alpha Item description structure

T	Thermal drift; standard T=100ppm
K	Tolerance; standard K = $\pm 10\%$, J = $\pm 5\%$,
22 R	Resistance value in Ohm (Example 2R2=2.2 Ω , / 22R = 22 Ω)
1	Number of case style housings (1, 2, 3 or 4)
8	Thermal switch temp; 5 = 130°C / 6 = 160°C / 7 = 180°C / 8 = 200°C
2	0 = cable connection, 2 = connection box type
T	T = Thermal switch, optional, (normally closed)
H	Internal configuration (E, H, N - Dependant on resistance value)
C	Connection style; C = cable / D = IP20 box / B = IP65 box / K = DIN rail IP00
400	Length of resistor housing in mm
H	H = horizontal mounting feet / V = vertical mounting feet
CMQ -	Housing case style; CCH/CAV/CAH/CCR/CAR/CBV/CBH/CBR/CBT/CMQ/HVBS/CVS/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
Page 12-19								
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	55	260	0.15 - 300	1.1	0.4	0.3	0.2	0.2
CAH / CAV 150 C	65	260	0.3 - 600	2.4	0.8	0.6	0.4	0.3
CAH / CAV 165 C	75	265	0.3 - 800	3.6	1.1	0.8	0.5	0.3
CAH / CAV 210 C	100	270	0.6 - 1200	7	1.8	1.1	0.8	0.4
CAH / CAV 240 C	120	275	0.7 - 1500	9.5	2.4	1.4	0.9	0.4
CAH / CAV 300 C	155	290	1 - 1200	12.8	3.2	1.9	1.1	0.6
CAH / CAV 360 C	190	305	1.2 - 2500	16.7	4.1	2.5	1.3	0.7
CAR 85 C	110	260	0.1 - 300	1.1	0.4	0.3	0.3	0.2
CAR 115 C	155	265	0.25 - 600	2.5	0.9	0.6	0.5	0.3
CAR 130 C	175	265	0.3 - 800	3.8	1.2	0.8	0.6	0.4
CAR 175 C	240	275	0.5 - 1200	7.4	1.9	1.2	0.8	0.6
CAR 205 C	280	285	0.7 - 1400	10.2	2.5	1.6	1.1	0.7
CAR 265 C	365	300	1.0 - 2000	13.8	3.5	2.1	1.4	0.9
CAR 325 C	450	320	1.2 - 2500	18.1	4.5	2.8	1.8	1.2
CAH / CAV 145 CT	42	210	0.15 - 300	1.1	0.4	0.3	0.2	0.2
CAH / CAV 175 CT	50	210	0.3 - 600	2.4	0.8	0.6	0.4	0.2
CAH / CAV 190 CT	57	215	0.3 - 800	3.6	1.1	0.8	0.5	0.2
CAH / CAV 235 CT	76	220	0.6 - 1200	7	1.8	1.1	0.6	0.3
CAH / CAV 265 CT	92	220	0.7 - 1500	9.5	2.4	1.3	0.7	0.3
CAH / CAV 325 CT	120	230	1 - 1200	12.8	3.2	1.7	0.8	0.4
CAH / CAV 385 CT	145	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	100	210	0.1 - 300	1.1	0.4	0.3	0.3	0.2
CAR 140 C/K/D T	125	210	0.25 - 600	2.5	0.9	0.7	0.5	0.3
CAR 155 C/K/D T	130	215	0.3 - 800	3.8	1.2	0.8	0.6	0.4
CAR 200 C/K/D T	165	220	0.5 - 1200	7.4	1.9	1.2	0.9	0.6
CAR 230 C/K/D T	190	225	0.7 - 1400	10.2	2.6	1.6	1.1	0.6
CAR 290 C/K/D T	230	235	1.0 - 2000	13.8	3.5	2.2	1.4	0.8
CAR 350 C/K/D T	275	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 21-28								
CBH / CBV 165 C	110	265	0.5 - 1000	5	1.4	0.9	0.5	0.3
CBH / CBV 215 C	155	270	0.8 - 1500	9.8	2.5	1.6	0.7	0.5
CBH / CBV 265 C	200	270	1.5 - 2000	16.6	4	2.4	1	0.6
CBH / CBV 335 C	270	280	1.8 - 2000	26.6	6.2	3.4	1.3	0.9
CBH / CBV 405 C	350	285	2.0 - 2000	34.1	8.5	4.3	1.6	1
CBH / CBV 190 CT	85	210	0.5 - 1000	5	1.4	0.9	0.5	0.3
CBH / CBV 240 CT	120	215	0.8 - 1500	9.8	2.5	1.5	0.8	0.4
CBH / CBV 290 CT	150	220	1.5 - 2000	16.6	3.8	1.9	1	0.5
CBH / CBV 360 CT	200	225	1.8 - 2000	25.6	5.2	2.6	1.3	0.7
CBH / CBV 430 CT	250	230	2.0 - 2000	32.5	6.5	3.2	1.6	0.8
CBR-V / H 175 C	310	265	0.8 - 1500	10.5	2.7	1.8	1.2	0.9
CBR-V / H 225 C	400	270	1.5 - 2000	18.3	4.5	2.8	1.8	1.2
CBR-V / H 295 C	525	275	1.8 - 2000	29.7	7.1	4.2	2.7	1.8
CBR-V / H 365 C	650	280	2.0 - 2000	38.4	11.3	6.7	3.8	2.4
CBR-V / H 426 C	980	285	2.4 - 2000	39.1	12.9	7.9	4.5	2.9
CBR-V / H 526 C	1220	295	3.0 - 2000	49.1	16.1	9.9	5.8	3.6

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 / H 626 C	1450	305	3.5 - 2000	60.6	19.7	12	7.1	4.4
CBR-V / H 726 C	1700	310	4.0 - 2000	73.1	23.4	14.3	8.6	5.2
CBR-V / H 160 CT	160	210	0.5 - 1000	5.4	1.5	1	0.7	0.5
CBR-V / H 210 CT	230	210	0.8 - 1500	10.6	2.8	1.8	1.3	0.9
CBR-V / H 260 CT	300	225	1.5 - 2000	18.4	4.6	2.8	1.9	1.3
CBR-V / H 330 CT	390	230	1.8 - 2000	30	7.1	4.2	2.7	1.7
CBR-V / H 400 CT	490	230	2.0 - 2000	38.8	11.4	6.8	4.1	2.1
CBR-V / H 460 CT	740	240	2.4 - 2000	39.4	12.9	8	4.8	2.4
CBR-V / H 560 CT	920	250	3.0 - 2000	49.4	16.2	10	6.1	3.1
CBR-V / H 660 CT	1100	260	3.5 - 2000	60.6	19.7	12.1	7.4	3.8
CBR-V / H 760 CT	1300	260	4.0 - 2000	73.8	23.3	14.2	8.7	4.3
Page 29-39				Pulse load kW Temp. amb 40°C cycle 120s				
CBT-H 180 C	455	270	0.04 - 13	18.4	5.1	3	1.9	1.1
CBT-H 210 C	580	270	0.05 - 2000	24.7	6.1	3.8	2.5	1.7
CBT-H 260 C	850	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	2300	310	0.18 - 110	190	50	28	15	7.6
CBT-H 660 C	2700	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	3600	340	0.31 - 180	370	89	50	25	12.4
CBT-H 960 C	4100	350	0.35 - 220	480	110	56	28	14
Page 40-55				Pulse load kW Temp. amb 40°C cycle 1800s				
CBS 210 C	580	270	0.05 - 20	39	16	11	7.6	5.5
CBS 260 C	850	280	0.07 - 35	67	27	19	13.1	9.5
CBS 330 C	1150	280	0.09 - 50	123	45	31	21.3	15.5
CBS 400 C	1400	290	0.11 - 65	200	68	44	31	21.6
CBS 460 C	1600	300	0.14 - 85	298	92	59	40	28
CBS 560 C	1900	310	0.18 - 110	390	120	77	52	36
CBS 660 C	2300	320	0.22 - 130	550	160	100	66	46
CBS 760 C	2800	330	0.27 - 150	740	205	125	83	56
CBS 860 C	3200	340	0.31 - 180	950	255	155	100	67
CBS 960 C	3600	350	0.35 - 220	820	250	160	105	73
Page 39-44				Pulse load kW Temp. amb 40°C cycle 1800s				
CMQ 210 C	1000	270	0.07 - 35	57	23	16	11	8
CMQ 260 C	1100	280	0.07 - 50	127	46	31	21	15
CMQ 330 C	1600	280	0.07 - 80	200	71	47	32	23
CMQ 400 C	2000	290	0.10 - 110	375	120	75	49	34
CMQ 460 C	2200	300	0.12 - 130	500	150	93	61	42
CMQ 560 C	3000	310	0.15 - 160	730	210	130	83	57

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
CMQ 660 C	3600	320	0.19 - 200	950	260	160	100	69
CMQ 760 C	4200	330	0.23 - 240	130	350	210	130	88
CMQ 860 C	4800	340	0.27 - 280	120	350	215	140	95
CMQ 960 C	5400	350	0.30 - 320	170	460	275	175	115
Page 46-48				Pulse load kW Temp. amb 40°C cycle 1800s				
CVS 400 C	1800	290	0.10 - 70	450	135	83	52	35
CVS 460 C	2100	300	0.12 - 85	680	190	115	71	46
CVS 560 C	2500	310	0.15 - 105	970	265	155	97	63
CVS 660 C	3000	320	0.19 - 130	1300	340	200	120	79
CVS 760 C	3500	330	0.23 - 150	1700	440	255	155	99
CVS 860 C	4000	340	0.27 - 180	2000	500	290	175	115
CVS 960 C	4500	350	0.30 - 210	2000	510	300	180	120
Page 39-54				Pulse load kW Temp. amb 40°C cycle 1800s				
HVBS 300 C	850	280	0.05 - 30	56	22.4	15.4	11	8
HVBS 370 C	1050	280	0.07 - 50	113	41.3	27.8	19.3	13.9
HVBS 440 C	1250	290	0.09 - 70	200	66	43.6	29.3	20.6
HVBS 520 C	1350	300	0.10 - 90	247	81	54	37.1	26.6
HVBS 620 C	1950	310	0.13 - 110	390	120	77	51	35.8
HVBS 720 C	2500	320	0.15 - 140	530	155	98	65	45.1
HVBS 820 C	2900	330	0.19 - 170	650	185	115	77	53
HVBS 920 C	3200	340	0.22 - 200	1000	270	165	105	69
HVBS 1000 C	3500	350	0.25 - 220	1150	300	180	115	77
Page 39-54				Pulse load kW Temp. amb 40°C cycle 1800s				
HVS 360 C	1600	300	0.07 - 7.5		65	39	25	17
HVS 430 C	1900	300	0.09 - 10		85	52	33	22
HVS 490 C	2200	310	0.11 - 13		121	72	45	30
HVS 590 C	2600	320	0.15 - 18		174	102	62	41
HVS 690 C	3100	340	0.18 - 22		300	168	98	61
HVS 790 C	3600	350	0.22 - 25		320	180	107	67
HVS 890 C	4100	360	0.25 - 27		455	252	146	89
HVS 990 C	4600	370	0.29 - 30		605	331	189	112
Page 55-61				Pulse load kW Temp. amb 40°C cycle 1800s				
CBW-H 180 C	1000	170	0.04 - 13	17.5	5.5	3.4	2.1	1.3
CBW-H 210 C	1400	180	0.05 - 2000	19.4	5.3	3.6	2.6	1.8
CBW-H 260 C	2000	180	0.07 - 2000	46	11.3	6.9	4.5	3
CBW-H 330 C	2500	180	0.09 - 2000	78	24.4	15	9.3	5.7
CBW-H 400 C	3000	180	0.11 - 2000	115	34	20.8	12.7	7.8
CBW-H 460 C	3500	180	0.14 - 2000	140	41	25	15.4	9.4
CBW-H 560 C	4200	180	0.18 - 110	215	58	34	20.4	12.3
CBW-H 660 C	5000	180	0.22 - 130	295	76	44	26.1	15.4
CBW-H 760 C	5700	180	0.27 - 150	370	92	52	30.7	18
CBW-H 860 C	6500	180	0.31 - 180	440	105	61	35.5	20.8
CBW-H 960 C	7500	180	0.35 - 220	580	135	75	42.4	23.2

01

CCH, CAH, CAV, CAR, CCR

Power range: 42 W - 1045 W

Cooling method: Convection cooled



CCH 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
CCH 110 C	100	260	2 - 1000	2500	1150	800	540	295
CCH 166 C	160	265	4 - 1200	5700	2380	1600	930	470
CCH 216 C	200	275	6 - 1500	10500	3760	2350	1180	590
CCH 270 C	260	280	9 - 1700	14200	5050	3080	1540	770
CCH 320 C	300	285	10 - 2000	18600	6320	3550	1780	890
CCH 420 C	390	295	13 - 2000	24700	8390	4590	2290	1160
CCH 520 C	480	305	16 - 2000	30300	9710	5760	2880	1440
CCH 620 C	570	315	20 - 2000	38100	11900	6890	3440	1720

CCH with thermal switch

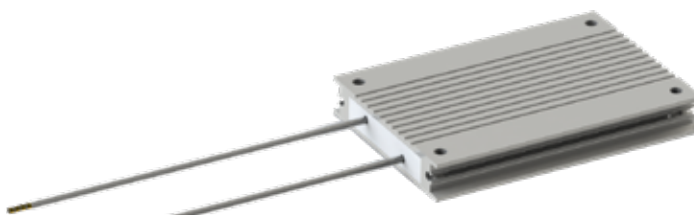
CCH 130 CT	-	-	-	-	-	-	-	-
CCH 145 CT	80	210	2 - 1000	2540	1210	850	580	345
CCH 201 CT	120	215	4 - 1200	5780	2480	1690	920	460
CCH 251 CT	160	220	6 - 1500	10600	3940	2280	1140	570
CCH 305 CT	200	225	9 - 1700	14500	5220	2820	1410	700
CCH 355 CT	230	230	10 - 2000	19100	6550	3280	1640	820
CCH 455 CT	300	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 42W—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 Test voltage
- SiO₂ filled for high thermal capacity/high power

overload capability

- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet (CAR type)
- Optional thermal switch 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

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

CAH / CAV with thermal switch

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	120	250	1 - 1200	12800	3150	1920	1100	550
CAH / CAV 385 CT	145	270	1.2 - 2500	16700	4080	2460	1320	660

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
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	365	300	1.0 - 2000	13800	3460	2140	1420	940
CAR 325 C	450	320	1.2 - 2500	18100	4460	2750	1810	1170

CAR with thermal switch

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

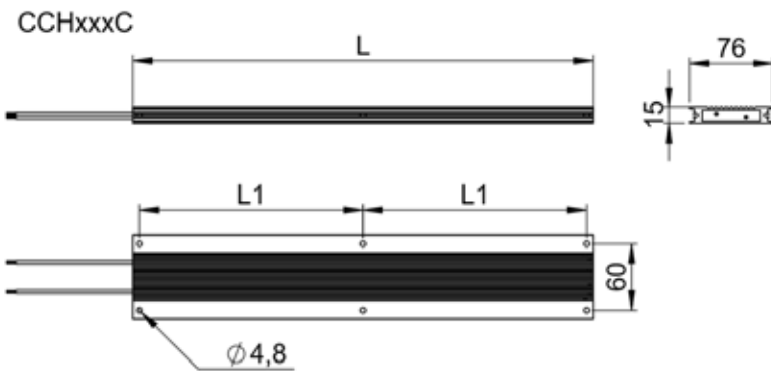
Cable connection with thermal switch and box connections

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 145 CT/DT/BT	140	230	2 - 1000	2.2	1	0.7	0.5	0.4
CCR-V 201CT/DT/BT	190	250	4 - 1200	4.7	2.1	1.5	1	0.7
CCR-V 251 CT/DT/BT	250	255	6 - 1500	7.1	3.2	2.2	1.5	0.9
CCR-V 305 CT/DT/BT	300	260	9 - 1700	13.8	5.9	3.9	2.2	1.1
CCR-V 355 CT/DT/BT	380	265	10 - 2000	18.3	7.5	4.9	2.8	1.4
CCR-V 455 CT/DT/BT	480	275	13 - 2000	29.7	11.1	7	3.5	1.8
CCR-V 555 CT/DT/BT	620	285	16 - 2000	17.8	7.1	4.7	2.9	1.9
CCR-V 655 CT/DT/BT	790	290	20 - 2000	40.6	15.9	10.5	6.6	4.1

General specifications CAH/CAV/CAR/CCR

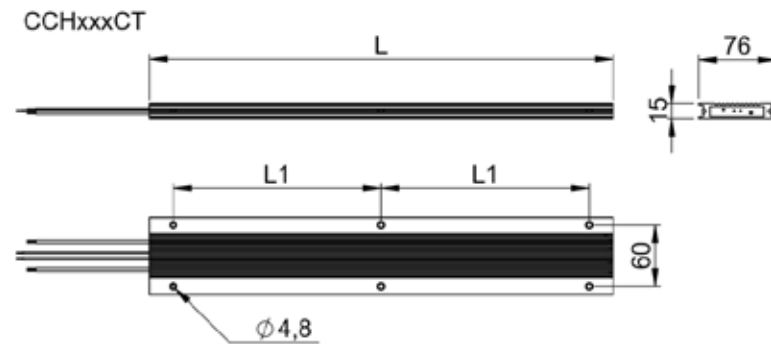
Temperature Coefficient:		100 ppm/K
Test voltage		3500 VAC @ 1 minute
Isolation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / 120 s		10 - 100 x (depending on resistor)
Overload: @ 5 sec pulse / 120 s		4 - 25 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable version		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	all types	no de-rating
De-rating horizontal mounting	CAH / CAV	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, the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling at 40°C ambient.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. 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
Test voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80 °C
	IP 65	90 °C

CCH cable connection IP50 / IP54



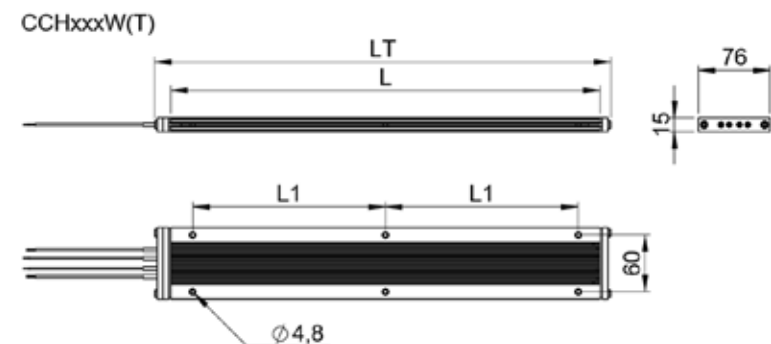
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 110 C	110	98	220
CCH 166 C	166	154	310
CCH 216 C	216	204	400
CCH 270 C	270	258	490
CCH 320 C	320	2x154	570
CCH 420 C	420	2x204	740
CCH 520 C	520	2x241.5	900
CCH 620 C	620	2x291.5	1070

