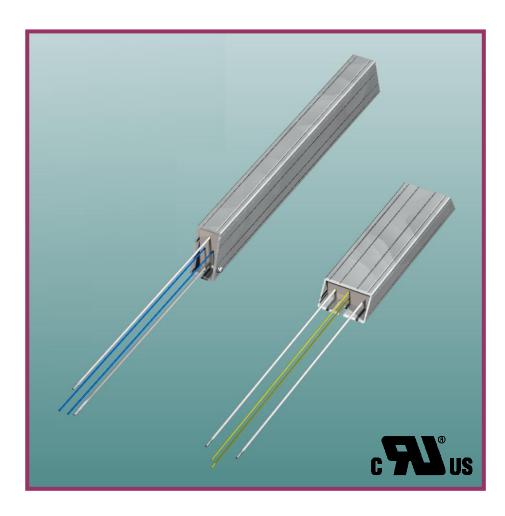
CBHK / CBVK 1000V AC

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS



CBHK and CBVK belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS are electrically insulated and with small dimensions so that they easily can be fitted into compact constructions. They are especially designed to endure high pulse loads compared to the average load.

The steady state power range span from 110W to 330W and they can withstand pulse loads of up to 60 times these values for one second every 120 seconds! The steady state power ratings of the resistors with integrated thermo watch are slightly reduced.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and on the resistor surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

The resistors comply with IP50 giving electrical and thermal protection. The resistors are Silicone free.

This product range is approved to CSA C22.2 No.14 and UL 508 (E208678).



Rating

CBHK / CBVK 360 CT

CBHK / CBVK 430 CT

Construction

The resistors are designed as follows:

The resistor elements are wire wound on mica support sheets. The outer housing is an aluminium profile isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses.

The aluminium profile with the fixed resistor element is filled with quarts sand. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

The standard cables are 300 mm AWG 18-10 PTFE, nature colour. We can supply cables in specified length, colours and mounted with cable shoes or connectors.

The resistors are approved to UL 508 edition 17 for USA and to CSA C22.2 No. 14 edition 10 for Canada. All thermal data in this data sheet complies to these standards (no further reduction is required)

If screw terminals or higher protection classes are required please use our CBR or CBT resistors with connection boxes. The highest protection class is IP65 / Type 4X, and the power range goes up to 6 kW.

rading								
TYPE	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ
CBHK / CBVK	W	Surface	Load in	Load in	Load in	Load in	Const	±10%
	@40°C	temp.	1s each	5s each	10s each	40s each	. sec.	(±5%, on
		°C	120s	120s	120s	120s	(Stea	request)
		@40°C	P1/120	P5/120	P10/120	P40/120	dy	
			kW	kW	kW	W	state)	
	ç 77 .us		@40°C	@40°C	@40°C	@40°C		
	Approved							
CBHK / CBVK 165 C	110	230	5.5	1.8	1.0	330	1000	71000
CBHK / CBVK 215 C	155	230	8.5	3.0	1.65	475	1000	131500
CBHK / CBVK 265 C	200	230	12.5	4.0	2.2	540	1000	192000
CBHK / CBVK 335 C	270	230	18.0	6.0	3.1	800	1000	292000
CBHK / CBVK 405 C	330	240	25.0	8.3	4.5	1000	1000	362000
CBHK / CBVK 190 CT	85*	200*	4.2	1.37	0.8	250	1000	71000
CBHK / CBVK 240 CT	120*	200*	6.4	2.28	1.25	360	1000	131500
CBHK / CBVK 290 CT	150*	200*	9.5	3.05	1.67	410	1000	192000

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

4.57

6.32

13.7

19.0

2.36

3.43

610

760

200

210

200

250

29...2000

36...2000

EUROBOWER COMPONENTS

₩ ₩

exx (30)

EULOBOWEICOMBONEHIS

1000

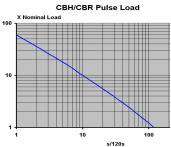
1000

General Specifications	
Temperature Coefficient:	<±100ppm
Dielectric strength:	3500VAC 1 minute
Working Voltage:	UL: 1000VAC; 1400V DC / CE: 1000VAC; 1400VDC
Isolation Resistance:	> 20 MΩ
Overload:	10 x in 10s / 120s; 60 x in 1s / 120s
Environmental:	-40 °C − 90 °C
De-rating :	Linear: 40° C = P_{N} to 90° C = 0.75*PN
Thermo Watch Optional	200°C (On request 180°C/160°C/130°C), 2A, 250V, NC
Approvals	UL 508

Colour code for thermo watch cables: 200°C: white / 180°C: orange / 160°C: blue / 130°C: brown PN: NOMINAL POWER WITH NATUAL COOLING AND WITH THE PROFILE MOUNTED IN A HORIZONTAL POSITION. * WITH INTERNAL THERMO WATCH (200°C)

PULSE LOAD

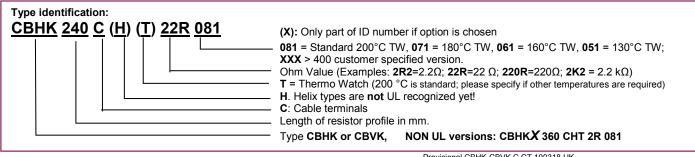
The curve show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse width from 1 to 120 seconds.



