

CBS / CMQ / CVS / HVBS / HVS

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

Type	Pn [W] @ 40°C	Ohm range R [Ω] min-max	Double housing	Triple housing	Quadruple housing
HVBS 300	850	0.05 - 30	1500		
HVBS 370	1050	0.07 - 50	1800		
HVBS 440	1250	0.09 - 70	2100	2900	3500
HVBS 520	1365	0.10 - 90	2500	3700	5000
HVBS 620	1950	0.13 - 110	3200	4800	6400
HVBS 720	2500	0.15 - 140	3600	5400	7200
HVBS 820	2900	0.19 - 170	4800	7100	9600
HVBS 920	3200	0.22 - 200	5300	7900	10600
HVBS 1000	3500	0.25 - 220	6000	8800	12000

*High Ohm values

Temperature Coefficient:		100 ppm/K
Dielectric strength	HVBS	7000 VAC @ 1 minute
	HVS	10000 VAC @ 1 minute
	other types	3500 VAC @ 1 minute
Insulation Resistance:		> 20MΩ / case housing
Overload: @ 1 sec pulse / hour		70 - 250 x (depending on resistor)
Overload: @ 5 sec pulse / hour		20 - 60 x (depending on resistor)
Environmental:		- 40 °C / +70 °C
De-rating cable version		Linear: 40°C = Pn to 70°C = 0.85 * Pn
De-rating TW 200°C version		Linear: 40°C = Pn to 70°C = 0.65 * Pn
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0.8 * Pn
De-rating at high altitudes	1000 m	no de-rating
	1500 m	0.94 * Pn
	3000 m	0.82 * Pn
Mounting instructions		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of a neighboring component.
		If two or more brake resistors are mounted next to each other the distance between these should be 400mm. If this is less then the nominal power needs to be de-rated.
Cooling		The nominal power of the resistors refers to cooling conditions with Free Natural Air Cooling.
Vibration		Acc. To EN 60068-2-6 frequency range 1 - 100Hz Acceleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0.7G
Corrosive resistance		Acc. IEC 60721-3-3/3K3 (C2 medium) 200 hours cyclic salt mist IEC 60068-2-52
Connection recommendations		To minimize EMC interference screened cables are recommended. in particular with any PWM brake pattern.
Resistance tolerance		± 10% (optional 5%)
Working voltage	box version	UL: 600VAC / 850VDC ; IEC: 690VAC / 975VDC
	cable version	1000VAC / 1400VDC
	HVBS cable version	IEC: 3000VAC / 4200VDC
	HVS cable and box	IEC: 3000VAC / 4200VDC
Time constant for heating up resistor		1000-3000s
Thermal switch (optional*)	Thermal switch	130 / 160 / 180 / 200 °C. 2A. 250 VAC NC
Minimum voltage		2V
Minimum current		10mA
Rated current / voltage		2.5A @ 250VAC cos φ=1
Dielectric voltage		2000VAC (3500VAC between TS and R)
Temperature requirements on cables		IP 21
	IP 65	90°C

*Optional for CBS / CMQ and CVS

Construction and salient properties

- Compact dimensions
- Nominal power range from 455W—4070W
- Energy levels from 80kJ-2.5MJ per case housing (5s single pulse), depending on ohmic value
- Aluminium case housing for high IP rating
- IP50-IP65
- Internal ceramic supported wirewound spirals for lower ohmic values
- Nickel-Chrome 8020 alloy for low thermal drift
- Mica insulated for high dielectric strength
- Al₂O₃ or SiO₂ filled for high thermal capacity/high power overload capability
- Low surface temperature
- Low noise level
- High vibration withstand capability
- Thermal relief expansion mounting feet
- 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)