CCH with thermal switch, cable connection IP50 / IP54



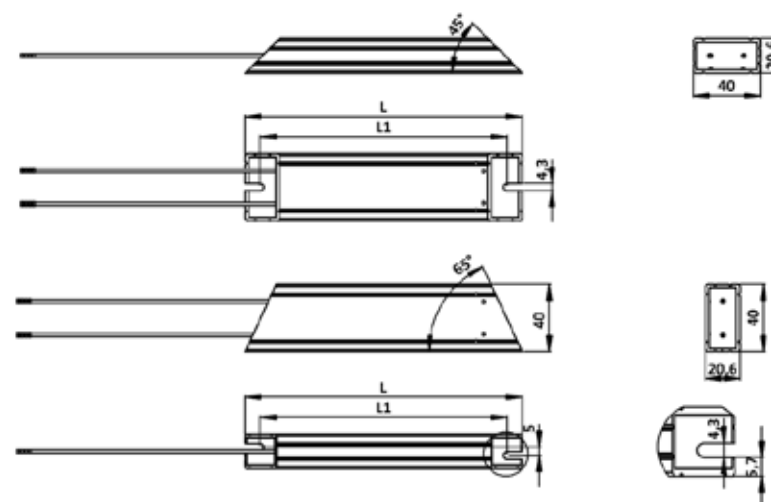
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 145 CT	145	98	260
CCH 201 CT	201	154	380
CCH 251 CT	251	204	480
CCH 305 CT	305	258	590
CCH 355 CT	355	2x154	690
CCH 455 CT	455	2x204	900
CCH 555 CT	555	2x241.5	1100
CCH 655 CT	655	2x291.5	1310

CCH with thermal switch, cable connection IP65



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CCH 145 W(T)	145	98	340
CCH 201 W(T)	201	154	460
CCH 251 W(T)	251	204	560
CCH 305 W(T)	305	258	670
CCH 355 W(T)	355	2x154	770
CCH 455 W(T)	455	2x204	980
CCH 555 W(T)	555	2x241.5	1180
CCH 655 W(T)	655	2x291.5	1390

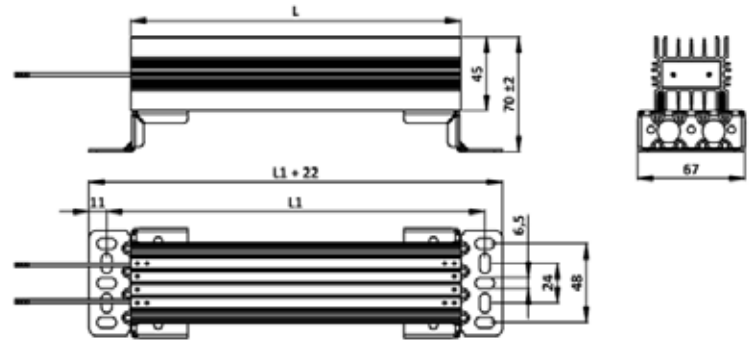
CAH / CAV cable connection IP50/IP4



Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAH / CAV 120 C	120	102	140
CAH / CAV 150 C	150	132	180
CAH / CAV 165 C	165	147	200
CAH / CAV 210 C	210	192	270
CAH / CAV 240 C	240	222	310
CAH / CAV 300 C	300	282	400
CAH / CAV 360 C	360	342	480
with thermal switch (T)			
CAH / CAV 145 CT	145	127	170
CAH / CAV 175 CT	175	157	210
CAH / CAV 190 CT	190	172	230
CAH / CAV 235 CT	235	217	300
CAH / CAV 265 CT	265	247	340
CAH / CAV 325 CT	325	307	430
CAH / CAV 385 CT	385	367	520

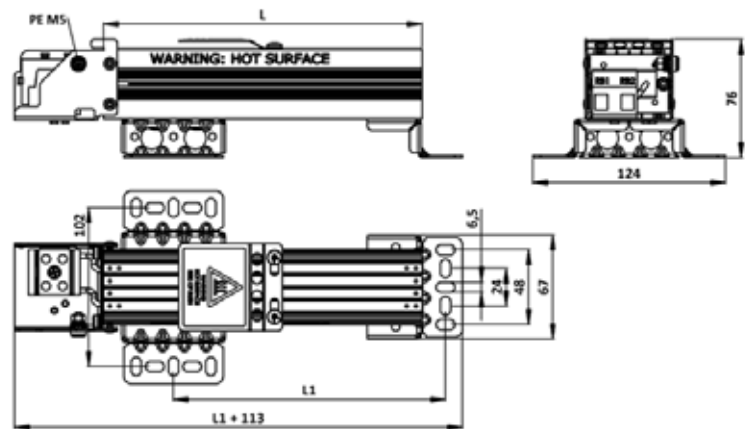
CAR cable connection IP50/IP54

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAR 85 C	85	115	320
CAR 115 C	115	145	390
CAR 130 C	130	160	430
CAR 175 C	175	205	530
CAR 205 C	205	235	600
CAR 265 C	265	295	730
CAR 325 C	325	355	870
with thermal switch (T)			
CAR 110 CT	110	140	380
CAR 140 CT	140	170	450
CAR 155 CT	155	185	490
CAR 200 CT	200	230	590
CAR 230 CT	230	260	660
CAR 290 CT	290	320	790
CAR 350 CT	350	380	930



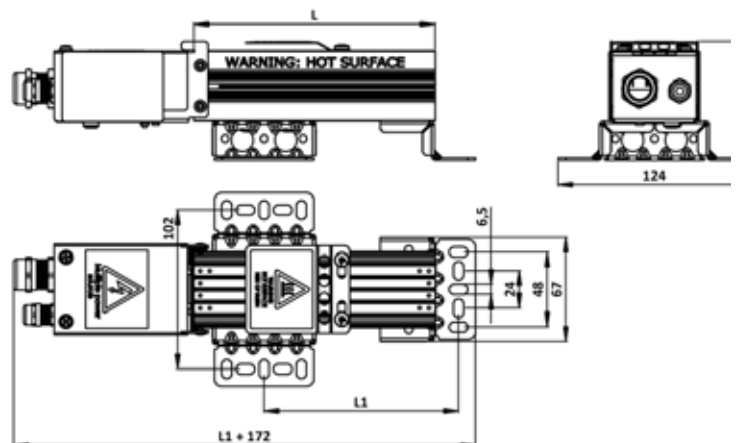
CAR box connection IP00

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAR 115 K	115	85	450
CAR 130 K	130	100	500
CAR 175 K	175	145	630
CAR 205 K	205	175	720
CAR 265 K	265	235	900
CAR 325 K	325	195	1080

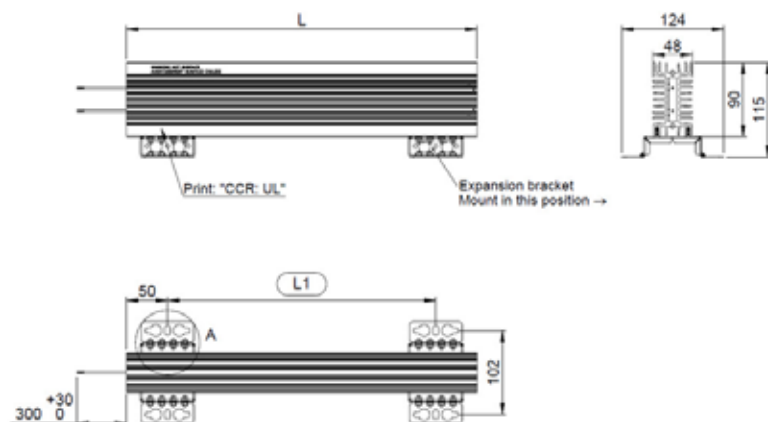


CAR with thermal switch, box connection IP20/IP21

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CAR 140 DT	140	110	720
CAR 155 DT	155	125	760
CAR 200 DT	200	170	900
CAR 230 DT	230	200	980
CAR 290 DT	290	260	1160
CAR 350 DT	350	320	1340

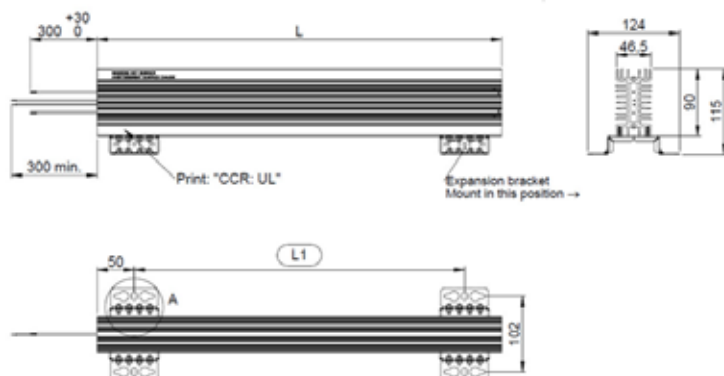


CCR xxx C, cable connection IP50 / IP54



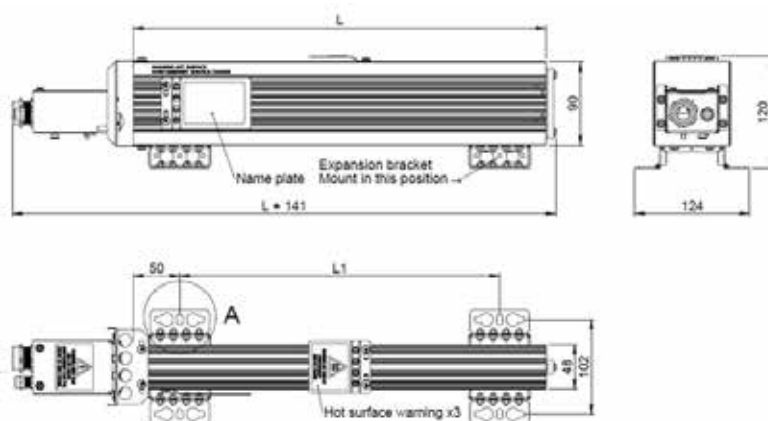
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CCR-V 116 C	116	-	0.8
CCR-V 172 C	172	72	1,0
CCR-V 222 C	222	122	1.3
CCR-V 276 C	276	176	1.6
CCR-V 326 C	326	226	1.8
CCR-V 426 C	426	326	2.3
CCR-V 526 C	526	426	2.8
CCR-V 626 C	626	526	3.3

CCR-V xxx CT, cable connection IP50 / IP54 with thermal switch



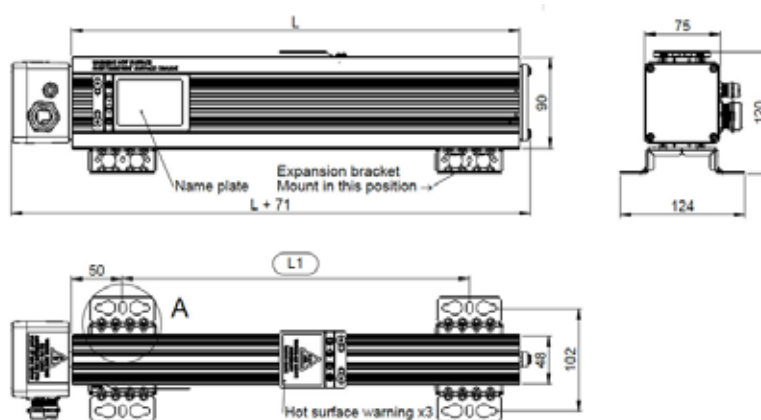
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CCR-V 145 CT	145	-	0.9
CCR-V 201 CT	201	91	1.2
CCR-V 251 CT	251	141	1.5
CCR-V 305 CT	305	195	1.7
CCR-V 355 CT	355	245	2,0
CCR-V 455 CT	455	345	2.5
CCR-V 555 CT	555	445	2.9
CCR-V 655 CT	655	545	3.4

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



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CCR-V 145 DT	145	-	1.5
CCR-V 201 DT	201	91	1.8
CCR-V 251 DT	251	141	2,0
CCR-V 305 DT	305	195	2.3
CCR-V 355 DT	355	245	2.6
CCR-V 455 DT	455	345	3
CCR-V 555 DT	555	445	3.6
CCR-V 665 DT	655	545	4,0

CCR-V xxx BT, box connection IP65 with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CCR-V 145 BT	145	-	1.5
CCR-V 201 BT	201	91	1.7
CCR-V 251 BT	251	141	2
CCR-V 305 BT	305	195	2.2
CCR-V 355 BT	355	245	2.5
CCR-V 455 BT	455	345	3
CCR-V 555 BT	555	445	3.5
CCR-V 655 BT	655	545	4,0



Conne- tion 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	-	-	-	-	-	-	0-5-4
B-Box*	IP65	M25	9-16.6	7.5	0.75-10	M12	3-7	0.5-4

Connection boxes (optional)



* 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, Optionally IP54 or IP65. 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.

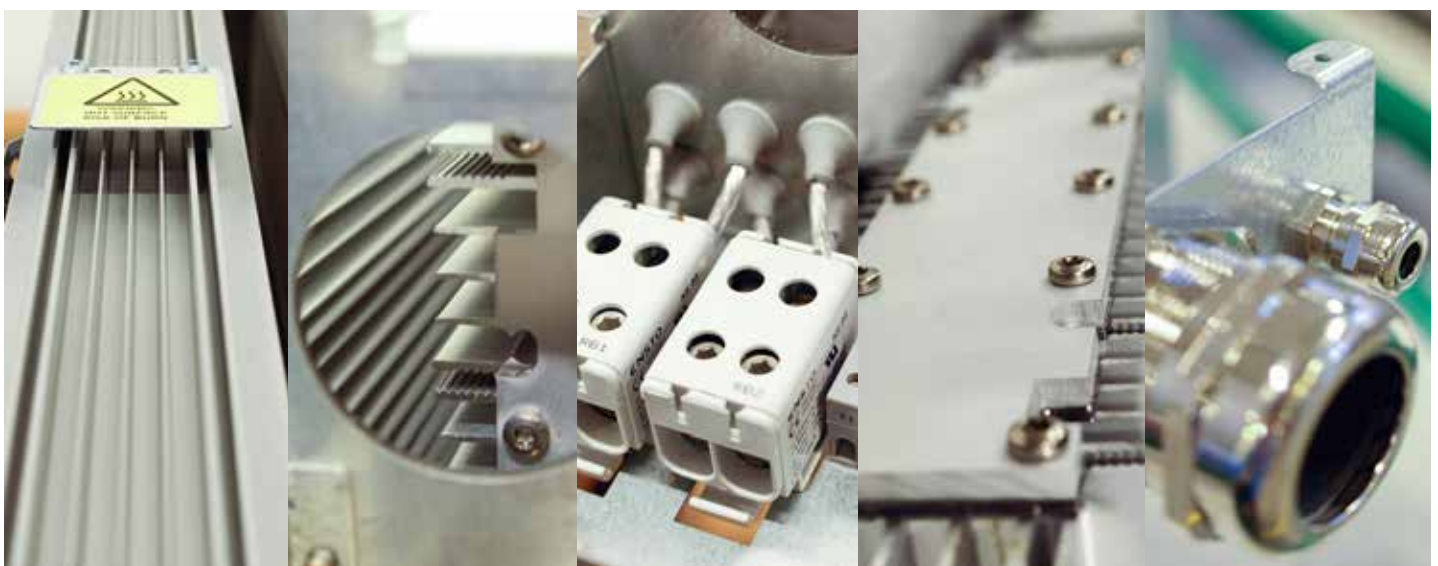
IP values and their type-tests are well defined; for instance “IP65” means dust cannot penetrate the box or if dust occurs internally, it will not influence the electrical properties. It should be able to withstand water jets from any direction with a certain pressure during 3 minutes; however, it does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

- 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

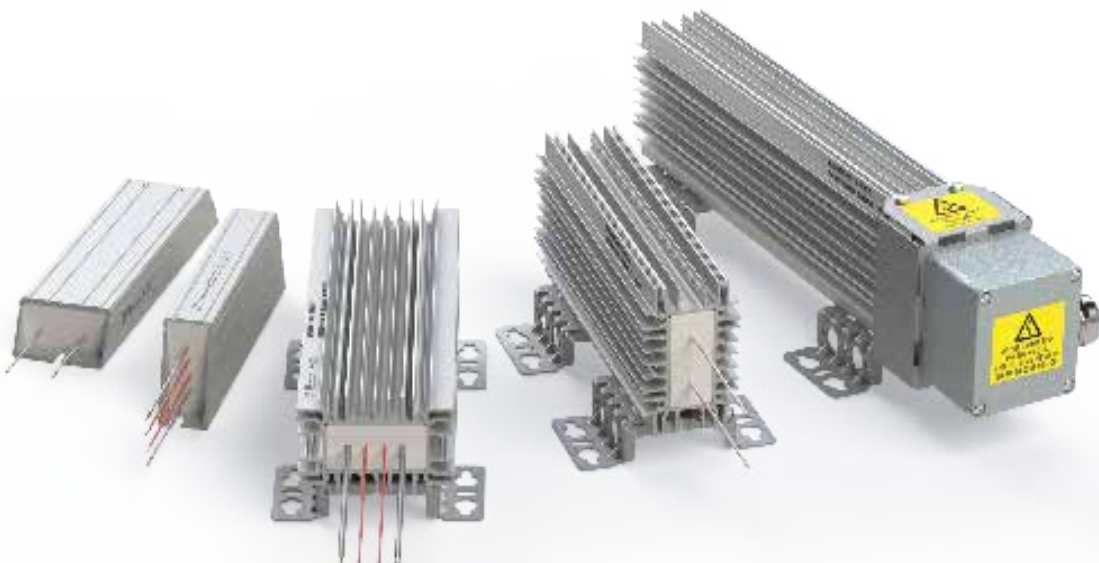


02

CBH, CBV, CBR-H, CBR-V

Power range: 85 W - 1700 W

Cooling method: Convection cooled



CBH / CBV / CBR Cable cable connection IP50/IP54

Type 	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 s	duty 5 s	duty 10 s	duty 20 s	duty 40 s
CBH / CBV 165 C	110	265	0.5 - 1000	5	1.4	0.9	0.5	0.3
CBH / CBV 215 C	155	270	0.8 - 1500	9.8	2.5	1.6	0.7	0.5
CBH / CBV 265 C	200	270	1.5 - 2000	16.6	4.0	2.4	1	0.6
CBH / CBV 335 C	270	280	1.8 - 2000	26.6	6.2	3.4	1.3	0.9
CBH / CBV 405 C	330	285	2.0 - 2000	34.1	8.5	4.3	1.6	1