For further optimization offers Danotherm individual thermal electric circuit models for all types and ohm values. With these models can the temperature of the resistor wire and resistor surface during any pulse load conditions be simulated software PSpice. Alternatively offers Danotherm to make thermal simulation for our customers

Mechanical Data СВН

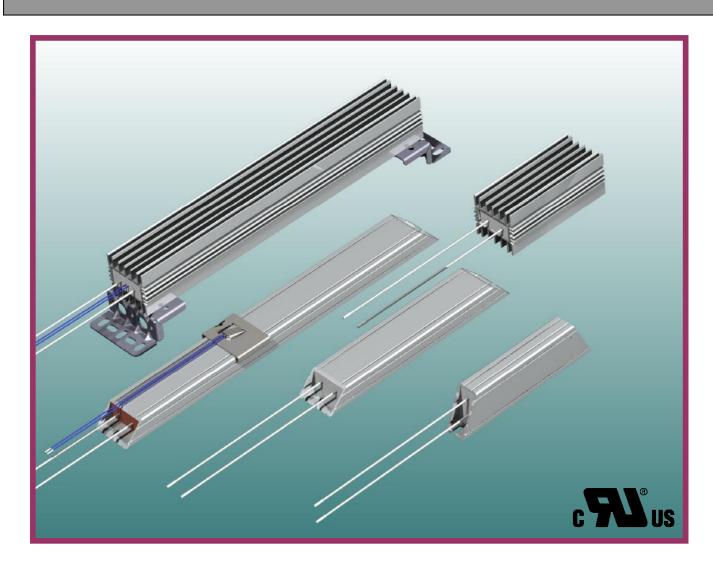
Туре	L	L1	Weight	Туре	L	L1	Weight
	±2mm	±2mm	kg		±2mm	±2mm	kg
CBHK/CBVK 165 C	165	146	0.39	CBHK/CBVK 190 CT	190	171	0.5
CBHK/CBVK 215 C	215	196	0.63	CBHK/CBVK 240 CT	240	221	0.71
CBHK/CBVK 265 C	265	246	0.88	CBHK/CBVK 290 CT	290	271	0.97
CBHK/CBVK 335 C	335	316	1.2	CBHK/CBVK 360 CT	360	341	1.3
CBHK/CBVK 405 C	405	386	1.5	CBHK/CBVK 430 CT	430	411	1.6



Cable length on standard resistors: LC = 300 mm +20mm - 0mm

CAH / CAV / CAR

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS



CAH, CAV and CAR belonging to our smallest range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS are electrically insulated and with small dimensions so that they easily can be fitted into compact constructions. They are especially designed to endure high pulse loads compared to the average load.

The steady state power range span from **55W** to **350W** and they can withstand pulse loads of up to 75 times these values for one second every 120 seconds!

The resistors comply with IP50 giving electrical and thermal protection. The resistors are silicone free.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

All types can be offered with thermo watch.

This range is generally approved to UL 508 (E 208678), please consult Danotherm (CAR Pending).



The resistors are designed as follows:

The resistor elements are wire wound on mica support sheets. Lower ohmic values are however made with helix wound elements mounted in a ceramic support part. The outer housing is an aluminium profile isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by the mica construction. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with quarts sand. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

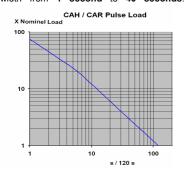
The standard cables are 300 mm AWG 16/14 Style 1659 PTFE, nature colour. We can supply cables in specified lengths, colours and mounted with cable shoes or connectors. If screw terminals are required please see special data sheet. (CAR-DT/CAR-KT)

The resistors are approved to UL 508 for USA and Canada. All thermal data in this data sheet comply with UL 508 (no further reduction is required)

If higher protection classes are required please use our CCR, CBR or CBT resistors. The highest protection class is IP65 / Type 4X, and the power range is up to 6 kW.

PULSE LOAD

The curve show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 second and a pulse width from 1 second to 40 seconds.