B-box single housings



B-box multiple housings

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



CVS-V 560 KH 003 xxR

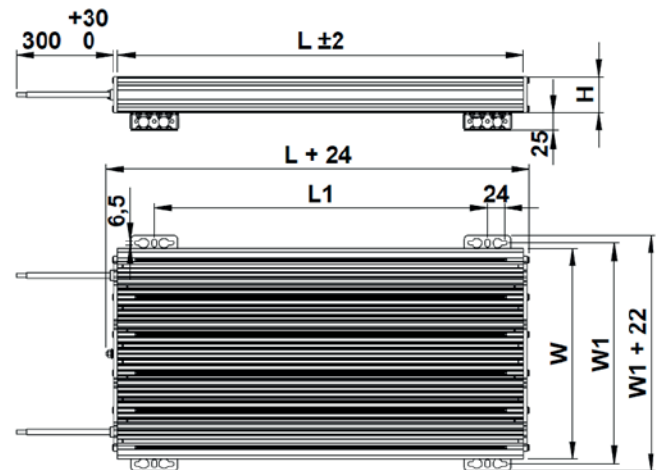
Type	IP rating	Cable gland	No. cable glands	clamping range mm	Braid min Ø mm	Electrical connection mm ²
CBS-H1C	IP50	-	-	-	-	-
CBS-H-1B	IP54	M25	1	9-16.6	7.5	0.75-10*
CBS-H-2B/3B/4B	IP54	M25	2	9-16.6	7.5	0.75-10*
CMQ-H1C	IP50	-	-	-	-	-
CMQ-V1B	IP54	M25	1	9-16.6	7.5	0.75-10*
CMQ-V2B/3B/4B	IP54	M25	2	9-16.6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

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

CBS/CMQ/CVS/HVS -H ... C ... cable connection IP50/IP54/65
with and without thermal switch

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

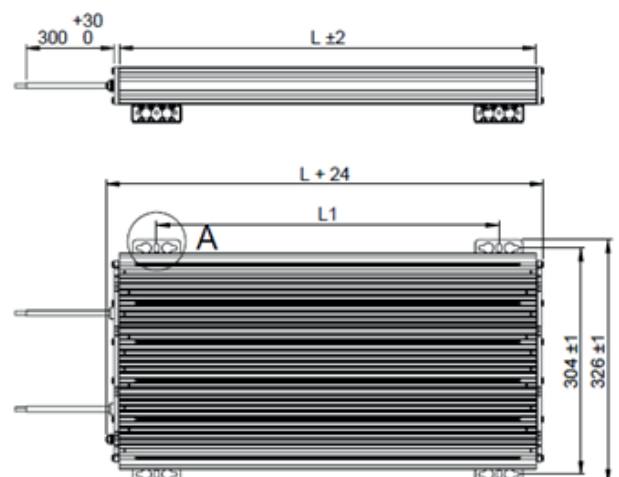
Type	H	W ± 1	W1 ± 1
CBS	47	218	230
CMQ	50	290	304
HVBS	50	290	304
CVS/HVS	60	290	304



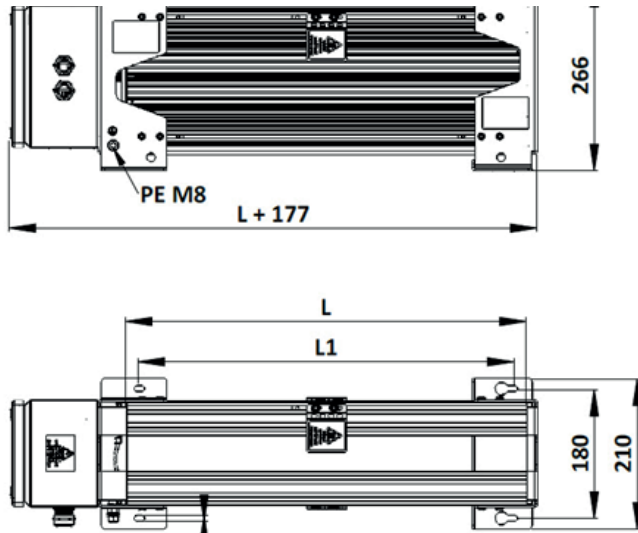
All tables show standard lengths.
Customer specific lengths are available.