CBH / CBV with thermal switch

CBH / CBV 190 CT	85	210	0.5 - 1000	5	1.4	0.9	0.5	0.3
CBH / CBV 240 CT	120	215	0.8 - 1500	9.8	2.5	1.5	0.8	0.4
CBH / CBV 290 CT	150	220	1.5 - 2000	16.6	3.8	1.9	1	0.5
CBH / CBV 360 CT	200	225	1.8 - 2000	25.6	5.2	2.6	1.3	0.7
CBH / CBV 430 CT	250	230	2.0 - 2000	32.5	6.5	3.2	1.6	0.8

CBHK 1000V

Type 	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 s	duty 5 s	duty 10 s	duty 20 s	duty 40 s
CBHK 165 C	110	270	0.5 - 1000	4.3	1.7	1.0	0.5	0.3
CBHK 215 C	155	280	0.8 - 1500	10.7	3.0	1.5	0.7	0.4
CBHK 265 C	200	280	1.5 - 2000	17.8	3.9	1.9	1.0	0.5
CBHK 335 C	270	290	1.8 - 2000	24.1	5.3	2.6	1.3	0.7
CBHK 405 C	330	300	2.0 - 2000	30.6	6.5	3.2	1.6	0.8

CBHK with thermal switch

CBHK 190 CT	85	220	0.5 - 1000	4.3	1.7	1.1	0.5	0.3
CBHK 240 CT	120	220	0.8 - 1500	10.9	3.0	1.5	0.8	0.4
CBHK 290 CT	150	230	1.5 - 2000	18	3.9	1.9	1.0	0.5
CBHK 360 CT	200	230	1.8 - 2000	24.1	5.2	2.6	1.3	0.6
CBHK 430 CT	250	240	2.0 - 2000	30.6	6.6	3.3	1.6	0.8



CBR-V 225 KT

Type 	Pn W @ 40°C	Temp max °C	R [Ω] min-max	Pulse load kW, Temp. amb 40°C, cycle 120s				
				duty 1 s	duty 5 s	duty 10 s	duty 20 s	duty 40 s
CBR-V / H 175 C / K	310	265	0.8 - 1500	10.5	2.7	1.8	1.2	0.9
CBR-V / H 225 C / K	400	270	1.5 - 2000	18.3	4.5	2.8	1.8	1.2
CBR-V / H 295 C / K	525	275	1.8 - 2000	29.7	7.1	4.2	2.7	1.8
CBR-V / H 365 C / K	650	280	2.0 - 2000	38.4	11.3	6.7	3.8	2.4
CBR-V / H 426 C / K	980	285	2.4 - 2000	39.1	12.9	7.9	4.5	2.9
CBR-V / H 526 C / K	1220	295	3.0 - 2000	49.1	16.1	9.9	5.8	3.6
CBR-V / H 626 C / K	1450	305	3.5 - 2000	60.6	19.7	12	7.1	4.4
CBR-V / H 726 C / K	1700	310	4.0 - 2000	73.1	23.4	14.3	8.6	5.2

CBR-V / H with thermal switch and or connection box

CBR-V / H 160 CT/KT/DT/BT	160	210	0.5 - 1000	5.4	1.5	1	0.7	0.5
CBR-V / H 210 CT/KT/DT/BT	230	210	0.8 - 1500	10.6	2.8	1.8	1.3	0.9
CBR-V / H 260 CT/KT/DT/BT	300	225	1.5 - 2000	18.4	4.6	2.8	1.9	1.3
CBR-V / H 330 CT/KT/DT/BT	390	230	1.8 - 2000	30	7.1	4.2	2.7	1.7
CBR-V / H 400 CT/KT/DT/BT	490	230	2.0 - 2000	38.8	11.4	6.8	4.1	2.1
CBR-V / H 460 CT/KT/DT/BT	740	240	2.4 - 2000	39.4	12.9	8	4.8	2.4
CBR-V / H 560 CT/KT/DT/BT	920	250	3.0 - 2000	49.4	16.2	10	6.1	3.1
CBR-V / H 660 CT/KT/DT/BT	1100	260	3.5 - 2000	60.6	19.7	12.1	7.4	3.8
CBR-V / H 760 CT/KT/DT/BT	1300	260	4.0 - 2000	73.8	23.3	14.2	8.7	4.3

Construction and salient properties

- UL approved
- Compact dimensions
- Nominal power range from 85W—1700W
- Energy levels from 9kJ-150kJ per case housing (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP00-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high Test voltage
- SiO₂ filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low audible 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)

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	
Test voltage		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	all types	no de-rating	
De-rating horizontal mounting	CBH / CBV	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, 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 / 975 VDC	Cable / B, K - Box
	On request	1000 VAC / 1400 VDC	Cable / BG - Box
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	
Test voltage		2000VAC (3500VAC between TS and R)	
Temperature requirements on cables	IP 21	80°C	
	IP 65	90°C	

Conne- ction box	IP rating	Cable gland	Clamping mm	Braid mm	Connection	TS gland	Clamping mm	Connection mm ²
B - Box	IP65	M25	9 - 16.6	7.5	0.5 - 10	M12	3 - 7	0.5 - 4
D - Box	IP21	M25	9 - 16.6	7.5	0.5 - 10	M12	3 - 7	0.5 - 4
K - Box	IP00	-	-	-	0.5 - 10	-	-	0.5 - 4

Connection boxes (optional)

*Thermal switch with
K-box optional



D / DT -box



B / BT-box

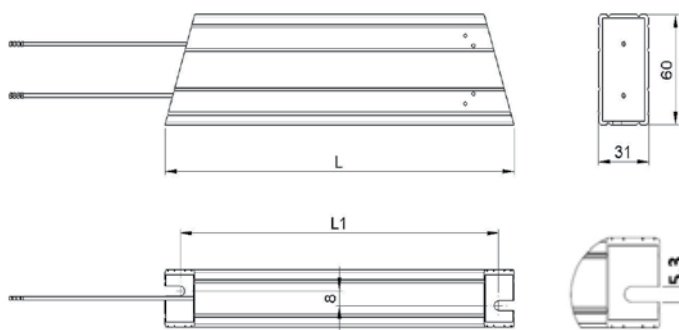


K-box

T = Thermostat

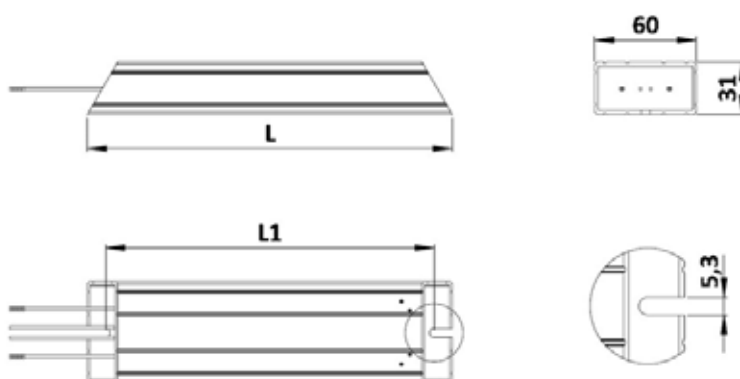
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBH / CBV 165 C	165	146	500
CBH / CBV 215 C	215	196	690
CBH / CBV 265 C	265	246	880
CBH / CBV 335 C	335	316	1140
CBH / CBV 405 C	405	386	1400

CBH / CBV with cable connection IP50/IP54

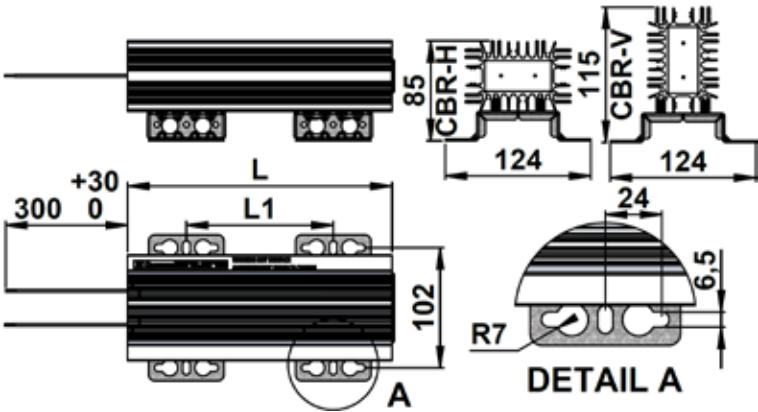


CBH / CBV with cable connection IP50/IP54 with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBH/CBV 190 CT	190	171	600
CBH/CBV 240 CT	240	221	790
CBH/CBV 290 CT	290	271	980
CBH/CBV 360 CT	360	341	1240
CBH/CBV 430 CT	430	411	1500

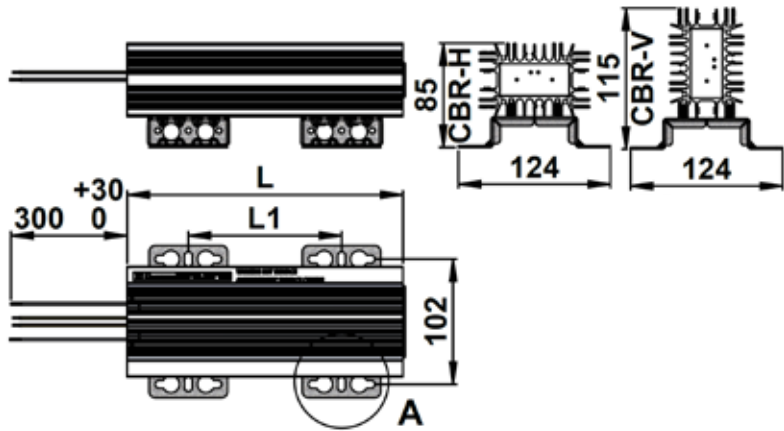


CBR-H ... C 001 cable connection IP50 / IP54



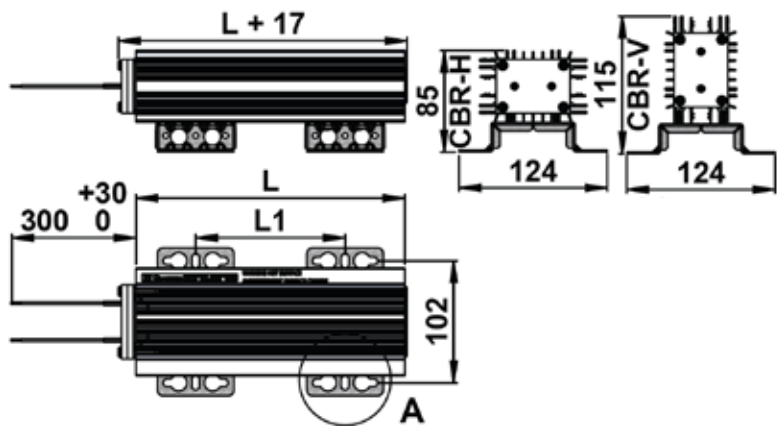
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-V/CBR-H 175 C 001	175	75	1.3
CBR-V/CBR-H 225 C 001	225	125	1.6
CBR-V/CBR-H 295 C 001	295	195	2.0
CBR-V/CBR-H 365 C 001	365	265	2.4
CBR-V/CBR-H 426 C 001	426	326	2.7
CBR-V/CBR-H 526 C 001	526	426	3.3
CBR-V/CBR-H 626 C 001	626	526	3.8
CBR-V/CBR-H 726 C 001	726	626	4.4

CBR-V ... CT ... cable connection IP50/IP54
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-H/CBR-V 160 CT 081	160	70	1.2
CBR-H/CBR-V 210 CT 081	210	110	1.5
CBR-H/CBR-V 260 CT 081	260	160	1.8
CBR-H/CBR-V 330 CT 081	330	230	2.2
CBR-H/CBR-V 400 CT 081	400	300	2.6
CBR-H/CBR-V 460 CT 081	460	360	3.0
CBR-H/CBR-V 560 CT 081	560	460	3.6
CBR-H/CBR-V 660 CT 081	660	560	4.2
CBR-H/CBR-V 760 CT 081	760	660	4.8

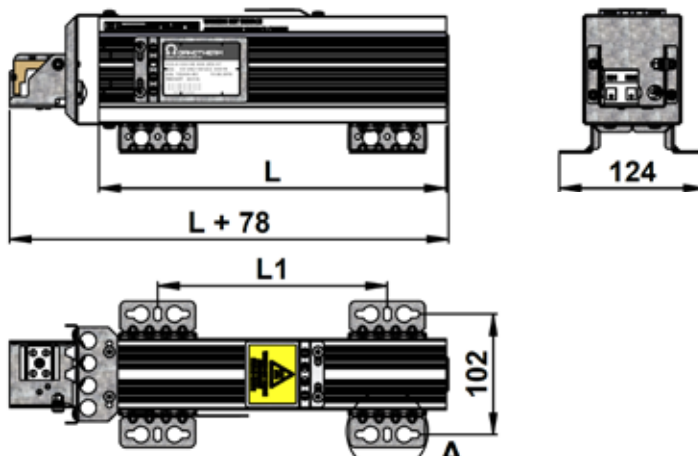
CBR-V ... W ... cable connection IP65
with or without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-H/CBR-V 160 WX 0X1	160	70	1.3
CBR-H/CBR-V 210 WX 0X1	210	110	1.6
CBR-H/CBR-V 260 WX 0X1	260	160	1.9
CBR-H/CBR-V 330 WX 0X1	330	230	2.3
CBR-H/CBR-V 400 WX 0X1	400	300	2.7
CBR-H/CBR-V 460 WX 0X1	460	360	3.0
CBR-H/CBR-V 560 WX 0X1	560	460	3.6
CBR-H/CBR-V 660 WX 0X1	660	560	4.2
CBR-H/CBR-V 760 WX 0X1	760	660	4.8

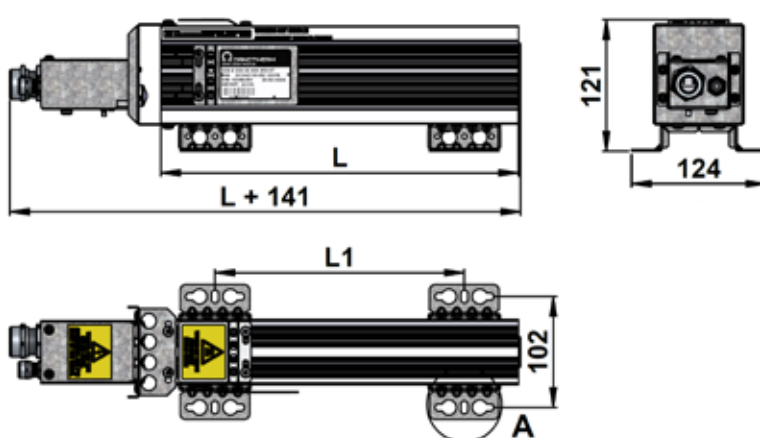
CBR-V ... K 2.1 box connection IP00
without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-V 175 K 201	175	75	1.6
CBR-V 225 K 201	225	125	1.9
CBR-V 295 K 201	295	195	2.3
CBR-V 365 K 201	365	265	2.8
CBR-V 426 K 201	426	326	3.1
CBR-V 526 K 201	526	426	3.8
CBR-V 626 K 201	626	526	4.4
CBR-V 726 K 201	726	626	5.0



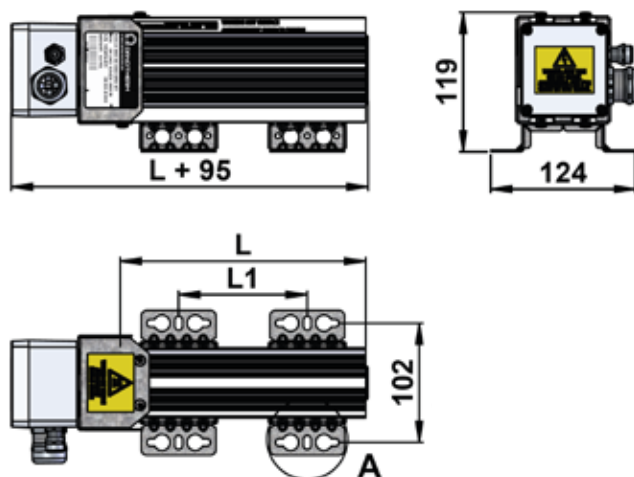
CBR-V ... DT 2.1 box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-V 160 D T 281	160	70	1.7
CBR-V 210 D T 281	210	110	2.0
CBR-V 260 D T 281	260	160	2.3
CBR-V 330 D T 281	330	230	2.7
CBR-V 400 D T 281	400	300	3.1
CBR-V 460 D T 281	460	360	3.5
CBR-V 560 D T 281	560	460	4.1
CBR-V 660 D T 281	660	560	4.7
CBR-V 760 D T 281	760	660	5.3



CBR-V ... BT 2.1 box connection IP 65
with thermal switch

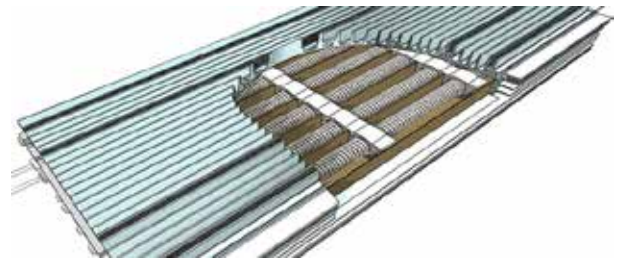
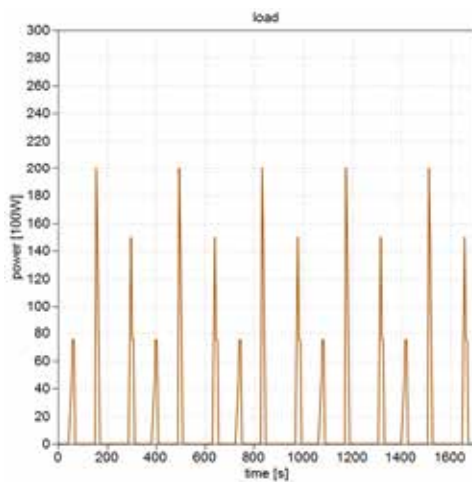
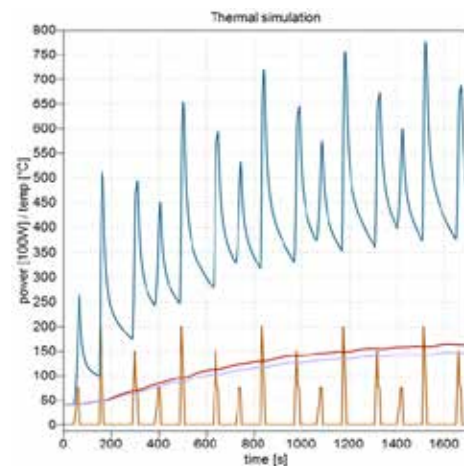
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBR-V 160 B T 281	160	70	2.0
CBR-V 210 B T 281	210	110	2.3
CBR-V 260 B T 281	260	160	2.6
CBR-V 330 B T 281	330	230	3.0
CBR-V 400 B T 281	400	300	3.4
CBR-V 460 B T 281	460	360	3.8
CBR-V 560 B T 281	560	460	4.4
CBR-V 660 B T 281	660	560	5.0
CBR-V 760 B T 281	760	660	5.6



Thermal simulations

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, Plects or any other)
- For more complex loads a data file (like csv) can be used for input
- Optimizing the design, reducing overall size and costs
- Proof of capability is given without even building and testing samples

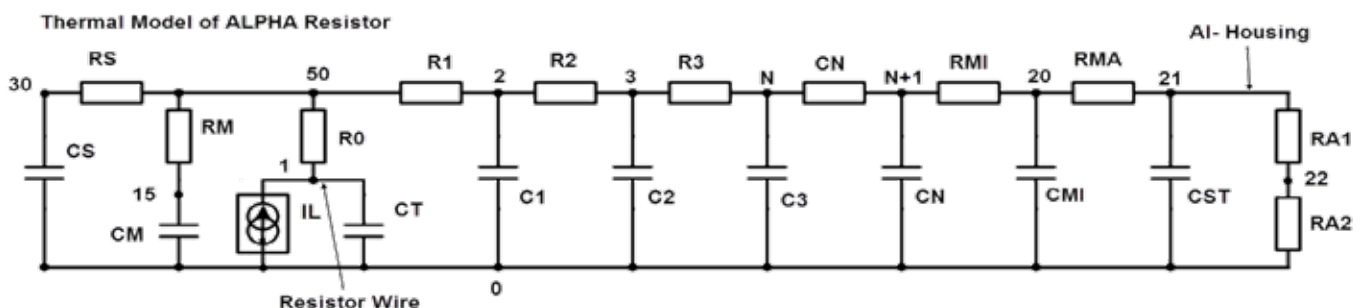


Measured on site: Brake Power saved in .csv file.