For further optimization offers Danotherm individual thermal electric circuit models for all types and ohm values. With these models can the temperatures of the resistor wire and the resistor surface be simulated during any pulse load conditions with standard software like PSpice. Alternatively offers Danotherm to make the thermal simulation for our customers

Ratings:

Type CAH / CAV	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ
Type CAR	w	Surface	Load in	Load in	Load in	Load in	Const.	±5%,
-V: Profile vertically	@40°C	temp.	1s each	5s each	10s each	40s each	sec.	±10%
-H: Profile horizontally,	Approved	°C	120s	120s	120s	120s	(Steady	
	UL508 *)	@40°C	P1/120	P5/120	P10/120	P40/120	state)	
	c71 2 us		w	w	W	W		
	0.2		@40°C	@40°C	@40°C	@40°C		
CAH / CAV 120 C H	55	230	2500	890	500	170	1000	0.2 - 20
CAH / CAV 150 C	65	230	3000	1050	600	200	1000	0.5 - 900
CAH / CAV 165 C	75	230	3500	1250	750	250	1000	1.0 - 1000
CAH / CAV 210 C	100	230	5500	1900	1100	310	1000	6.0 - 1000
CAH / CAV 240 C	120	240	6600	2300	1350	350	1000	9.0 – 1000
CAH / CAV 300 C	155	250	12000	3350	1850	410	1000	12 – 1000
CAH / CAV 360 C	190	270	14000	4350	2350	550	1000	15 – 1000
CAR 85 C H	100	260	6000	1700	950	260	1000	0.2 - 20
CAR 115 C	135	270	8100	2290	1280	350	1000	0.5 - 900
CAR 130 C	155	272	9300	2630	1470	400	1000	1.0 – 1000
CAR 175 C	195	265	11700	3310	1850	500	1000	6.0 - 1000
CAR 205 C	225	265	13500	3830	2140	580	1000	9.0 – 1000
CAR 265 C	285	268	17100	4840	2700	740	1000	12 – 1000
CAR 325 C	350	270	21000	5950	3320	910	1000	15 – 1000

Pulse Ratings for short pulses depend on the ohmic value. (Resistors with lower resistance values have more resistor wire than resistors with higher resistance values). The ratings in this table refer to resistors of about 40 OHMS.

General Specifications	
Temperature Coefficient:	<±100ppm
Dielectric strength:	3500VAC 1 minute
Working Voltage:	UL: 600VAC / CE: 690VAC; 1100VDC
Isolation Resistance:	> 20 MΩ
Overload:	10-12 x in10 sec; 50 - 75 x in 1 s
Environmental:	-40 °C − 90 °C
De-rating :	Linear: 40°C = P _N to 90°C = 0.75*PN
Thermo watch, CAH and CAV:	External, mounted with CLIP-ON bracket or
	internal in +25mm long housings:
	200°C (Optional: 130°C/160°C/180°C), 2A, 250VAC NC
Thermo watch CAR	Internal in +25mm long housings:
	200°C (Optional 130°C/ 160°C/180°C), 2A, 250VAC, NC
Approvals	UL 508

Europower Components

₩ ₩

COCO

eco vvv

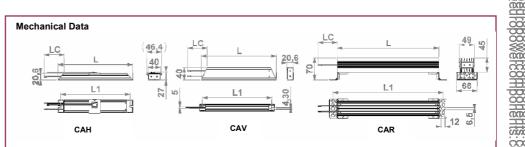
PN: NOMINAL POWER WITH NATURAL COOLING and:

For CAV and CAH mounted in a horizontal position

For CAR mounted in a vertical position

Color code for thermo watch cables: 130°C: brown/ 160°C: blue/ 180°C: orange/ 200°C: white

*) UL approval of CAR is pending. Please consult Danotherm



The CAH is shown with external CLIP-ON thermo watch TW. External CLIP-ON thermo watch is also available for CAV.

Internal thermo watch (TW) for all types require 25 mm extra length of the aluminium housing!

Type	L±2	L1 ± 2	Weight	Type	L ± 2	L1 ± 2	Weight
			g				g
CAH / CAV 120 C	120	102	160	CAR 85 C	85	115	200
CAH / CAV 150 C	150	132	185	CAR 115 C	115	145	280
CAH / CAV 165 C	165	147	220	CAR 130 C	130	160	300
CAH / CAV 210 C	210	192	315	CAR 175 C	175	205	380
CAH / CAV 240 C	240	222	370	CAR 205 C	205	235	530
CAH / CAV 300 C	300	282	460	CAR 265 C	265	295	600
CAH / CAV 360 C	360	342	550	CAR 325 C	325	355	740

Type identification:

CAR 175 C (H)(T) 22R 081

NON UL Versions CAHX 165 C 22R 800

(X): Only part of ID number if option is chosen

800: <u>CAH</u> and <u>CAV</u>: Standard / <u>CAR</u>: **001** = No TW / **081** = 200 °C TW / **071** = 180 °C TW / **061** = 160 °C TW / **051** = 130 °C TW / XXX > **400** for customer

specified versions

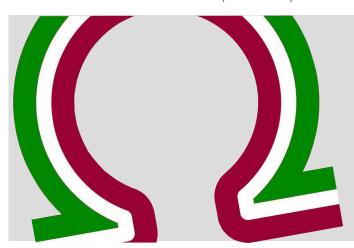
Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22~\Omega$; $220R=220\Omega$; $2K2=2.2~k\Omega$)

T = Internal Thermo Watch, 130, 160, 180 or 200°C

H: helix shape winding (only specified by Danotherm).