HVBS-H ... C ... cable connection IP50/IP54/65
without thermal switch

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

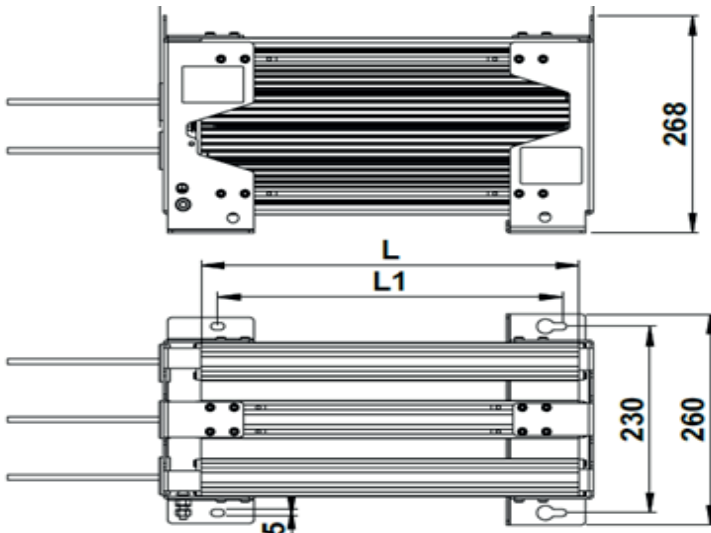


CBS-V ... B 2.2 box connection IP54
with and without thermal switch



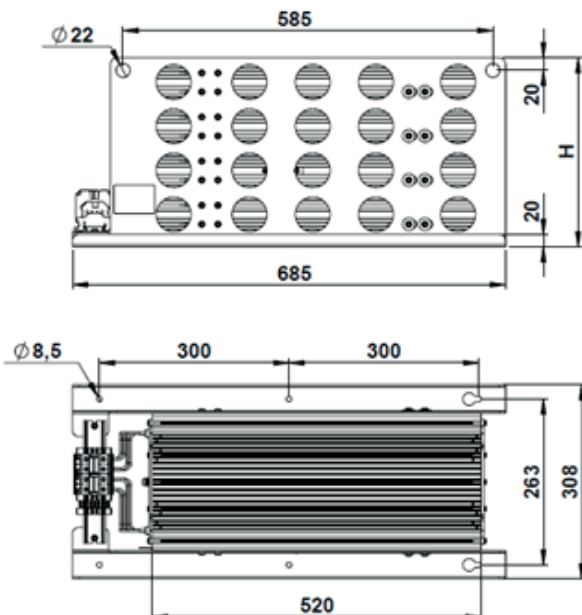
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CBS-V 400 BGH 2x2	400	365	16.0
CBS-V 460 BGH 2x2	460	425	18.4
CBS-V 560 BGH 2x2	560	525	22.0
CBS-V 660 BGH 2x2	660	625	26.0
CBS-V 760 BGH 2x2	760	725	30.4
CBS-V 860 BGH 2x2	860	825	34.6
CBS-V 960 BGH 2x2	960	925	37.2

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



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

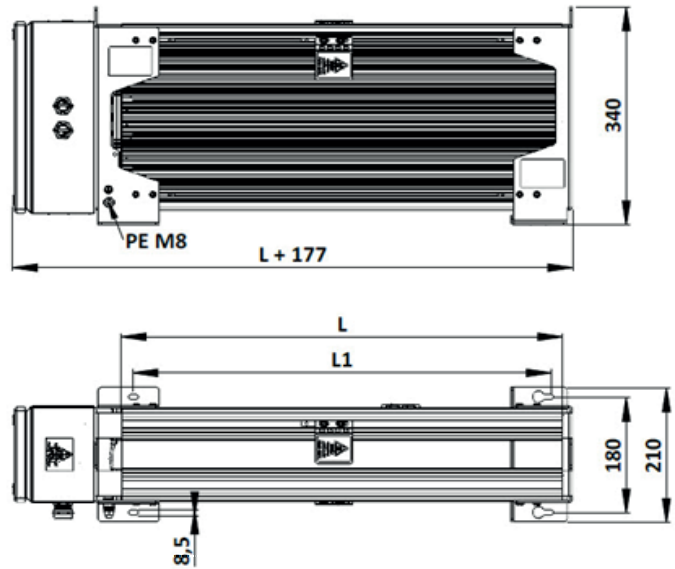
CBS-H ... K 2.. box connection IP00
with and without thermal switch