Simulation made by Danotherm

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

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

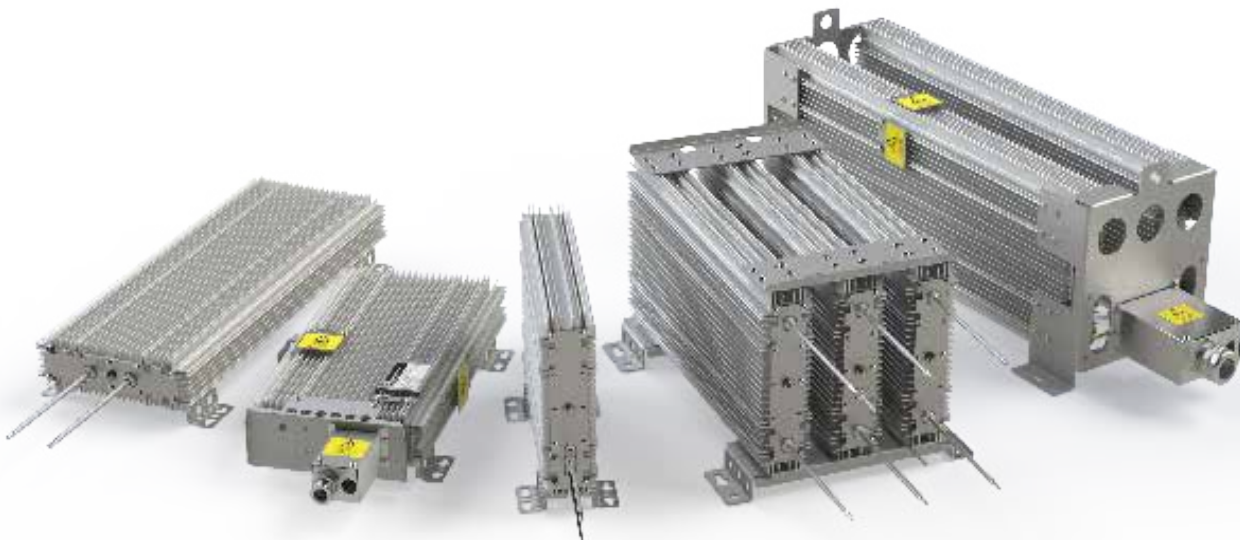


03

CBT-H, CBT-V

Power range: 380 W - 12000 W

Cooling method: Convection cooled



Length / Type	Nominal power [W] @ 40°C amb. , Cable connection				
	1 housing	2 housings	3 housings	4 housings	R [Ω] min-max
CBT 180 CH	455				0.04 - 13
CBT 210 CH	580				0.05 - 2000
CBT 260 CH	850				0.07 - 2000
CBT 330 CH	1350				0.09 - 2000
CBT 400 CH	1650	2500	3700	4900	0.11 - 2000
CBT 460 CH	1900	2900	4300	5600	0.14 - 2000
CBT 560 CH	2300	3500	5200	6800	0.18 - 110
CBT 660 CH	2700	4100	6100	8000	0.22 - 130
CBT 760 CH	3200	4900	7200	9500	0.27 - 150
CBT 860 CH	3600	5500	8200	10800	0.31- 180
CBT 960 CH	4100	6200	9200	12000	0.35 - 220
CBT-H / V with thermal switch and or connection box					
CBT 180 CT/W/WT/DT/BT	380				0.04 - 13
CBT 210 CT/W/WT/DT/BT	520				0.05 - 2000
CBT 260 CT/W/WT/DT/BT	750				0.07 - 2000
CBT 330 CT/W/WT/DT/BT	1100	1650	2500	3300	0.09 - 2000
CBT 400 CT/W/WT/DT/BT	1450	2200	3200	4300	0.11 - 2000
CBT 460 CT/W/WT/DT/BT	1700	2600	3900	5100	0.14 - 2000
CBT 560 CT/W/WT/DT/BT	2100	3200	4700	6200	0.18 - 110
CBT 660 CT/W/WT/DT/BT	2500	3800	5600	7300	0.22 - 130
CBT 760 CT/W/WT/DT/BT	2900	4400	6500	8600	0.27 - 150
CBT 860 CT/W/WT/DT/BT	3300	5000	7400	9800	0.31- 180
CBT 960 CT/W/WT/DT/BT	3700	5600	8300	10900	0.35 - 220

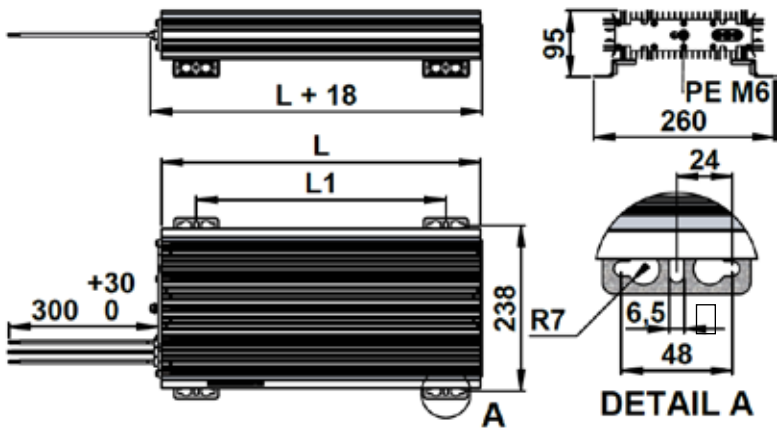
Construction and salient properties

- Compact dimensions
- Nominal power range from 380W—12000 W
- Energy levels from 25kJ-550kJ per case housing (5s duty,120s cycle), depending on ohmic value
- Aluminium case housing for high IP rating
- IP00-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 Test voltage
- Al_2O_3 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		
Test voltage		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: Option 1	600 V	CBT-B-Box
		UL: Option 2	1000 VAC / 14000 VDC	CBT-BG+multiple+Cable
		UL: Option 3	1500 V	CBT-BG+Cable
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		
Test voltage		2000VAC (3500VAC between TS and R)		
Temperature requirements on cables	IP 21	80°C		
	IP 65	90°C		

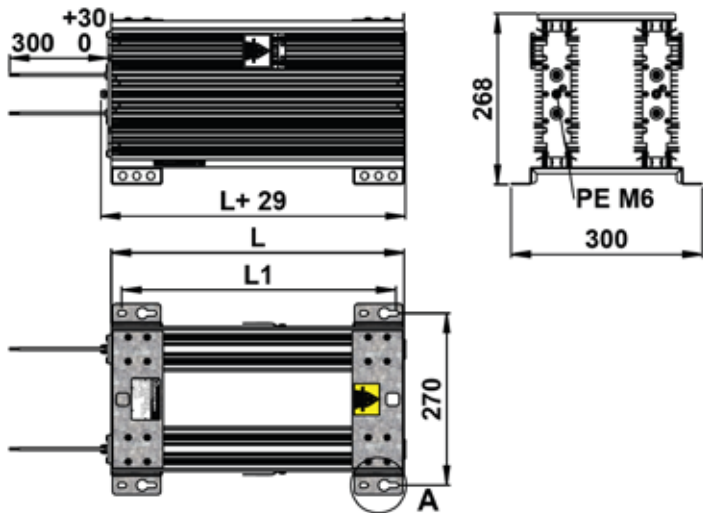
* refers to drawing configuration

CBT-H ... CT 001 cable connection IP50 / IP54
with and without thermal switch



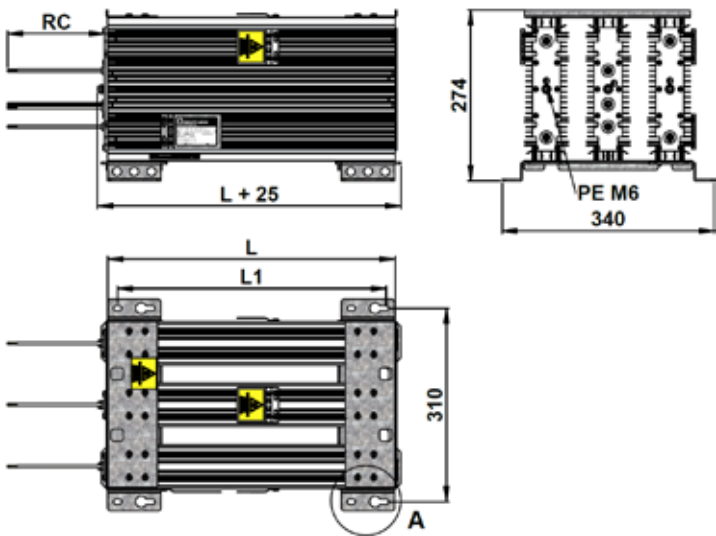
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-H 180 C(H/E)(T) 0X1	180	70	3.3
CBT-H 210 C(H/E)(T) 0X1	210	110	3.8
CBT-H 260 C(H/E)(T) 0X1	260	160	4.5
CBT-H 330 C(H/E)(T) 0X1	330	230	5.6
CBT-H 400 C(H/E)(T) 0X1	400	300	6.7
CBT-H 460 C(H/E)(T) 0X1	460	360	7.6
CBT-H 560 C(H/E)(T) 0X1	560	460	9.2
CBT-H 660 C(H/E)(T) 0X1	660	560	10.7
CBT-H 760 C(H/E)(T) 0X1	760	660	12.3
CBT-H 860 C(H/E)(T) 0X1	860	760	13.8
CBT-H 960 C(H/E)(T) 0X1	960	860	15.4

CBT-V ... C 0.2 cable connection IP50 / IP54
with and without thermal switch x1



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 C(H/E)(T) 0X2	400	370	14.9
CBT-V 460 C(H/E)(T) 0X2	460	430	16.8
CBT-V 560 C(H/E)(T) 0X2	560	530	19.9
CBT-V 660 C(H/E)(T) 0X2	660	630	23
CBT-V 760 C(H/E)(T) 0X2	760	730	26
CBT-V 860 C(H/E)(T) 0X2	860	830	29
CBT-V 960 C(H/E)(T) 0X2	960	930	32

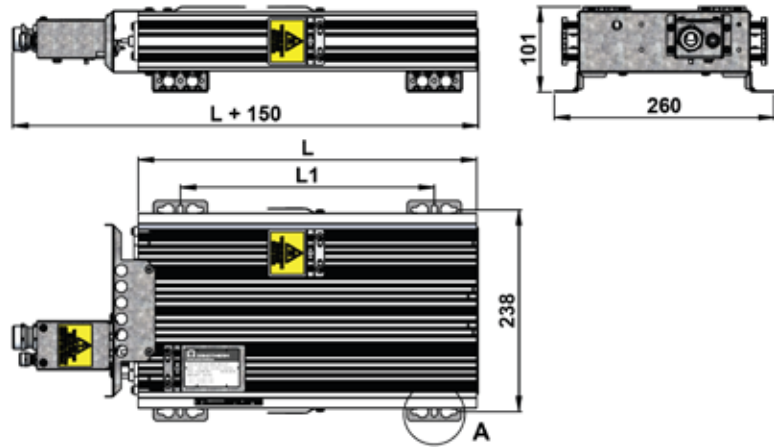
CBT-V ... C ... 0.3 cable connection IP50 / IP54
with and without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 C(H/E)(T) 0X3	400	370	21
CBT-V 460 C(H/E)(T) 0X3	460	430	24
CBT-V 560 C(H/E)(T) 0X3	560	530	29
CBT-V 660 C(H/E)(T) 0X3	660	630	34
CBT-V 760 C(H/E)(T) 0X3	760	730	39
CBT-V 860 C(H/E)(T) 0X3	860	830	43
CBT-V 960 C(H/E)(T) 0X3	960	930	48

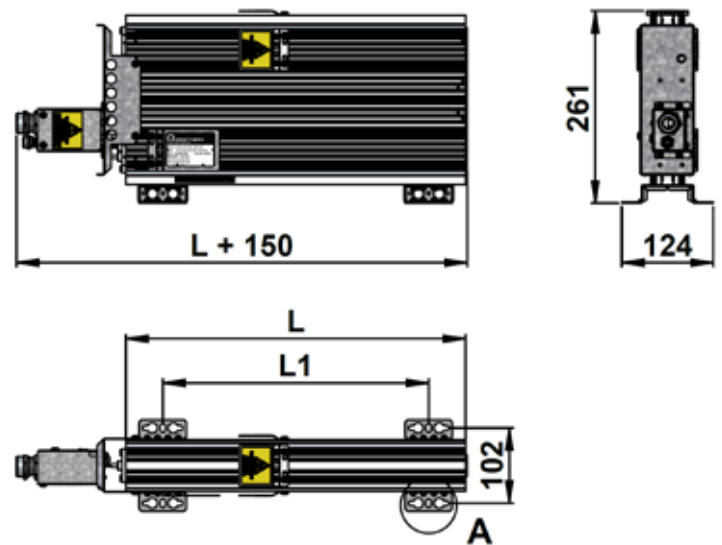
CBT-H ... D ... box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-H 180 D(H/E)(T) 2X1	180	70	3.9
CBT-H 210 D(H/E)(T) 2X1	210	110	4.4
CBT-H 260 D(H/E)(T) 2X1	260	160	5.1
CBT-H 330 D(H/E)(T) 2X1	330	230	6.2
CBT-H 400 D(H/E)(T) 2X1	400	300	7.3
CBT-H 460 D(H/E)(T) 2X1	460	360	8.2
CBT-H 560 D(H/E)(T) 2X1	560	460	9.8
CBT-H 660 D(H/E)(T) 2X1	660	560	11.3
CBT-H 760 D(H/E)(T) 2X1	760	660	12.9
CBT-H 860 D(H/E)(T) 2X1	860	760	14.4
CBT-H 960 D(H/E)(T) 2X1	960	860	16



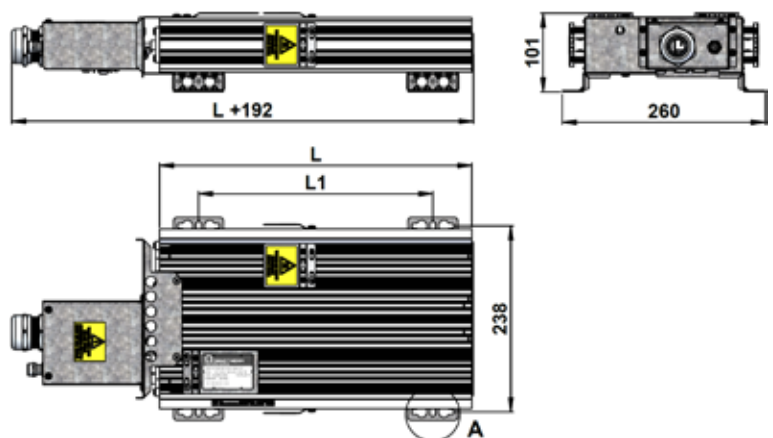
CBT-V ... D ... box connection IP20/IP21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 180 D(H/E)(T) 2X1	180	70	3.9
CBT-V 210 D(H/E)(T) 2X1	210	110	4.4
CBT-V 260 D(H/E)(T) 2X1	260	160	5.1
CBT-V 330 D(H/E)(T) 2X1	330	230	6.2
CBT-V 400 D(H/E)(T) 2X1	400	300	7.3
CBT-V 460 D(H/E)(T) 2X1	460	360	8.2
CBT-V 560 D(H/E)(T) 2X1	560	460	9.8
CBT-V 660 D(H/E)(T) 2X1	660	560	11.3
CBT-V 760 D(H/E)(T) 2X1	760	660	12.9
CBT-V 860 D(H/E)(T) 2X1	860	760	14.4
CBT-V 960 D(H/E)(T) 2X1	960	860	16