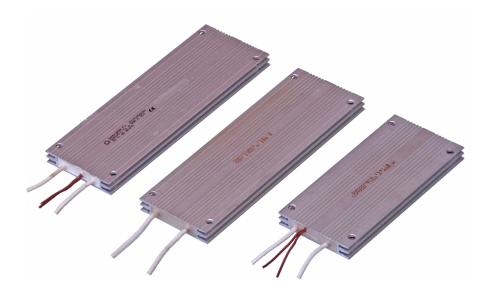
C: Cable connections

Length of resistor profile in mm.



CDH

Compact aluminium housed air cooled Resistor 110W - 205W



CDH type resistors are used as brake resistors in moderate CDH style resistors are build up from resistor wire, with very escalators and other drive systems.

When mounted on a heatsink the nominal power can be further increased. They are compact and have a high ingress protection degree of IP66. Because of their flat construction they are ideally suited for applications where space is limited.

Normal connection is 500mm cable leads. Other lengths or cables with glass fiber reinforcement are also possible.

low power drive systems like conveyer belts, elevators and low thermal drift, that is supported by a ceramic. This is placed inside the aluminum housing and filled with quartz sand giving very good thermal properties. The dielectric strength is 3.500VAC and the insulation resistance is high $(>1000M\Omega)$ and very stable over a long time of period.

> The resistors can be used as a small to medium dump load resistor or for continuous power loads. The surface temperatures at nominal power are limited to 290°C.





CDH resistors are designed as follows: The resistor elements are wire wound helix elements fitted in and supported by a ceramic insulator. The outer housing is an aluminium profile.

The resistor elements are symmetrical fixed in the profile by the ceramic insulator. This ensures a symmetric expansion of the resistor elements and thereby achieves a maximum stability to high load impulses. The aluminium profile with the fixed resistor elements is filled with quarts sand, MgO or Al_2O_3 . This ensures a minimum change of the resistor surface temperature

even if the resistor element reaches its maximum temperature during a pulse load.

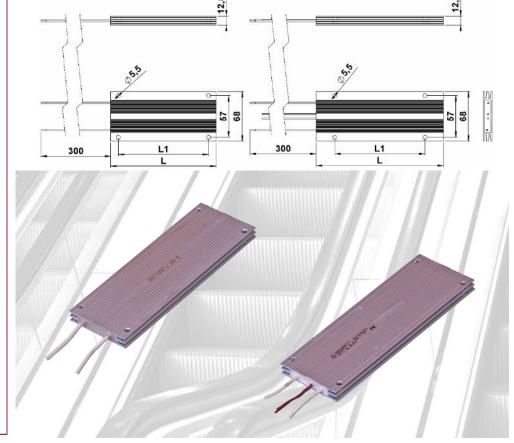
The CDH resistors are delivered with 300mm long style 1659 PTFE cables AWG18/16/14 in nature colour. We can supply cables in specified length, colours and mounted with cable shoes or connectors. Other cable types like glass fibre silicone insulated cables are also available.

Resistors with integrated thermo watch are available in two versions, one with normal (TI) and one with extra insulation (T). The extra insulated type (T) has the thermo watch mounted in a ceramic insulator which require 30mm longer aluminium profile.

CDH	Continous power [W]	Pu 1/120	lse load [k' 10/120	W] 40/120	Ohm value [Ω] ±5%	Weight [g]
CDH 102 C(TI)	110	4	1.3	0.3	2.2 - 200	195
CDH 145 C(TI)	155	6	1.9	0.5	3.3 - 250	270
CDH 195 C(TI)	205	8	2.5	0.6	3.3 - 300	365
CDH 130 CT	110	4	1.3	0.3	2.2 - 200	245
CDH 175 CT	140	6	1.7	0.5	3.3 - 250	325
CDH 225 CT	180	8	2.2	0.6	3.3 - 300	420

Pulse ratings depend on the ohm value. Resistors with lower ohm value have more resistor wire than resistors with high ohm value. The ratings in this table refer to a single resistor

wire than resistors w	wire than resistors with high ohm value. The ratings in this table refer to a single resistor								
General Specificatio	ns								
Temperature Coeffic	cient		<± 100 ppm						
Max resistor wire ter	mperature			1000 °C					
Dielectric strength			3500	VAC 1 minute					
Limiting element vo	ltage		UL: 600VAC; (CE: 690 VAC, 1100\	/DC				
Insulation Resistance	е		>	· 1000 MΩ					
Overload			3 x in 10 sec; 10 x in 1 s						
Environmental				0 - 60 °C					
Protection Degree			IP 66						
Thermo watch			2 A @ 250 VAC, NC						
Cooling (standard)			natural air cooled						
Mechanical data									
type	L±2	L1 ±0.5	type	L ±2	L1 ±0.5				
CDH 102 C(TI)	102	81	CDH 130 CT	130	81				
CDH 145 C(TI)	145	124	CDH 175 CT	175	124				
CDH 195 C(TI)	195	174	CDH 225 CT	225	174				