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

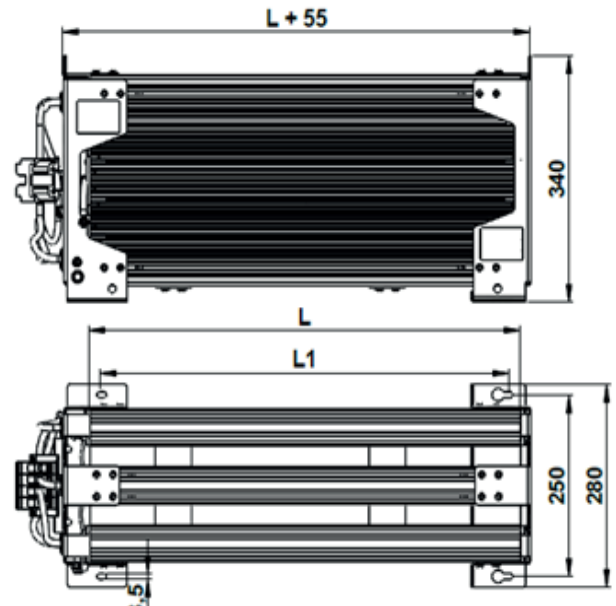
CMQ-V ... B 2.2 box connection IP54
with thermal switch

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



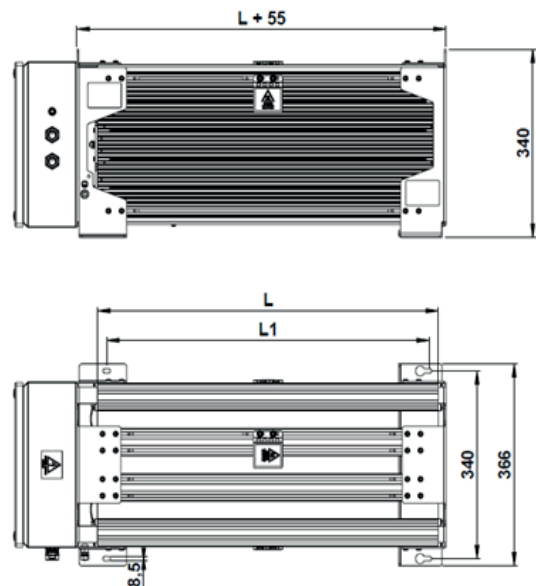
CMQ-V ... K 2.3 box connection IP00
with and without thermal switch