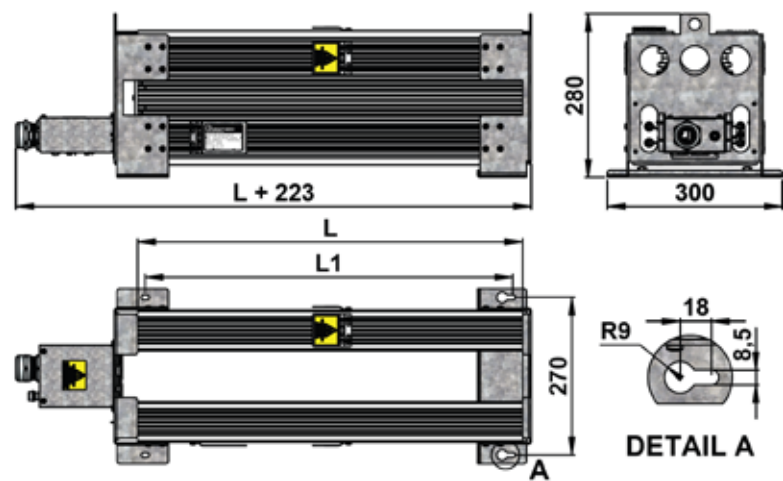


CBT-H ... G ... box connection IP20/21
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-H 180 G(H/E)(T) 2X1	180	70	4.5
CBT-H 210 G(H/E)(T) 2X1	210	110	5,0
CBT-H 260 G(H/E)(T) 2X1	260	160	5.7
CBT-H 330 G(H/E)(T) 2X1	330	230	6.8
CBT-H 400 G(H/E)(T) 2X1	400	300	7.9
CBT-H 460 G(H/E)(T) 2X1	460	360	8.8
CBT-H 560 G(H/E)(T) 2X1	560	460	10.4
CBT-H 660 G(H/E)(T) 2X1	660	560	11.9
CBT-H 760 G(H/E)(T) 2X1	760	660	13.5
CBT-H 860 G(H/E)(T) 2X1	860	760	15
CBT-H 960 G(H/E)(T) 2X1	960	860	16.6

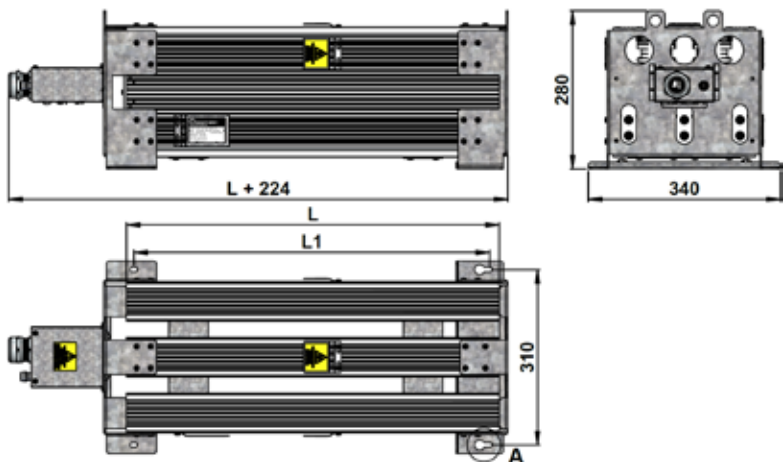


CBT-H ... G ..2 box connection IP20/IP21
with thermal switch



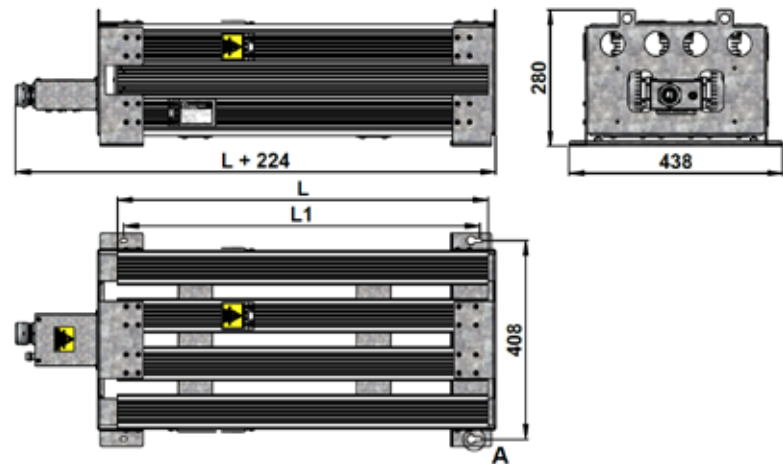
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 G(H/E)(T) 2X2	400	370	18
CBT-V 460 G(H/E)(T) 2X2	460	430	20
CBT-V 560 G(H/E)(T) 2X2	560	530	24
CBT-V 660 G(H/E)(T) 2X2	660	630	27
CBT-V 760 G(H/E)(T) 2X2	760	730	31
CBT-V 860 G(H/E)(T) 2X2	860	830	34
CBT-V 960 G(H/E)(T) 2X2	960	930	38

CBT-V ... G ..3 box connection IP20/IP21
with thermal switch



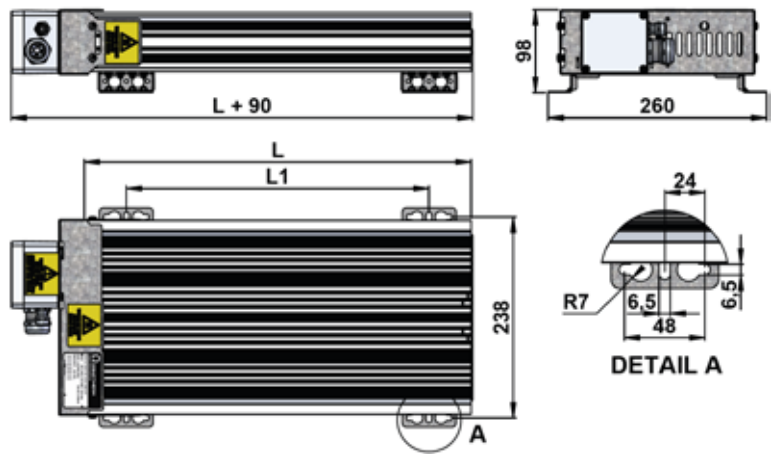
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 G(H/E)(T) 2X3	400	370	26
CBT-V 460 G(H/E)(T) 2X3	460	430	29
CBT-V 560 G(H/E)(T) 2X3	560	530	33
CBT-V 660 G(H/E)(T) 2X3	660	630	38
CBT-V 760 G(H/E)(T) 2X3	760	730	43
CBT-V 860 G(H/E)(T) 2X3	860	830	47
CBT-V 960 G(H/E)(T) 2X3	960	930	52

CBT-V ... G ..4 box connection IP20/IP21
with thermal switch

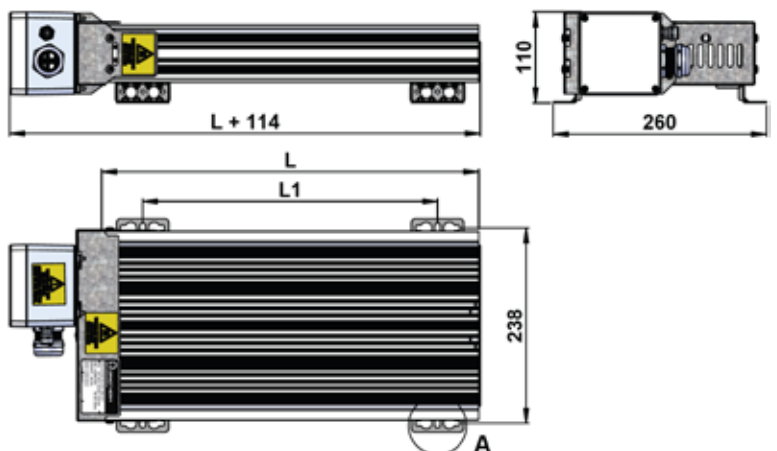


Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 G(H/E)(T) 2X4	400	370	34
CBT-V 460 G(H/E)(T) 2X4	460	430	38
CBT-V 560 G(H/E)(T) 2X4	560	530	44
CBT-V 660 G(H/E)(T) 2X4	660	630	50
CBT-V 760 G(H/E)(T) 2X4	760	730	56
CBT-V 860 G(H/E)(T) 2X4	860	830	63
CBT-V 960 G(H/E)(T) 2X4	960	930	69

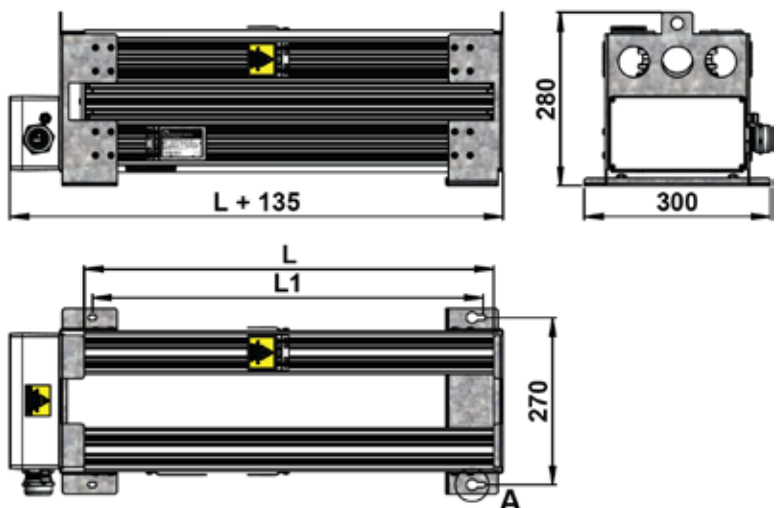
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-H 180 B(H/E)T 281	180	70	4,0
CBT-H 210 B(H/E)T 281	210	110	4.5
CBT-H 260 B(H/E)T 281	260	160	5.3
CBT-H 330 B(H/E)T 281	330	230	6.3
CBT-H 400 B(H/E)T 281	400	300	7.4
CBT-H 460 B(H/E)T 281	460	360	8.4
CBT-H 560 B(H/E)T 281	560	460	9.9
CBT-H 660 B(H/E)T 281	660	560	11.5
CBT-H 760 B(H/E)T 281	760	660	13.1
CBT-H 860 B(H/E)T 281	860	760	14.6
CBT-H 960 B(H/E)T 281	960	860	16.2



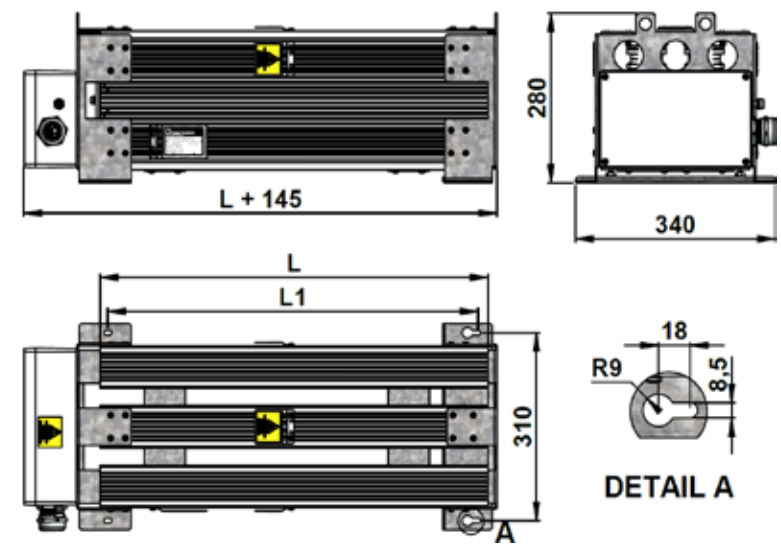
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-H 180 BG(H/E)T 281	180	70	4.6
CBT-H 210 BG(H/E)T 281	210	110	5.1
CBT-H 260 BG(H/E)T 281	260	160	5.8
CBT-H 330 BG(H/E)T 281	330	230	6.9
CBT-H 400 BG(H/E)T 281	400	300	8,0
CBT-H 460 BG(H/E)T 281	460	360	8.9
CBT-H 560 BG(H/E)T 281	560	460	10.5
CBT-H 660 BG(H/E)T 281	660	560	12
CBT-H 760 BG(H/E)T 281	760	660	13.6
CBT-H 860 BG(H/E)T 281	860	760	15.1
CBT-H 960 BG(H/E)T 281	960	860	16.7



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 B(H)T 282	400	370	18
CBT-V 460 B(H)T 282	460	430	20
CBT-V 560 B(H) T 282	560	530	23
CBT-V 660 B(H)T 282	660	630	27
CBT-V 760 B(H)T 282	760	730	30
CBT-V 860 B(H)T 282	860	830	34
CBT-V 960 B(H)T 282	960	930	37

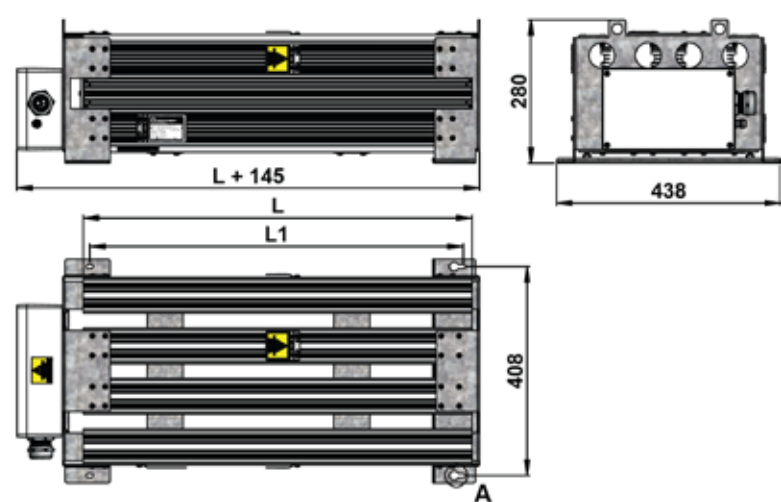


CBT-V ... B 2.3 box connection IP65
with thermal switch x1



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 B(H/E)T 283	400	370	28
CBT-V 460 B(H/E)T 283	460	430	30
CBT-V 560 B(H/E)T 283	560	530	35
CBT-V 660 B(H/E)T 283	660	630	40
CBT-V 760 B(H/E)T 283	760	730	45
CBT-V 860 B(H/E)T 283	860	830	49
CBT-V 960 B(H/E)T 283	960	930	54

CBT-V ... B 2.4 box connection IP65
with thermal switch x1



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBT-V 400 B(H/E)T 284	400	370	35
CBT-V 460 B(H/E) T 284	460	430	39
CBT-V 560 B(H/E)T 284	560	530	45
CBT-V 660 B(H/E)T 284	660	630	52
CBT-V 760 B(H/E) T 284	760	730	58
CBT-V 860 B(H/E) T 284	860	830	64
CBT-V 960 B(H/E) T 284	960	930	71



Connection box	IP rating	Cable gland	Clamping mm	Braid mm	Connection	TS gland	Clamping mm	Connection mm ²
B - Box Single	IP65	M25	9 - 16.6	7.5	0.5 - 10	M12	3 - 7	0.5 - 4
BG - Box Single	IP65	M32	11 - 21	9	2.5 - 35	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	0.5 - 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	-	-	-	0.5 - 10	-	-	-



B-box



BG-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.

04

CBS, CMQ, CVS, HVBS, HVS

Power range: 445 W - 11300 W

Cooling method: Convection cooled



Construction and salient properties

- Compact dimensions
- Nominal power range from 445 W—11300 W
- 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 Test voltage
- SiO₂ filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optionally thermal switch or PT100 element for thermal protection guard.
- Cable 300mm (AWG 10—AWG4) with sleeves or box connection up to 50mm²
- Multiple case housings (from 2-4 housings)
- Customized to your needs and application (OEM versions available)

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 continuous

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



CVS-H 960 BHT xxx xxR

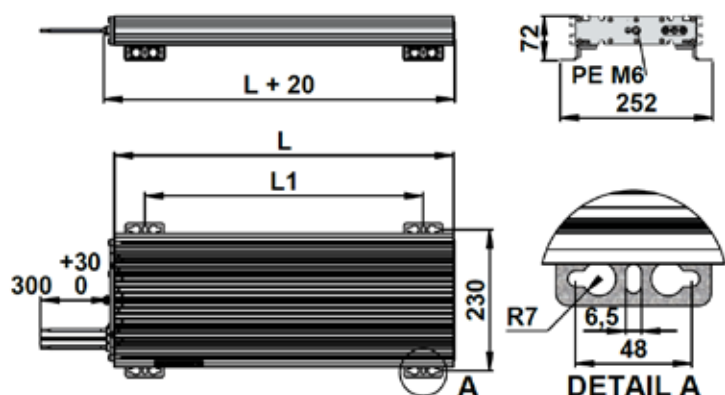
Temperature Coefficient:		100 ppm/K
Test voltage	HVBS	7000 VAC @ 1 minute
	HVS	10000 VAC @ 1 minute
	other types	3500 VAC @ 1 minute
Insulation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		70 - 250 x (depending on resistor)
Overload: @ 5 sec pulse / hour		20 - 60 x (depending on 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	Depending on terminals
	cable version	UL / IEC: 1000VAC / 1400VDC + UL: 1500 V
	HVBS cable version	IEC: 3000VAC / 4200VDC
	HVS cable version	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
Test voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables	IP 21	80°C
	IP 65	90°C

Length / Type	Nominal power [W] @ 40°C amb.				
	1 housing	2 housings	3 housings	4 housings	R [Ω] min-max
CBS 210 CH	580				0.05 - 2000
CBS 260 CH	850				0.07 - 2000
CBS 330 CH	1150				0.09 - 2000
CBS 400 CH	1400	2300	3400	4500	0.11 - 2000
CBS 460 CH	1600	2700	3900	5200	0.14 - 2000
CBS 560 CH	1900	3300	4700	6300	0.18 - 110
CBS 660 CH	2300	3800	5600	7400	0.22 - 130
CBS 760 CH	2800	4700	6800	9100	0.27 - 150
CBS 860 CH	3200	5400	7800	10500	0.31- 180
CBS 960 CH	3600	6100	8800	11700	0.35 - 220

CBS-H / V with thermal switch and or connection box

CBS 210 CT/W/WT/DT/BT	440				0.05 - 2000
CBS 260 CT/W/WT/DT/BT	680				0.07 - 2000
CBS 330 CT/W/WT/DT/BT	870				0.09 - 2000
CBS 400 CT/W/WT/DT/BT	1050	1800	2600	3500	0.11 - 2000
CBS 460 CT/W/WT/DT/BT	1200	2100	3000	4000	0.14 - 2000
CBS 560 CT/W/WT/DT/BT	1500	2500	3600	4800	0.18 - 110
CBS 660 CT/W/WT/DT/BT	1750	3000	4300	5700	0.22 - 130
CBS 760 CT/W/WT/DT/BT	2100	3600	5200	7000	0.27 - 150
CBS 860 CT/W/WT/DT/BT	2400	4200	6000	8000	0.31- 180
CBS 960 CT/W/WT/DT/BT	2700	4600	6700	9000	0.35 - 220