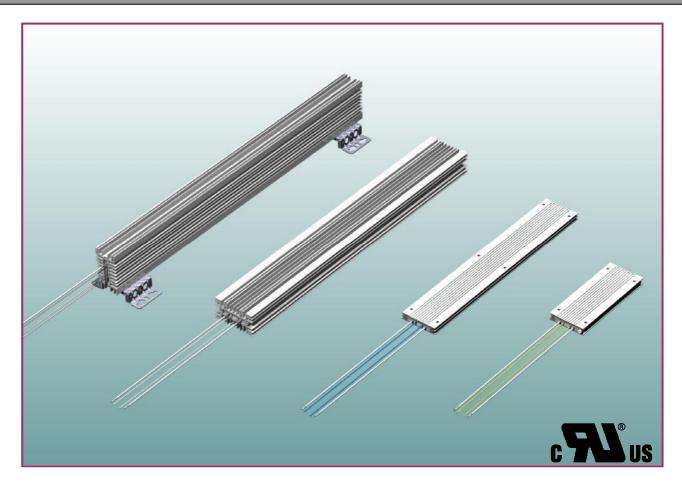




Danotherm Electric A/S Naesbyvej 20 2610 Roedovre

α ALPHA CCH / CCR

ALUMINIUM HOUSED COMPACT BRAKE RESISTORS WITH INTERNAL THERMO WATCH



CCH and CCR with internal thermo watch belonging to our medium range of ALUMINIUM HOUSED COMPACT ALPHA BRAKE RESISTORS are electrically insulated and with small dimensions so that they can easily be fitted into compact constructions. They are especially designed to endure high pulse loads compared to the average load.

The steady state power range span from **80W** to **790W** and they can withstand pulse loads of up to 40 times these values for one second every 120 seconds! The very flat construction of CCH makes it ideal suitable for heat sink cooling and can be used in **liquid cooled** equipment. Improvements in the cooling of the resistor will naturally enhance its power capability.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and of the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

The CCH and CCR are available in two versions with different protection degrees: **IP50** or **IP65**. They are both Silicone free.

CCH and CCR are also available without internal thermo watch. Please see separate datasheet.

This range is generally approved to UL 508 (E208678). Please consult Danotherm.



140

190

250

300

380

480

230

250

255

260

265

275

Ratings:

CCR-V/CCR-H 145CT

CCR-V/CCR-H 201CT

CCR-V/CCR-H 251CT

CCR-V/CCR-H 305CT

CCR-V/CCR-H 355CT

CCR-V/CCR-H 455CT

Approvals

Construction

The resistors are designed as follows:

The resistor elements are wire wound on mica support sheets. The outer housing is an aluminium profile insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profiles by the mica construction. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The resistor profile with the fixed resistor element is filled with quarts sand or MgO. This ensures a minimum change of temperature on the resistor surface even if the resistor element reaches its maximum temperature during a pulse load

The standard cables are 300 mm AWG 16/14 Style 1659 PTFE, nature colour. We can supply cables in specified length, colours and mounted with cable shoes or

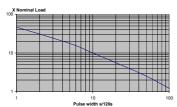
The resistors are approved to UL 508 for USA and Canada. All thermal data in this data sheet complies to UL 508 (no further reduction is required)

If screw terminals are required for the CCR types please use our CCR-V XXX BT or CCR XXX DT resistors with connection boxes

If higher impulse or average load is required please consider the CBR or CBT types which have higher weight and thereby higher heat capacity / length.

PULSE LOAD

The curve show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse width from 1 to 120 seconds.



optimization DANOTHERM For further offers individual thermal electric circuit models for all types and ohm values. With these models can the temperature of the resistor wire and resistor surface be simulated during any pulse load conditions with a standard software like PSpice. Alternatively offers Danotherm to make thermal simulation for our customers

TYPE	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ
CCHCT	W	Surface	Load in	Load in	Load in	Load in	Const	(±5%)
CCRCT	@40°C Approved UL508	temp. °C @40°C	1s each 120s P1/120 kW @40°C	5s each 120s P5/120 kW @40°C	10s each 120s P10/120 kW @40°C	40s each 120s P40/120 W @40°C	sec.	±10%
CCH 145 CT	80	200	1.56	1.4	0.78	230	1000	2 - 1000
CCH 201 CT	120	205	2.5	2.25	1.25	370	1000	4 - 1200
CCH 251 CT	160	210	3.1	2.8	1.56	470	1000	6 - 1500
CCH 305 CT	200	210	3.9	3.5	1.99	600	1000	9 - 1700
CCH 355 CT	230	215	4.6	4.2	2.34	700	1000	10 - 2000
CCH 455 CT	300	220	6	5.4	3	910	1000	13 - 2000
CCH 555 CT	370	230	7.5	6.7	3.7	1120	1000	16 - 2000
CCH 655 CT	440	230	8.9	8	4.4	1330	1000	20 - 2000