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

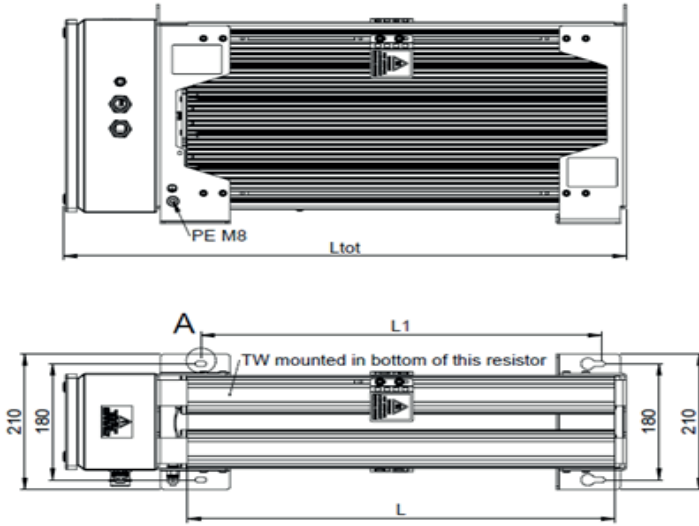


CMQ-V ... B 2.4 box connection IP54
with and without thermal switch

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

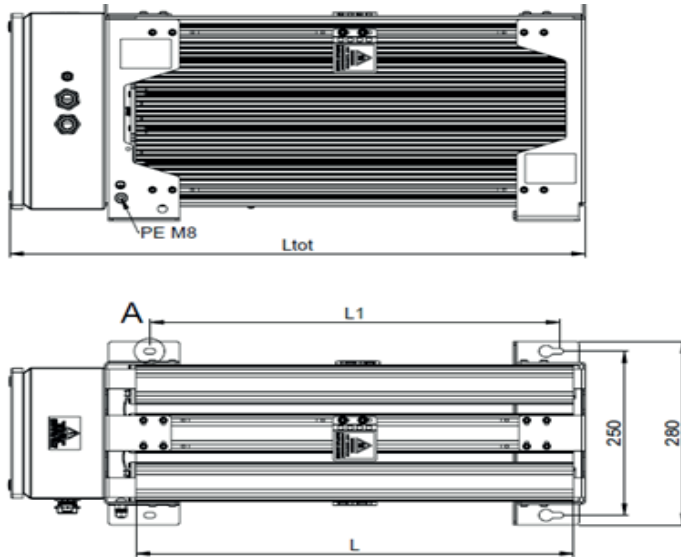


CVS-V ... B 2.2 box connection IP54
with thermal switch



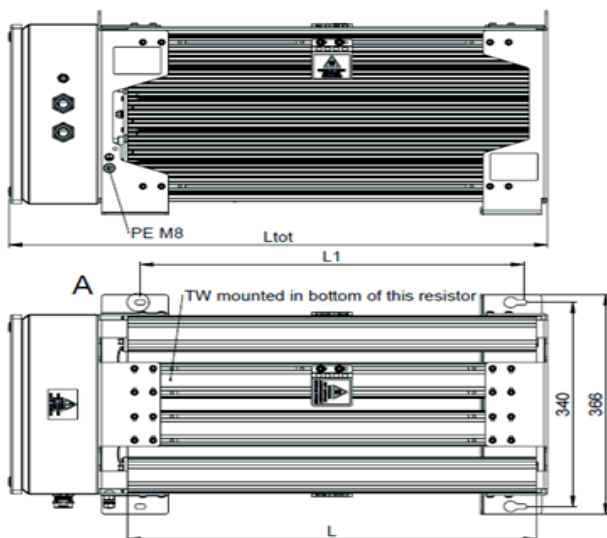
Type	L ± 2 mm	L1 ± 2 mm	Weight g
CVS-V 460 B(H/E)T 2x2	460	425	31.5
CVS-V 560 B(H/E)T 2x2	560	525	37
CVS-V 660 B(H/E)T 2x2	660	625	42
CVS-V 760 B(H/E)T 2x2	760	725	47.5
CVS-V 860 B(H/E)T 2x2	860	825	54
CVS-V 960 B(H/E)T 2x2	960	925	59

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



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

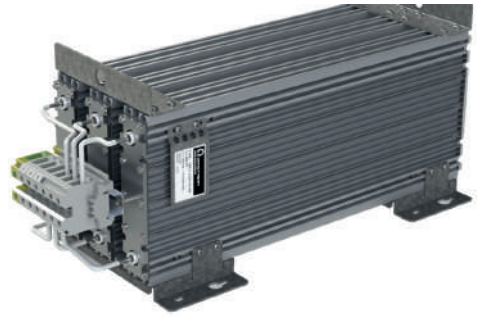
CVS-V ... B 4. box connection IP54
with thermal switch