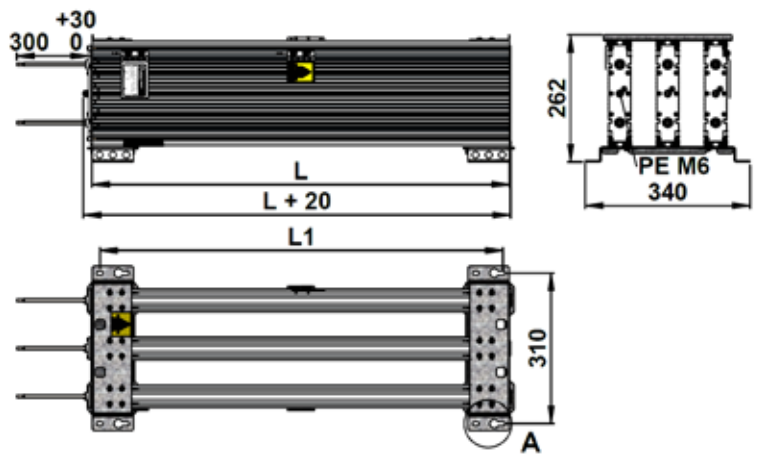
CBS ... C ... cable connection IP50/IP54/65
with and without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBS-H 210 CHT 001	210	110	3.4
CBS-H 260 CHT 001	260	160	4.1
CBS-H 330 CHT 001	330	230	5.0
CBS-H 400 CHT 001	400	300	6.0
CBS-H 460 CHT 001	460	360	6.8
CBS-H 560 CHT 001	560	460	8.2
CBS-H 660 CHT 001	660	560	9.5
CBS-H 760 CHT 001	760	660	10.9
CBS-H 860 CHT 001	860	760	12.2
CBS-H 960 CHT 001	960	860	13.6

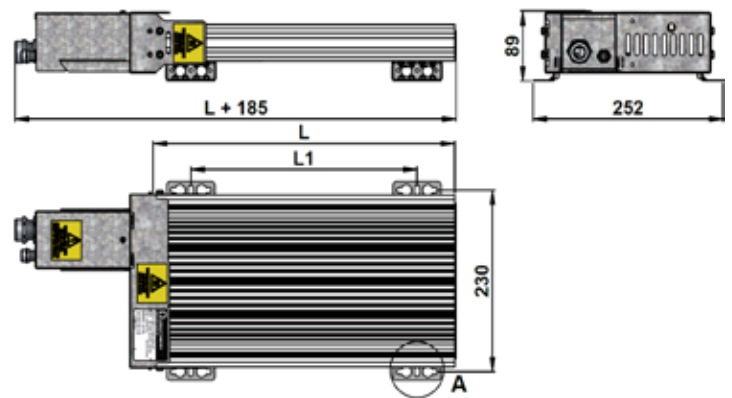
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBS-V 400 C(H/E) 0x3	400	370	20
CBS-V 460 C(H/E) 0x3	460	430	23
CBS-V 560 C(H/E) 0x3	560	530	27
CBS-V 660 C(H/E) 0x3	660	630	31
CBS-V 760 C(H/E) 0x3	760	730	35
CBS-V 860 C(H/E) 0x3	860	830	39
CBS-V 960 C(H/E) 0x3	960	930	43

CBS-V ... C 2.3 cable connection IP50/IP54
with and without thermal switch x1



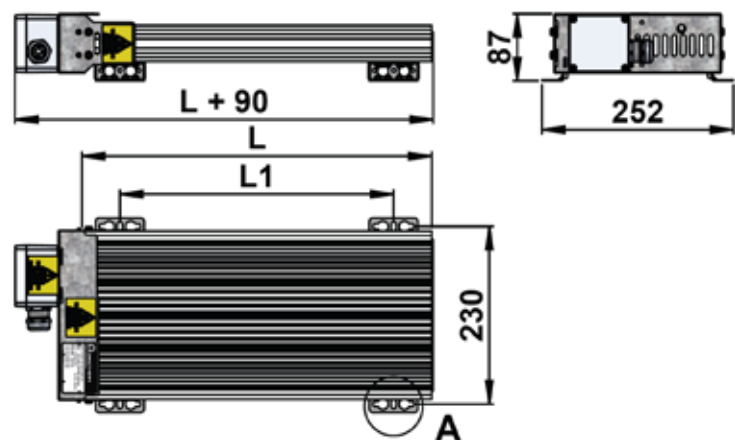
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBS-H 180 DXT 2x1	180	70	4,0
CBS-H 210 DXT 2x1	210	110	4.4
CBS-H 260 DXT 2x1	260	160	5.1
CBS-H 330 DXT 2x1	330	230	6,0
CBS-H 400 DXT 2x1	400	300	7,0
CBS-H 460 DXT 2x1	460	360	7.8
CBS-H 560 DXT 2x1	560	460	9.2
CBS-H 660 DXT 2x1	660	560	10.5
CBS-H 760 DXT 2x1	760	660	11.9
CBS-H 860 DXT 2x1	860	760	13.2
CBS-H 960 DXT 2x1	960	930	14.6

CBS-H... D2.1 cable connection IP20/21
with thermal switch

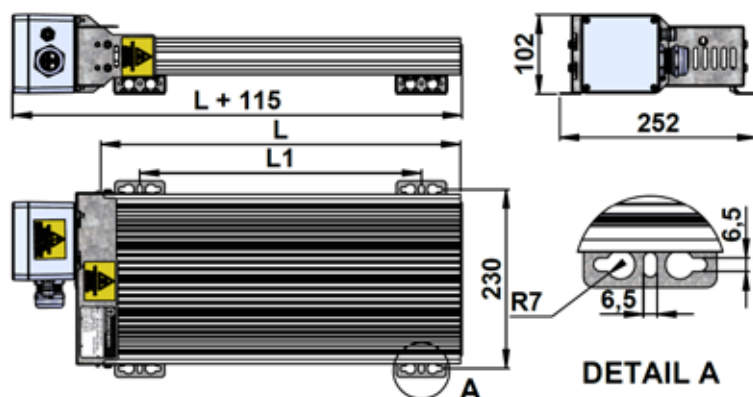


Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBS-H 180 BXT 2x1	180	70	4,0
CBS-H 210 BXT 2x1	210	110	4.4
CBS-H 260 BXT 2x1	260	160	5.1
CBS-H 330 BXT 2x1	330	230	6,0
CBS-H 400 BXT 2x1	400	300	7,0
CBS-H 460 BXT 2x1	460	360	7.8
CBS-H 560 BXT 2x1	560	460	9.2
CBS-H 660 BXT 2x1	660	560	10.5
CBS-H 760 BXT 2x1	760	660	11.9
CBS-H 860 BXT 2x1	860	760	13.2
CBS-H 960 BXT 2x1	960	930	14.6

CBS-H ... B 2.1 box connection IP65
with thermal switch



CBS-H ... BG 2.1 box connection IP65
with thermal switch



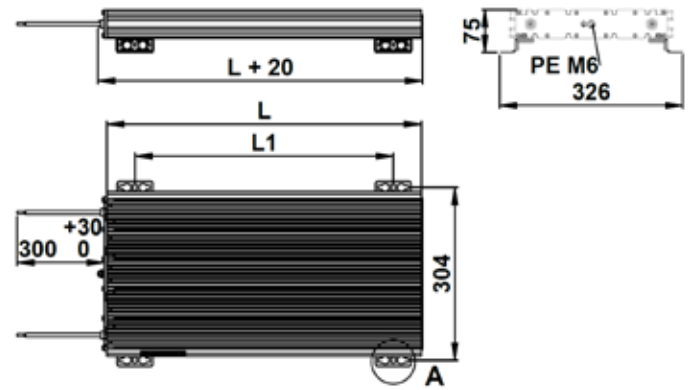
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CBS-H 180 BGXT 2x1	180	70	4.4
CBS-H 210 BGXT 2x1	210	110	4.8
CBS-H 260 BGXT 2x1	260	160	5.5
CBS-H 330 BGXT 2x1	330	230	6.5
CBS-H 400 BGXT 2x1	400	300	7.4
CBS-H 460 BGXT 2x1	460	360	8.2
CBS-H 560 BGXT 2x1	560	460	9.6
CBS-H 660 BGXT 2x1	660	560	11
CBS-H 760 BGXT 2x1	760	660	12.4
CBS-H 860 BGXT 2x1	860	760	13.7
CBS-H 960 BGXT 2x1	960	930	15.1

Length / Type	Nominal power [W] @ 40°C amb.				R [Ω] min-max
	1 housing	2 housings	3 housings	4 housings	
CMQ 210 C	1000				0.02 - 30
CMQ 260 C	1100				0.04 - 50
CMQ 330 C	1600	2200	3200	4300	0.065 - 80
CMQ 400 C	2000	2700	4000	5400	0.07 - 100
CMQ 460 C	2200	3000	4400	5900	0.09 - 140
CMQ 560 C	3000	4100	6000	8000	0.12 - 170
CMQ 660 C	3600	4900	7200	9600	0.15 - 210
CMQ 760 C	4200	5700	8400	11200	0.18 - 250
CMQ 860 C	4800	6500	9600	12900	0.2 - 300
CMQ 960 C	5400	7300	10800	14500	0.25 - 340

CMQ-H / V with thermal switch and or connection box

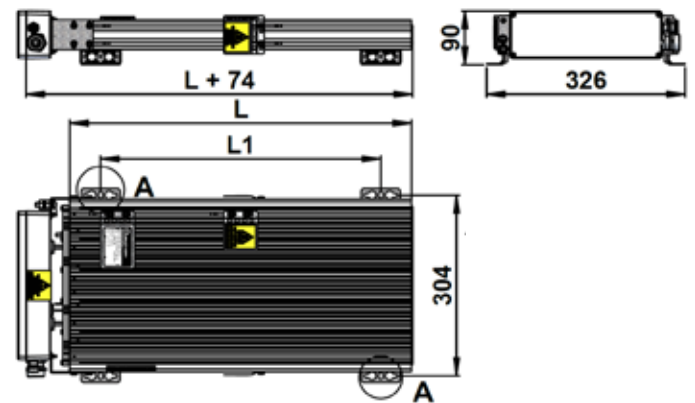
CMQ 210 CT/W/WT/BT	520				0.02 - 30
CMQ 260 CT/W/WT/BT	660				0.04 - 50
CMQ 330 CT/W/WT/BT	910	1250	1800	2400	0.065 - 80
CMQ 400 CT/W/WT/BT	1100	1500	2200	2900	0.07 - 100
CMQ 460 CT/W/WT/BT	1300	1750	2600	3500	0.09 - 140
CMQ 560 CT/W/WT/BT	1700	2300	2400	4500	0.12 - 170
CMQ 660 CT/W/WT/BT	2000	2700	4000	5400	0.15 - 210
CMQ 760 CT/W/WT/BT	2400	3300	4800	6400	0.18 - 250
CMQ 860 CT/W/WT/BT	2700	3700	5400	7200	0.2 - 300
CMQ 960 CT/W/WT/BT	3100	4200	6200	8300	0.25 - 340

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CMQ-H 260 C(E/N/H) 001	210	110	5.5
CMQ-H 260 C(E/N/H) 001	260	160	6.1
CMQ-H 330 C(E/N/H) 001	330	230	7.6
CMQ-H 400 C(E/N/H) 001	400	300	9.2
CMQ-H 460 C(E/N/H) 001	460	360	10.5
CMQ-H 560 C(E/N/H) 001	560	460	12.7
CMQ-H 660 C(E/N/H) 001	660	560	14.8
CMQ-H 760 C(E/N/H) 001	760	660	17
CMQ-H 860 C(E/N/H) 001	860	760	19.2
CMQ-H 960 C(E/N/H) 001	960	860	21



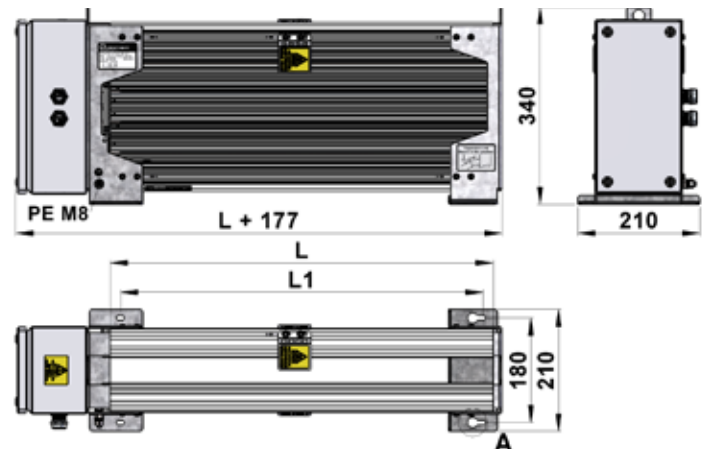
CMQ-H ... B 2.1 box connection IP54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CMQ-H 210 B(E/N/H)T 001	210	110	5.9
CMQ-H 260 B(E/N/H)T 001	260	160	7.1
CMQ-H 330 B(E/N/H)T 001	330	230	8.7
CMQ-H 400 B(E/N/H)T 001	400	300	10.3
CMQ-H 460 B(E/N/H)T 001	460	360	11.7
CMQ-H 560 B(E/N/H)T 001	560	460	14
CMQ-H 660 B(E/N/H)T 001	660	560	16.3
CMQ-H 760 B(E/N/H)T 001	760	660	18.7
CMQ-H 860 B(E/N/H)T 001	860	760	21
CMQ-H 960 B(E/N/H)T 001	960	860	23

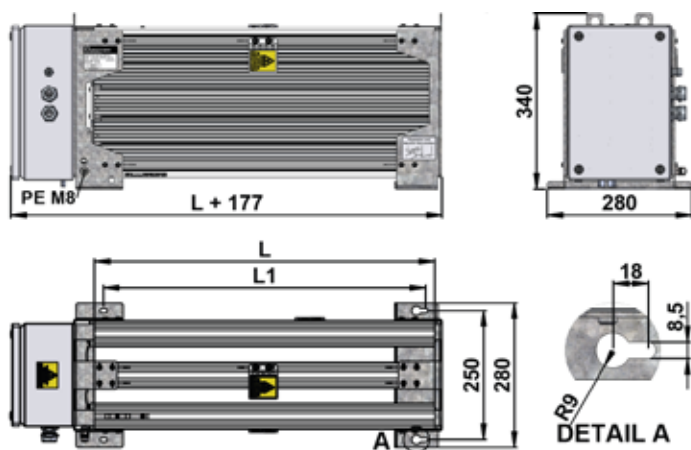


CMQ-V ... B 2.2 box connection IP54
with thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CMQ-V 330 B(H/E)T 2x2	330	295	20
CMQ-V 400 B(H/E)T 2x2	400	365	24
CMQ-V 460 B(H/E)T 2x2	460	425	26
CMQ-V 560 B(H/E)T 2x2	560	525	30
CMQ-V 660 B(H/E)T 2x2	660	625	35
CMQ-V 760 B(H/E)T 2x2	760	725	39
CMQ-V 860 B(H/E)T 2x2	860	825	44
CMQ-V 960 B(H/E)T 2x2	960	925	48

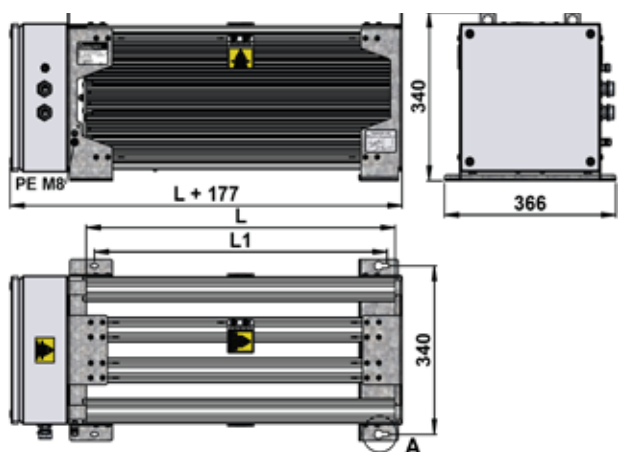


CMQ-V ... B 2.3 box connection IP54
with thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CMQ-V 330 BHT 2x3	330	295	31
CMQ-V 400 BHT 2x3	400	365	36
CMQ-V 460 BHT 2x3	460	425	40
CMQ-V 560 BHT 2x3	560	525	46
CMQ-V 660 BHT 2x3	660	625	53
CMQ-V 760 BHT 2x3	760	725	59
CMQ-V 860 BHT 2x3	860	825	66
CMQ-V 960 BHT 2x3	960	925	72

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



Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CMQ-V 400 BHT 2x4	400	365	44
CMQ-V 460 BHT 2x4	460	425	50
CMQ-V 560 BHT 2x4	560	525	58
CMQ-V 660 BHT 2x4	660	625	67
CMQ-V 760 BHT 2x4	760	725	76
CMQ-V 860 BHT 2x4	860	825	85
CMQ-V 960 BHT 2x4	960	925	93

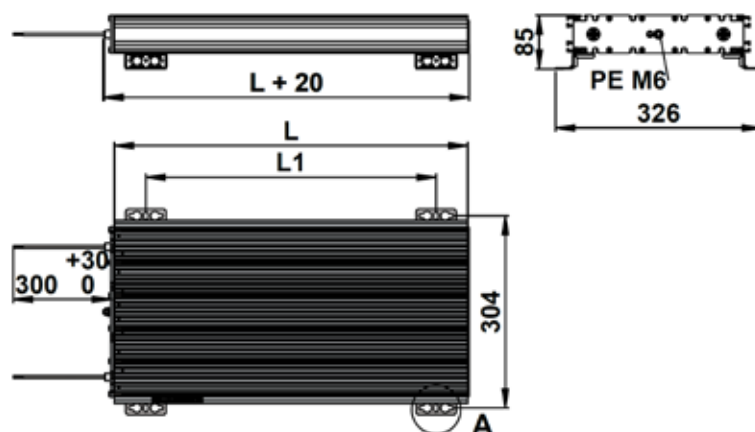
Length / Type	Nominal power [W] @ 40°C amb.				
	1 housing	2 housings	3 housings	4 housings	R [Ω] min-max
CVS 330 CH	1500				70 mR - 6R
CVS 400 CH	1800	3100	4500	6000	90 mR - 8R
CVS 460 CH	2100	3600	5300	7000	110 mR - 10R
CVS 560 CH	2500	4200	6300	8400	150 mR - 13R
CVS 660 CH	3000	5100	7600	10100	180 mR - 16R
CVS 760 CH	3500	6000	8800	11800	220 mR - 20R
CVS 860 CH	4000	6800	10100	13400	260 mR - 23R
CVS 960 CH	4500	7600	11300	15100	290 mR - 26R