1.9

2.6

3.4

4.1

5.1

6.5

0.91

1.9

2.8

3.4

4.5

5.3

410

760

990

1370

1520

2050

UL 508

1000

1000

1000

1000

1000

1000

2 - 1000

4 - 1200

6 - 1500

9 - 1700

10 - 2000

13 - 2000

Componen

COCO

₩ ₩

COCO

COCO

3.4

8.3

11.8

13.7

17.5

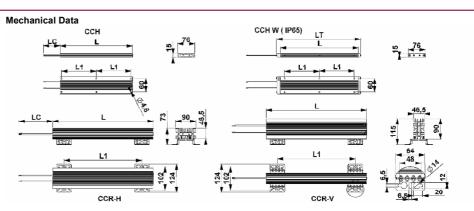
21.3

CCK-V/CCK-H 455C1	400	213	21.3	0.5	5.5	2030	1000	13 - 2000		
CCR-V/CCR-H 555CT	620	285	28.9	8.3	6.8	2660	1000	16 - 2000		
CCR-V/CCR-H 655CT	790	290	32.7	10.7	8.3	3420	1000	20 - 2000		
General Specifications										
Temperature Coefficier	nt:			<±100ppm						
Dielectric strength:				2500VAC 1 minute						
Working Voltage:				UL: 600VAC / CE: 690VAC; 1100VDC						
Isolation Resistance:				> 20 MΩ						
Overload:				10 x in10 s / 120 s; 40 x in 1 s / 120 s						
Environmental:				-40 °C - 90 °C						
De-rating :				Linear: $40^{\circ}C = P_N \text{ to } 90^{\circ}C = 0.75^{\circ}PN$						
Thermo watch contact	:		200°C (Optional 130°C/160°C/180°C), 2A, 250V, NC							

PN: NOMINAL POWER WITH NATURAL COOLING WITH INTERNAL 200°C CH and: CCH mounted in a horizontal position; CCR-V and CCR-H mounted in a vertical position

For data for resistors without internal thermostats please ask for special data sheet Colour code for T.W. cables: 130°C: brown / 160°C: blue / 180°C: orange / 200°C: white

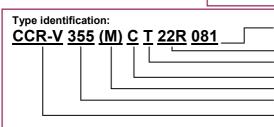




The total resistor length (LT) will in the IP 65 versions be 27mm longer than the profile length (L): <u>LT=L+27mm.</u> CCH and CCH W have the same distance L1 between the mounting points.

CCH for heat sink cooling requires extra mounting holes to assure sufficient thermal contact. The distance between mounting points (L1) should be about 100mm and can be made according to customer specification. The table shows our standard sizes, other sizes are possible. The weight in the table refers to IP 50 versions.

Type	L	L1	Weight	Туре	L	L1	Weight
	±2mm	±0.5mm	kg		±2mm	±2mm	kg
CCH 145 CT	145	98	0.27	CCR-V/CCR-H 145 CT	145	-	0.61
CCH 201 CT	201	154	0.41	CCR-V/CCR-H 201 CT	201	91	0.90
CCH 251 CT	251	204	0.54	CCR-V/CCR-H 251 CT	251	141	1.10
CCH 305 CT	305	258	0.62	CCR-V/CCR-H 305 CT	305	195	1.35
CCH 355 CT	355	2x154	0.85	CCR-V/CCR-H 355 CT	355	245	1.58
CCH 455 CT	455	2x204	1.11	CCR-V/CCR-H 455 CT	455	345	2.03
CCH 555 CT	555	2x241.5	1.36	CCR-V/CCR-H 555 CT	555	445	2.46
CCH 655 CT	655	2x291.5	1.61	CCR-V/CCR-H 655 CT	655	545	2.92



081 = Standard thermostat 200°C; **071** = 180°C; **061** = 160°C; **051** = 130°C; XXX > 400 customer specified version.

Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22\Omega$; $220R=220\Omega$; $2K2=2.2 k\Omega$)

T = Thermostat

Terminals: C: Cable, W: Cables and IP65 (UL: Type 4X)

M MgO filling, (specified by Danotherm)

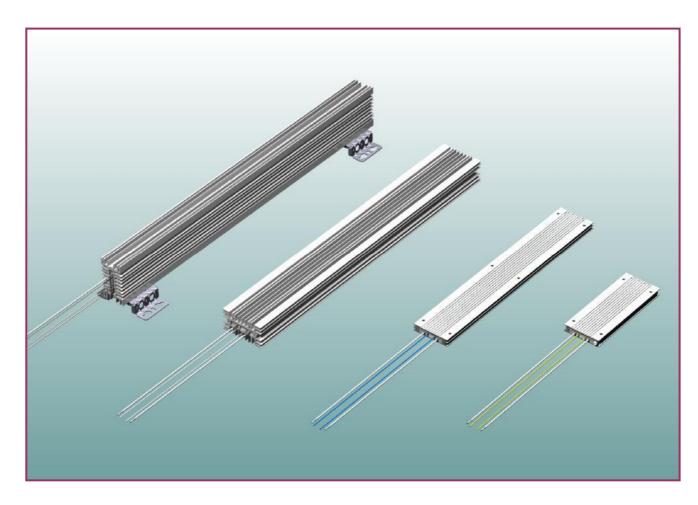
Length of resistor profile in mm.