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



CMQ / HVBS type with cable leads, IP50



CMQ triple type with DIN rail terminals IP00



CMQ type with long connection box, IP54



CMQ double type with connection box, IP54





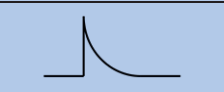
CMQ double type with DIN rail terminals, IP00



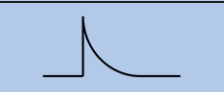


CMQ quadruple type with connection box, IP54



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


Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CBS 210 22R	16	45	11	70	7.6	85	5.5	100
CBS 260 18R	27	65	19	75	13.1	90	9.5	120
CBS 330 13R	45	60	31	85	21.3	100	15.5	130
CBS 400 10R	68	70	44	90	31	110	21.6	140
CBS 460 6R5	92	85	59	100	40	120	28	150
CBS 560 6R0	120	85	77	100	52	120	36	150
CBS 660 4R5	160	70	100	110	66	130	46	160
CBS 760 3R5	205	95	125	110	83	130	56	170
CBS 860 2R5	255	85	155	120	100	140	67	170
CBS 960 2R0	250	95	160	110	105	140	73	170
Type	One single triangular pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CBS 210 22R	34	65	23	75	16	85	11.4	110
CBS 260 18R	57	70	40	80	27	95	20	120
CBS 330 13R	96	75	64	85	44	100	32	130
CBS 400 10R	145	80	95	95	64	110	45	140
CBS 460 6R5	195	90	125	100	83	120	57	150
CBS 560 6R0	255	90	160	100	110	120	75	160
CBS 660 4R5	340	95	215	110	140	130	95	170
CBS 760 3R5	440	100	270	120	175	140	120	170
CBS 860 2R5	540	110	330	120	210	140	140	180
CBS 960 2R0	540	100	340	120	225	140	150	180
Type	One single exponential pulse each 1800s							
	$\tau = 5$ 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

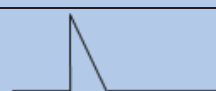
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CMQ 210 22R	23	65	16	70	11	85	8	110
CMQ 260 18R	46	75	31	85	21	100	15	130
CMQ 330 13R	71	75	47	90	32	110	23	140
CMQ 400 10R	120	85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

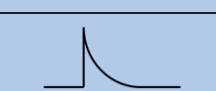
The tables above show pulse power ratings for typical resistor sizes/lengths and typical ohmic values.


Formulas for e-curve:


$$p(t) = P_{max} \cdot e^{-2t/\tau} \qquad E = \frac{\tau}{2} \cdot P_{max} \qquad \tau = R \cdot C$$

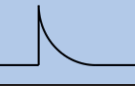
Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
HVBS 300 15R	22.4	60	15.4	65	11	75	8	90
HVBS 370 12R	41.3	65	27.8	75	19.3	85	13.9	110
HVBS 440 10R	66	70	43.6	80	29.3	95	20.6	120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



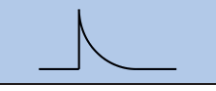
The table above shows pulse power ratings for typical resistor sizes/lengths and typical ohmic values.

Formulas for e-curve:

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

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

$$\tau = R \cdot C$$

Type	One single square pulse each 1800s							
	duty 5 seconds kW	Max temp °C	duty 10 seconds kW	Max temp °C	duty 20 seconds kW	Max temp °C	duty 40 seconds kW	Max temp °C
CVS 400 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
CVS 400 10R	290	85	180	95	110	110	74	130
CVS 460 6R5	410	90	245	100	150	120	98	140
CVS 560 6R0	560	95	330	110	205	120	130	150
CVS 660 4R5	720	100	420	110	260	130	165	150
CVS 760 3R5	930	110	550	120	330	140	210	160
CVS 860 2R5	1050	110	620	120	370	140	235	160
CVS 960 2R0	1050	100	630	120	390	130	250	160
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.

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.