CVS-H / V with thermal switch and or connection box

CVS 330 CT/BT	840				70 mR - 6R
CVS 400 CT/BT	1000	1700	2500	3400	90 mR - 8R
CVS 460 CT/BT	1200	2000	3000	4000	110 mR - 10R
CVS 560 CT/BT	1600	2700	4000	5400	150 mR - 13R
CVS 660 CT/BT	1800	3100	4500	6000	180 mR - 16R
CVS 760 CT/BT	2200	3700	5500	7400	220 mR - 20R
CVS 860 CT/BT	2500	4200	6300	8400	260 mR - 23R
CVS 960 CT/BT	2800	4800	7000	9400	290 mR - 26R

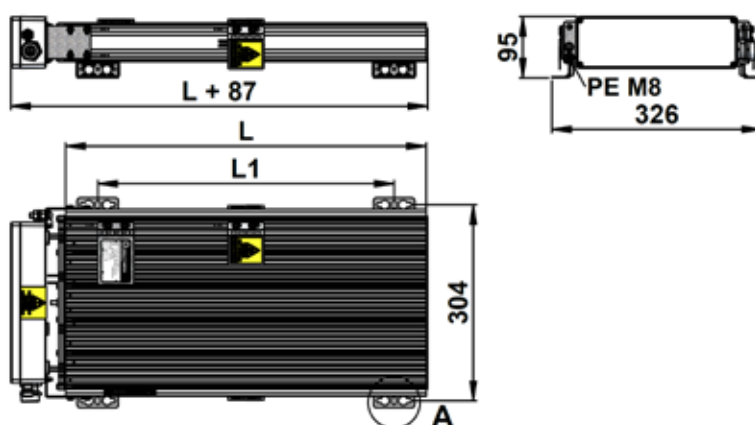
CVS-H ... C 001 cable connection IP50/54
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CVS-H 330 C(H/E) 001	330	295	9.1
CVS-H 400 C(H/E) 001	400	365	11
CVS-H 460 C(H/E) 001	460	425	12.5
CVS-H 560 C(H/E) 001	560	525	15.2
CVS-H 660 C(H/E) 001	660	625	17.8
CVS-H 760 C(H/E) 001	760	725	20
CVS-H 860 C(H/E) 001	860	825	23
CVS-H 960 C(H/E) 001	960	925	26



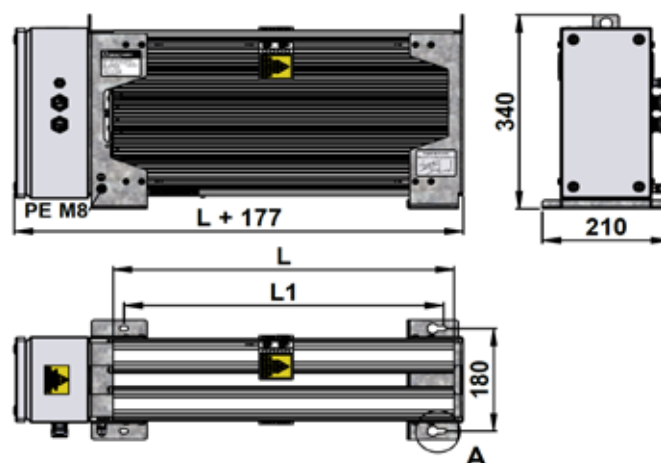
CVS-V ... B 2.1 box connection IP54
with thermal switch

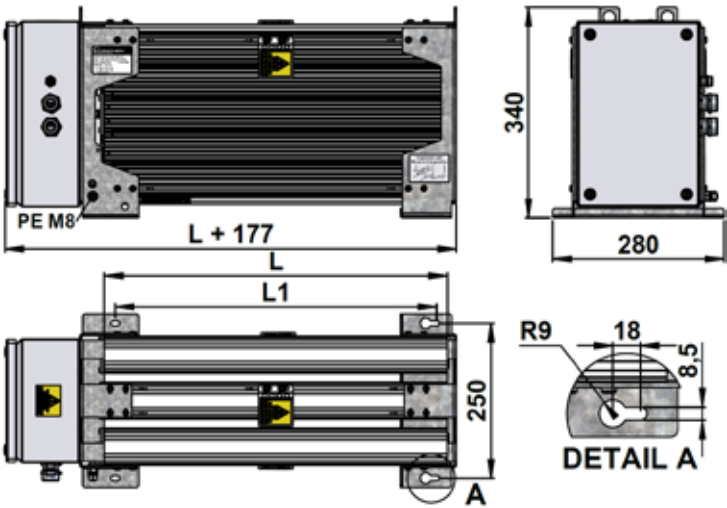
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CVS-H 460 B(H/E)T 001	460	425	14.3
CVS-H 560 B(H/E)T 001	560	525	17
CVS-H 660 B(H/E)T 001	660	625	19.6
CVS-H 760 B(H/E)T 001	760	725	22
CVS-H 860 B(H/E)T 001	860	825	25
CVS-H 960 B(H/E)T 001	960	925	28



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

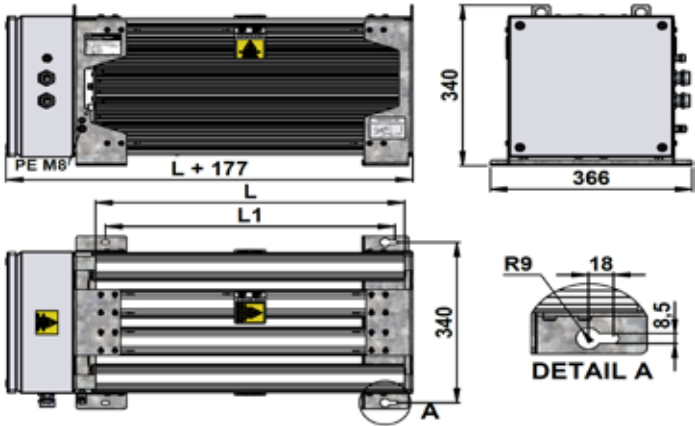
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CVS-V 460 B(H/E)T 2x2	460	425	30
CVS-V 560 B(H/E)T 2x2	560	525	36
CVS-V 660 B(H/E)T 2x2	660	625	41
CVS-V 760 B(H/E)T 2x2	760	725	46
CVS-V 860 B(H/E)T 2x2	860	825	52
CVS-V 960 B(H/E)T 2x2	960	925	57





Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CVS-V 460 B(H/E)T 2x3	460	425	46
CVS-V 560 B(H/E)T 2x3	560	525	54
CVS-V 660 B(H/E)T 2x3	660	625	62
CVS-V 760 B(H/E)T 2x3	760	725	70
CVS-V 860 B(H/E)T 2x3	860	825	78
CVS-V 960 B(H/E)T 2x3	960	925	86

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



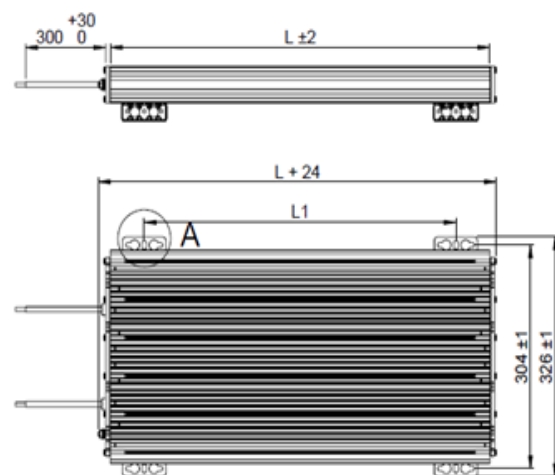
Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
CVS-V 460 B(H/E)T 2x4	460	425	58
CVS-V 560 B(H/E)T 2x4	560	525	69
CVS-V 660 B(H/E)T 2x4	660	625	79
CVS-V 760 B(H/E)T 2x4	760	725	90
CVS-V 860 B(H/E)T 2x4	860	825	100
CVS-V 960 B(H/E)T 2x4	960	925	110

Nominal power [W] @ 40°C amb.				
Type	1 housing	2 housings	3 housings	R [Ω] min-max
HVBS 300 C(E/H) 001	850	1500		0.05 - 10
HVBS 370 C(E/H) 001	1050	1800		0.07 - 17
HVBS 440 C(E/H) 001	1250	2100	3100	0.09 - 25
HVBS 520 C(E/H) 001	1350	2300	3400	0.1 - 35
HVBS 620 C(E/H) 001	1950	3300	4800	0.13 - 44
HVBS 720 C(E/H) 001	2500	4200	6200	0.15 - 53
HVBS 820 C(E/H) 001	2900	4900	7100	0.19 - 62
HVBS 920 C(E/H) 001	3200	5400	7900	0.22 - 71
HVBS 1000 C(E/H) 001	3500	6000	8600	0.25 - 80

Nominal power [W] @ 40°C amb.				
Type	1 housing	2 housings	3 housings	R [Ω] min-max
HVS 360 C(E/H) 001	1600			0.07 - 7.5
HVS 430 C(E/H) 001	1900	3200	4800	0.09 - 10
HVS 490 C(E/H) 001	2200	3700	5500	0.11 - 13
HVS 590 C(E/H) 001	2600	4400	6600	0.15 - 18
HVS 690 C(E/H) 001	3100	5300	7800	0.18 - 22
HVS 790 C(E/H) 001	3600	6100	9100	0.22 - 25
HVS 890 C(E/H) 001	4100	7000	10300	0.25 - 27
HVS 990 C(E/H) 001	4600	7800	11600	0.29 - 30

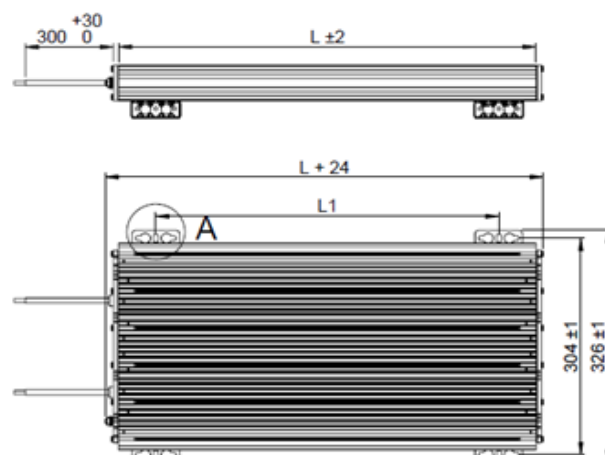
HVBS-H ... C 001 cable connection IP50/IP54
without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
HVBS 300 C(E/H) 001	300	200	7.5
HVBS 370 C(E/H) 001	370	270	9.5
HVBS 440 C(E/H) 001	440	340	11.5
HVBS 520 C(E/H) 001	520	420	13.8
HVBS 620 C(E/H) 001	620	520	16.6
HVBS 720 C(E/H) 001	720	620	19.4
HVBS 820 C(E/H) 001	820	720	22
HVBS 920 C(E/H) 001	920	820	25
HVBS 1000 C(E/H) 001	1000	900	27



HVBS-H ... C 001 cable connection IP50/IP54
without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight Kg
HVS 360 C(E/H) 001	360	260	10.1
HVS 430 C(E/H) 001	430	330	11.9
HVS 490 C(E/H) 001	490	390	13.5
HVS 590 C(E/H) 001	590	490	16.1
HVS 690 C(E/H) 001	690	590	18.8
HVS 790 C(E/H) 001	790	690	21
HVS 890 C(E/H) 001	890	790	24
HVS 990 C(E/H) 001	990	890	27
HVS 1000 C(E/H) 001	1000	900	28

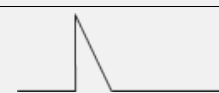


Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CBS 210 22R	16	45	11	70	7.6	85	5.5	100
CBS 260 18R	27	65	19	75	13.1	90	9.5	120
CBS 330 13R	45	60	31	85	21.3	100	15.5	130
CBS 400 10R	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							
	$\tau = 5$ seconds kW	Max temp °C	$\tau = 10$ seconds kW	Max temp °C	$\tau = 20$ seconds kW	Max temp °C	$\tau = 40$ 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							
	$\tau = 5$ seconds kW	Max temp °C	$\tau = 10$ seconds kW	Max temp °C	$\tau = 20$ seconds kW	Max temp °C	$\tau = 40$ 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
CVS 400 10R	135	80	83	90	52	100	35	120
CVS 460 6R5	190	90	115	95	71	110	46	130
CVS 560 6R0	265	95	155	100	97	120	63	140
CVS 660 4R5	340	100	200	110	120	120	79	150
CVS 760 3R5	440	100	255	120	155	130	99	160
CVS 860 2R5	500	110	290	120	175	130	115	160
CVS 960 2R0	510	100	300	110	180	130	120	160

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
400CVS 400 10R	290	85	180	95	110	110	74	130
CVS 460 6R5	410	90	245	100	150	120	98	140
CVS 560 6R0	560	95	330	110	205	120	130	150
CVS 660 4R5	720	100	420	110	260	130	165	150
CVS 760 3R5	930	110	550	120	330	140	210	160
CVS 860 2R5	1050	110	620	120	370	140	235	160
CVS 960 2R0	1050	100	630	120	390	130	250	160

Type	One single exponential pulse each 1800s							
	$\tau = 5$ seconds kW	Max temp °C	$\tau = 10$ seconds kW	Max temp °C	$\tau = 20$ seconds kW	Max temp °C	$\tau = 40$ seconds kW	Max temp °C
CVS 400 10R	350	95	220	100	140	120	92	150
CVS 460 6R5	490	100	295	120	185	130	120	160
CVS 560 6R0	670	110	410	120	250	140	160	170
CVS 660 4R5	860	110	510	130	320	150	205	180
CVS 760 3R5	1100	120	660	140	400	160	255	190
CVS 860 2R5	1250	120	740	140	460	160	295	200
CVS 960 2R0	1250	120	760	130	480	150	310	190

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

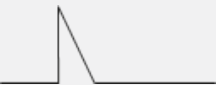
Formulas for e-curve:

$$p(t) = P_{\max} \cdot e^{-2t/\tau}$$

$$E = \frac{\tau}{2} \cdot P_{\max}$$

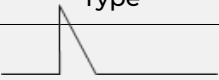
$$\tau = R \cdot C$$

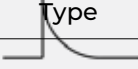
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVBS 300 15R	22.4	60	15.4	65	11	75	8	90
HVBS 370 12R	41.3	65	27.8	75	19.3	85	13.9	110
HVBS 440 10R	66	70	43.6	80	29.3	95	20.6	120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

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.

05

CBW

Power range: 860 W - *

Cooling method: Liquid cooled



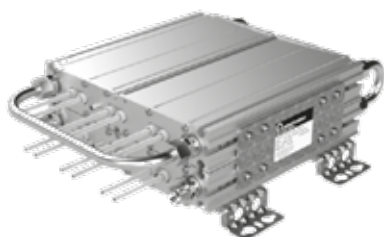
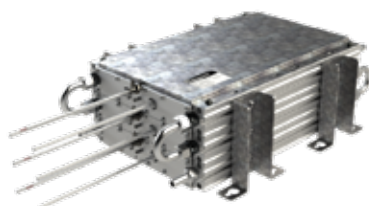
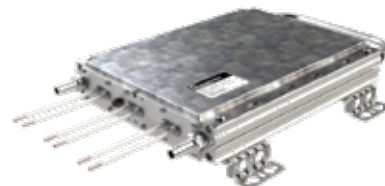
* Power ratings start from 860 W, with maximum ratings determined by the number of profiles.

Type	Ohm range R [Ω] min-max	Nominal power [W] 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

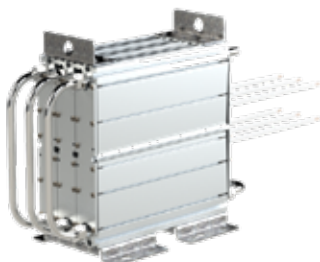
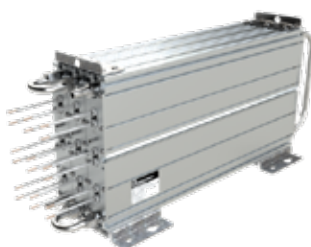
Construction and salient properties

- Compact dimensions
- Nominal power range from 860 — *
- 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 Test voltage
- SiO₂ filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- Optional thermal switch or PT100 element for thermal protection 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

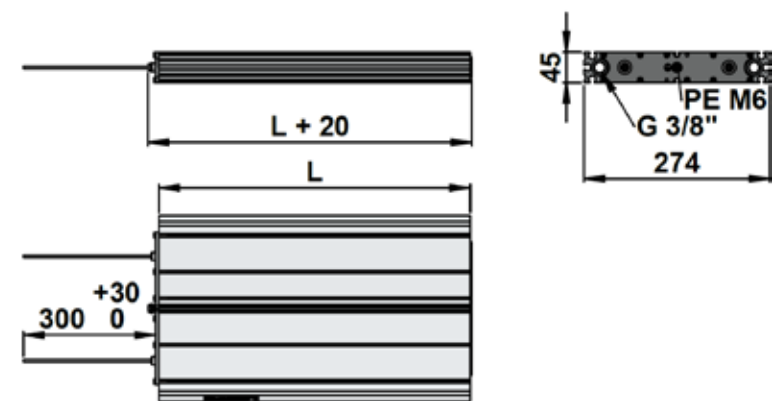
* Power ratings start from 860 W, with maximum ratings determined by the number of profiles.