Type CCH, CCR-V, CCR-H

NON UL versions: CCHX 355 CT 22R 081

CCH / CCR-V / CCR-H

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS with INTERNAL THERMO WATCH



CCH and **CCR** belonging to our medium range of **ALUMINIUM HOUSED** COMPACT **ALPHA BRAKE RESISTORS** are insulated and can easily be integrated in compact constructions. They are constructed for high pulse loads compared to the average load.

The resistors comply with IP50, IP52 or IP65 giving electrical and thermal protection. The resistors are Silicone free.

The power range is from **80W to 790 W** <u>steady state</u> load and pulse loads of 40 times compared to the nominal load in one second each 120s

The flat construction of CCH makes it suitable for heat sink cooling and can be used in water cooled equipment.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation. All types can be offered with thermo watch. This range is generally approved to UL 508 (E208678), please consult Danotherm.





The Alpha resistors are constructed as follows:

The resistor elements are wire wound elements wound on mica support sheets.

The housing is an aluminium profile, which is insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profiles by the mica construction. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses.

The resistor with the fixed resistor element is filled with quarts sand or MgO. This construction ensures a minimum change of temperature on the resistor surface even if the resistor element reaches its maximum temperature during a pulse load.

The resistors are approved to UL 508 for USA and Canada. All thermal data in this data sheet complies to UL 508 (no further reduction is required)

The standard cables are 300 mm AWG 16/14 Style 1659 PTFE for 600V types and 10724 for 1000V types, nature colour. We can supply cables in specified length, colours and mounted with cable shoes or connectors.

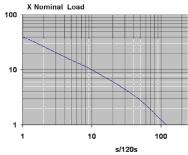
If screw terminals are required for the CCR types please use our CCR-V XXX BT or CCR XXX DT resistors with connection houses

If higher impulse/average load is required please consider the CBR or CBT types which have higher weight and heat capacity / length.

PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the CCH-CCR resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 sec.

CCH/CCR Pulse Load



For further optimization DANOTHERM offers individual thermal electric circuit models for all types and ohm values. With these models the temperature of the resistor wire and resistor surface during any pulse load conditions can be simulated with a standard soft ware like P-Spice. Alternatively Danotherm offers to make thermal simulation for our customers

Ratings:

TYPE	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ
CCR(K)C	W	Surface	Load in	Load in	Load in	Load in	Const	(±5%)
(): 600V types	@40°C	temp.	1 s each	5 s each	10s each	40 s each	sec.	±10%
K: 1000V types	Approved	°C	120s.	120 s.	120 s.	120 s		'
	UL508	@40°C	P1/120	P5/120	P10/120	P40/120		
	c PL ius		kW	kW	kW	W		
	C # 45502		@40°C	@40°C	@40°C	@40°C		
CCH 135 CT	80	200	1.56	1.4	0.78	230	1000	2 - 1000
CCH 191 CT	120	205	2.5	2.25	1.25	370	1000	4 - 1200
CCH 241 CT	160	210	3.1	2.8	1.56	470	1000	6 - 1500
CCH 295 CT	200	210	3.9	3.5	1.99	600	1000	9 - 1700
CCH 345 CT	230	215	4.6	4.2	2.34	700	1000	10 - 2000
CCH 445 CT	300	220	6	5.4	3	910	1000	13 - 2000
CCH 545 CT	370	230	7.5	6.7	3.7	1120	1000	16 - 2000
CCH 645 CT	440	230	8.9	8	4.4	1330	1000	20 - 2000
CCR-V/CCR-H 135CT	140	230	3.4	1.9	0.91	410	1000	2 - 1000
CCR-V/CCR-H 191CT	190	250	8.3	2.6	1.9	760	1000	4 - 1200
CCR-V/CCR-H 241CT	250	255	11.8	3.4	2.8	990	1000	6 - 1500
CCR-V/CCR-H 295CT	300	260	13.7	4.1	3.4	1370	1000	9 - 1700
CCR-V/CCR-H 345CT	380	265	17.5	5.1	4.5	1520	1000	10 - 2000
CCR-V/CCR-H 445CT	480	275	21.3	6.5	5.3	2050	1000	13 - 2000
CCR-V/CCR-H 545CT	620	285	28.9	8.3	6.8	2660	1000	16 - 2000
CCR-V/CCR-H 645CT	790	290	32.7	10.7	8.3	3420	1000	20 - 2000
General Specifications	3							