Temperature Coefficient:		100 ppm/K
Test voltage		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 100mm to the neighboring components. Optionally, a thermal isolation plate is available
		There are no restrictions for distances between two or more brake resistors.
Cooling		The nominal power of the resistors refers to cooling conditions with sweet water cooling with or without glycol
Working pressure		6 bar
Test pressure		10 bar
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		± 10% (optional 5%)
Working Voltage	cable 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
Test voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables		80°C

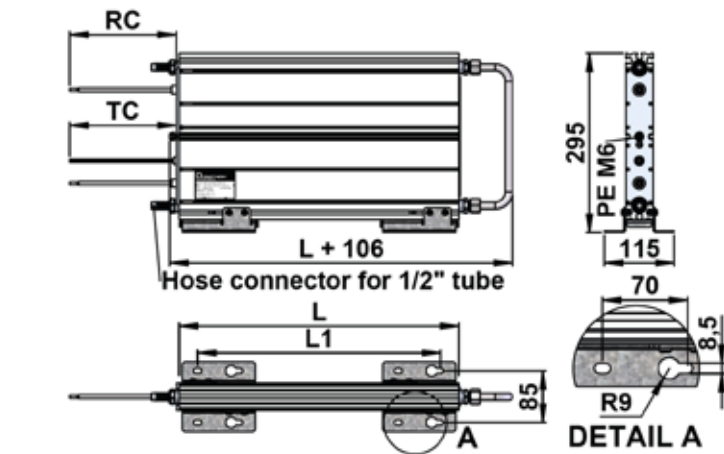


CBW ... with water nipples, IP50 / IP54
with or without thermal switch



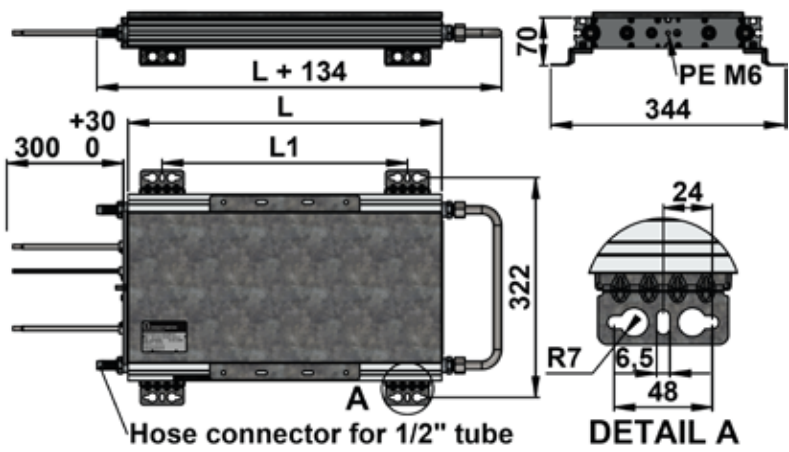
Type	L ± 2 mm	Weight kg
CBW 180 C(H/E)(T) 0X1	180	5,0
CBW 210 C(H/E)(T) 0X1	210	5.7
CBW 260 C(H/E)(T) 0X1	260	6.8
CBW 330 C(H/E)(T) 0X1	330	8.4
CBW 400 C(H/E)(T) 0X1	400	10
CBW 460 C(H/E)(T) 0X1	460	11.3
CBW 560 C(H/E)(T) 0X1	560	13.5
CBW 660 C(H/E)(T) 0X1	660	15.8
CBW 760 C(H/E)(T) 0X1	760	18
CBW 860 C(H/E) T) 0X1	860	20
CBW 960 C(H/E)(T) 0X1	960	22

CBW-V ... with water return pipe and side isolation
with or without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight kg
CBW-V 180 C(H/E)(T) 0X1	180	120	5
CBW-V 210 C(H/E)(T) 0X1	210	150	5.7
CBW-V 260 C(H/E)(T) 0X1	260	200	6.8
CBW-V 330 C(H/E)(T) 0X1	330	270	8.4
CBW-V 400 C(H/E)(T) 0X1	400	340	10
CBW-V 460 C(H/E)(T) 0X1	460	400	11.3
CBW-V 560 C(H/E)(T) 0X1	560	500	13.5
CBW-V 660 C(H/E)(T) 0X1	660	600	15.8
CBW-V 760 C(H/E)(T) 0X1	760	700	18
CBW-V 860 C(H/E)(T) 0X1	860	800	20
CBW-V 960 C(H/E)(T) 0X1	960	900	22

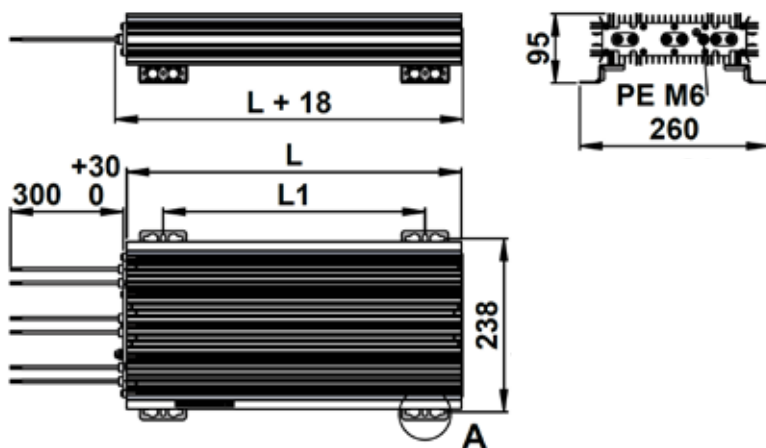
CBW-H ... with water return pipe and isolation
with or without thermal switch



Type	L ± 2 mm	L1 ± 2 mm	Weight kg
CBW-H 180 C(H/E)(T) 0X1	180	80	5,0
CBW-H 210 C(H/E)(T) 0X1	210	110	5.7
CBW-H 260 C(H/E)(T) 0X1	260	160	6.8
CBW-H 330 C(H/E)(T) 0X1	330	230	8.4
CBW-H 400 C(H/E)(T) 0X1	400	300	10
CBW-H 460 C(H/E)(T) 0X1	460	360	11.3
CBW-H 560 C(H/E)(T) 0X1	560	460	13.5
CBW-H 660 C(H/E)(T) 0X1	660	560	15.8
CBW-H 760 C(H/E)(T) 0X1	760	660	18
CBW-H 860 C(H/E)(T) 0X1	860	760	20
CBW-H 960 C(H/E)(T) 0X1	960	860	22

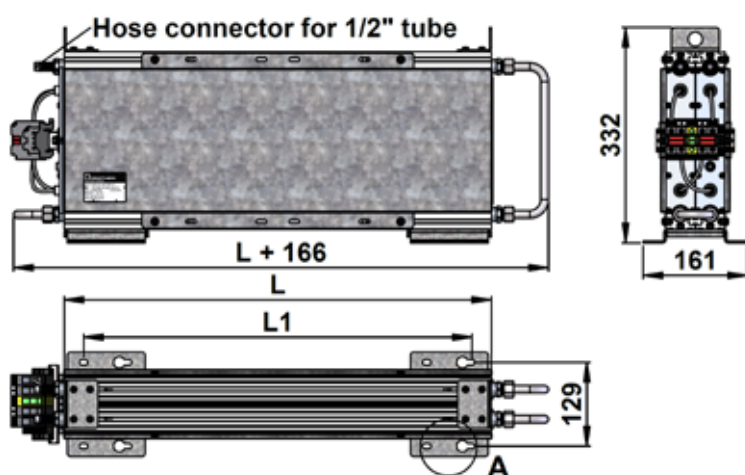
CBW-H ... C 001 3xR cable connection with water nipples
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight kg
CBW-H 180	180	70	5,0
CBW-H 210	210	110	5.7
CBW-H 260	260	160	6.8
CBW-H 330	330	230	8.4
CBW-H 400	400	300	10
CBW-H 460	460	360	11.3
CBW-H 560	560	460	13.5
CBW-H 660	660	560	15.8
CBW-H 760	760	660	18
CBW-H 860	860	760	20
CBW-H 960	960	900	22



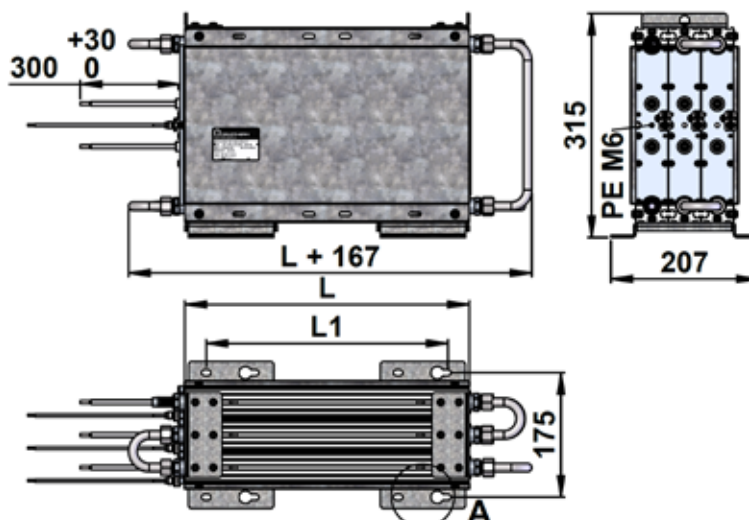
CBW-V ... K 2.2 IP 00 box with water series connection
with or without thermal switch

Type	L ± 2 mm	L1 ± 2 mm	Weight kg
CBW-V 400 K	400	340	21
CBW-V 460 K	460	400	24
CBW-V 560 K	560	500	28
CBW-V 660 K	660	600	33
CBW-V 760 K	760	700	37
CBW-V 860 K	860	800	42
CBW-V 960 K	960	900	46



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

Type	L ± 2 mm	L1 ± 2 mm	Weight kg
CBW-V 400	400	340	30
CBW-V 460	460	400	34
CBW-V 560	560	500	41
CBW-V 660	660	600	48
CBW-V 760	760	700	55
CBW-V 860	860	800	62
CBW-V 960	960	900	68



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. The table shows the maximum continuous power at given water inlet temperatures and different ΔT.

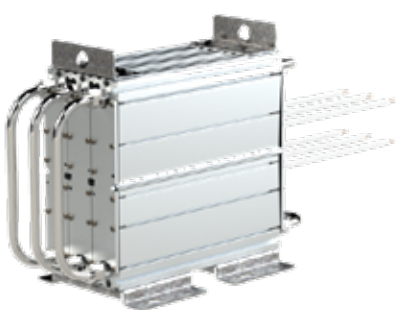
Flow L/h	Δ T water [K]					Δ T water/glycol 60/40 [K]				
	10	15	20	25	30	10	15	20	25	30
7 kW	710	470	350	280	240	1070	710	530	420	360
6 kW	610	400	300	240	200	920	600	450	360	300
5 kW	510	340	250	200	170	770	510	380	300	260
4 kW	400	270	200	160	130	600	410	300	240	200
3 kW	300	200	150	120	100	450	300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

Pressure drop

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

Water connections

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



Water return connection back Double with short and long tubes 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.

Applications

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
- (Trolley)busses
- Trams / Metros / Trains (auxiliary circuits)
- Conveyor belts
- Transformers
- Turbines
- Excavation machines

CCH / CAH / CBH / CBR-V

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.



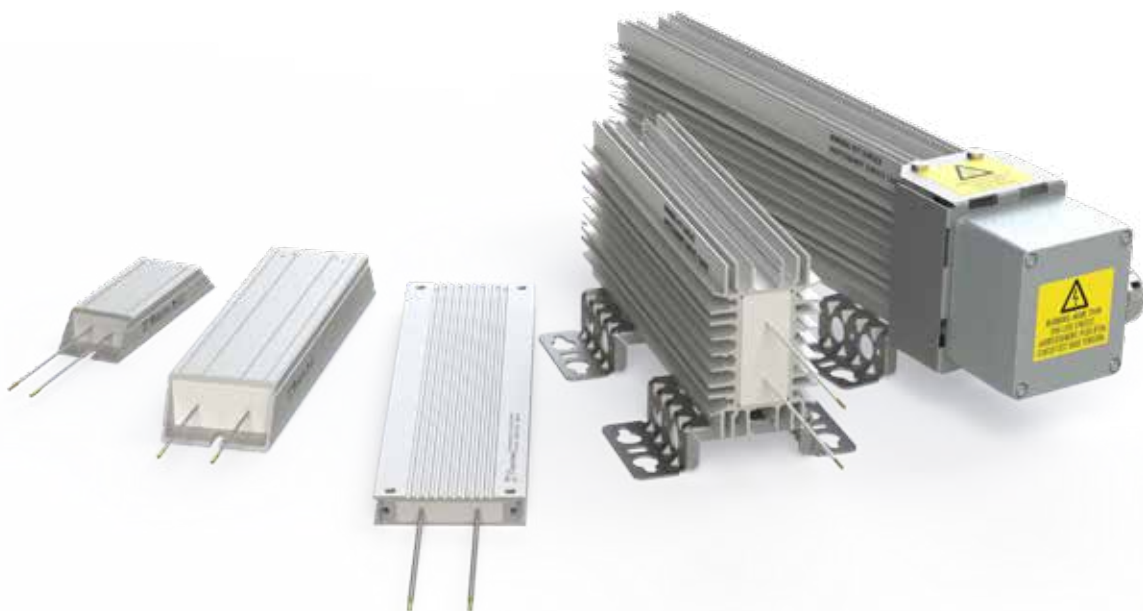
06

ON STOCK RESISTORS

CCH, CAH, CBH, CBR-V

Power range: 75 W - 525 W

Cooling method: Convection cooled



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				

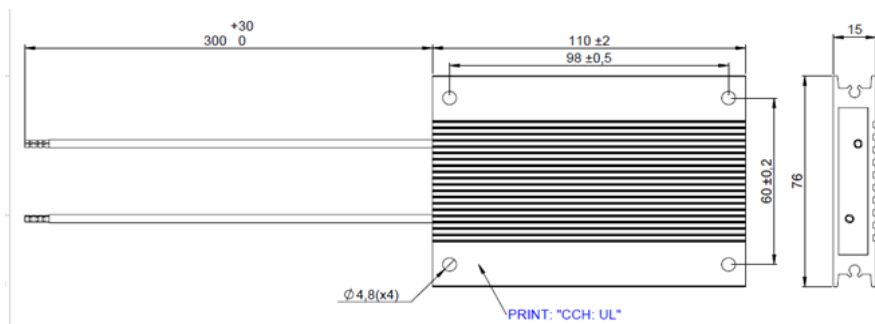
Duty time / Brake power	Duty time square impuls load / 120 s cycle time				
	1s [kW]	5s [kW]	10s [W]	20s [W]	40s [W]
CCH 110	1.55 - 1.9	0.87 - 0.98	660	460	290
CAH 165	1.5 - 4.3	0.775 - 1.050	630	440	220
CBH 165	2.3 - 6.7	1.0 - 1.6	840	570	330
CBH 265	7.5 - 16.2	2.8 - 4.6	2,200	1,250	620
CBR-V 225	12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

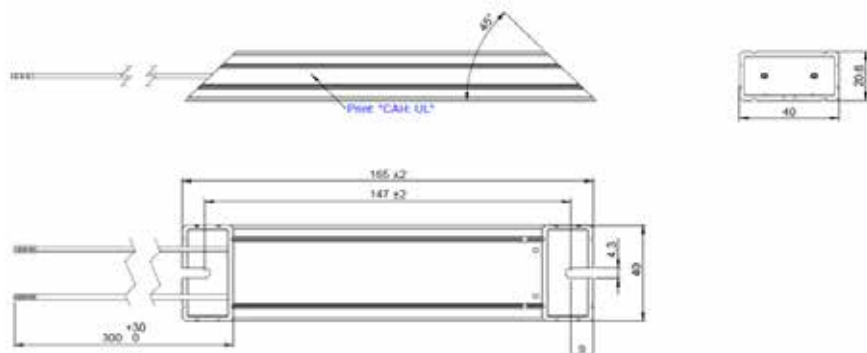
To protect the internal resistor-wire when applying an impulse load, the thermal model which is available for each resistor can be used to calculate the internal temperature. Consult your Danotherm distributor for assistance.

Temperature Coefficient:		100 ppm/K
Test voltage		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, 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
Test voltage		2000VAC (3500VAC between TS and R)



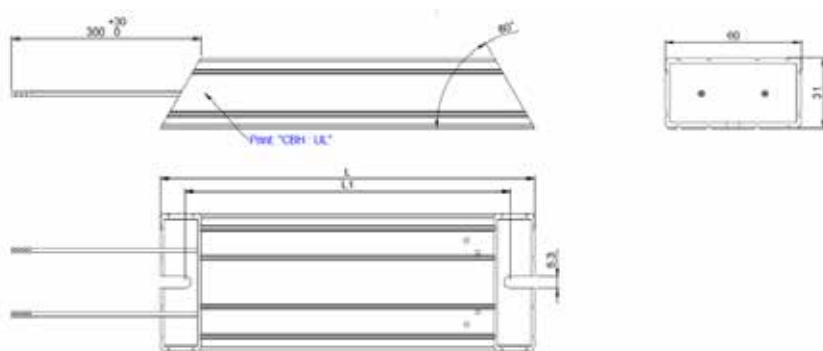
Type	Nominal power [W]	Weight [g]
CCH 110	100	220

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
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	200

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

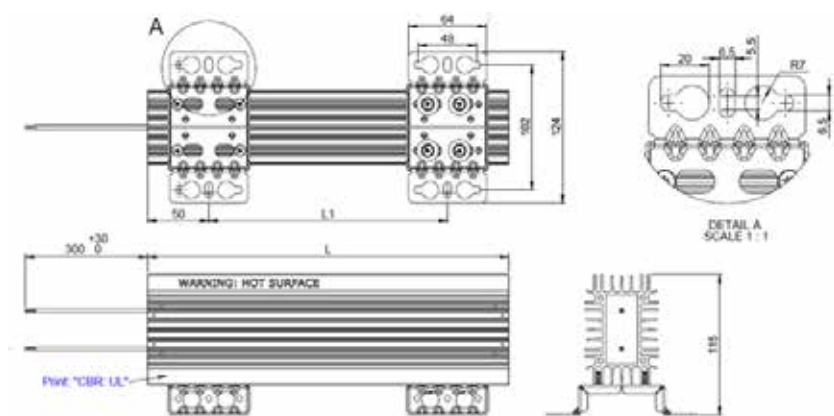
Part number	Part description	Ohm value Ω	Pulse load [W] ambient temp 40°C, cycle time 120s				
			Duty 1s	Duty 5s	Duty 10s	Duty 20s	Duty 40s
Z3163210777	CBH 165 C 777 10R KT	10	6700	1600	940	590	330
Z3163215777	CBH 165 C 777 15R KT	15	6100	1500	895	580	335
Z3163222777	CBH 165 C 777 22R KT	22	5200	1300	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	1600
CBR-V	525	295	195	2000

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

Notes

[illegible]

T	Thermal drift; standard T=100ppm
K	Tolerance; standard K = $\pm 10\%$, J = $\pm 5\%$,
22 R	Resistance value in Ohm (Example 2R2=2.2 Ω , / 22R = 22 Ω)
1	Number of case style housings (1, 2, 3 or 4)
8	Thermal switch temp; 5=130°C / 6=160°C / 7=180°C / 8=200°C
2	0 = cable connection, 2 = connection box type
T	T=Thermal switch, optional, (normally closed)
H	Internal configuration (E, H, N - Dependant on resistance value)
C	Connection style; C=cable / D=IP20 box / B=IP65 box / K=DIN rail IP00
400	Length of resistor housing in mm
H	H=horizontal mounting feet / V=vertical mounting feet
CMQ - H	Housing case style; CCH/CAV/CAH/CCR/CAR/CBV/CBH/CBR/CBT/CMQ/HVBS/CVS/CBW

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