Temperature Coefficient:	<±100ppm
Dielectric strength:	2500VAC 1 minute
Working Voltage:	UL: 600VAC / CE: 690VAC; 1100VDC
Isolation Resistance:	> 20 MΩ
Overload:	10 x in10 s / 120 s; 40 x in 1 s / 120 s
Environmental:	-40 °C – 90 °C
De-rating :	Linear: $40^{\circ}C = P_N \text{ to } 90^{\circ}C = 0.75^{*}PN$
Thermo watch contact :	N.C. 2A, 250VAC
Approvals	UL 508

PN: NOMINAL POWER WITH NATURAL COOLING WITH INTERNAL THERMO WATCH and: CCH mounted in a horizontal position; CCR-V and CCR-H mounted in a vertical position. For data for resistors without internal thermostats please ask for special data sheet.

Colour code for T.W. cables: Brown = 130°C; Blue = 160°C; Orange = 180°C; White = 200°C

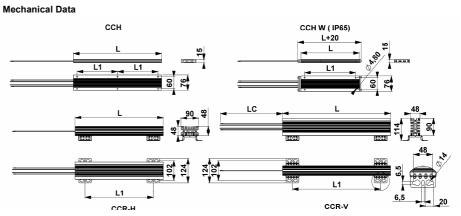


COCO

COCO

COCO

EU COM SOM E COM SOM EN S



IP65 require extra length LT = L+20mm. L and L1 has the same value for IP50 and IP65. The weight figures in the table below refer to IP50 versions. The table shows standard sizes. Other sizes are possible.

Type			IP 65	W	Туре			IP65	IP65:	W
	L ± 2	L1±0.5	L ± 2	Kg		L	L1	L±2	L1±0.5	Kg
						± 2	±0.5			
CCH 135 CT	135	98	135	0.27	CCR-V/CCR-H 135CT	135	-	135	-	0.61
CCH 191 CT	191	154	191	0.41	CCR-V/CCR-H 191CT	191	91	191	91	0.90
CCH 241 CT	241	204	241	0.54	CCR-V/CCR-H 241CT	241	141	241	141	1.1
CCH 295 CT	295	158	294	0.62	CCR-V/CCR-H 295CT	295	195	295	195	1.35
CCH 345 CT	345	2x154	345	0.85	CCR-V/CCR-H 345CT	345	245	345	245	1.58
CCH 445 CT	445	2x204	445	1.11	CCR-V/CCR-H 445CT	445	345	445	345	2.03
CCH 545 CT	545	2x241.5	545	1.36	CCR-V/CCR-H 545CT	545	445	545	445	2.46
CCH 645 CT	645	2x291.5	645	1.61	CCR-V/CCR-H 645CT	645	545	645	545	2.92

Type identification:

CCR-V (K) 326 (M) C T 22R 081

NON UL versions: CCHX 335 C 22R 800

081 = Standard, 200 °C; **071** = Standard 180 °C; **061** = Standard 160 °C; **051** = Standard 130 °C; **XXX** > 400 customer specified version.

Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22~\Omega$; $220R=220\Omega$; $2K2=2.2~k\Omega$)

T = Thermostat (200 °C is standard; please specify if other temperatures are required)

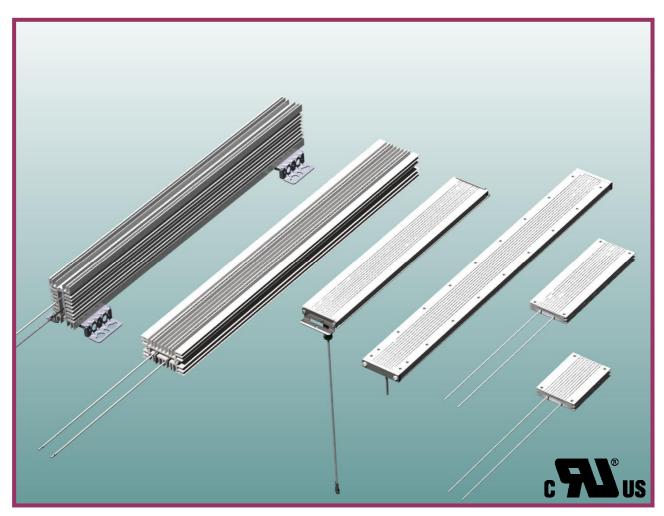
Terminals: C: Cable, W: Cables and IP65 (UL: Type 4X)

M MgO filling, (specified by Danotherm)

Length of resistor profile in mm. **K** = 1000V; () 600V (UL Approved) Type **CCH**, **CCR-V**, **CCR-H**

CCH / CCR

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS



CCH and CCR belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS are electrically insulated and with small dimensions so that they can easily be fitted into compact constructions. They are especially designed to endure high pulse loads compared to the average load.

The steady state power range span from **100W** to **1045W** and they can withstand pulse loads of 40 times these values for one second every 120 seconds! The very flat construction of CCH makes it ideal suitable for heat sink cooling and can be used in **liquid cooled** equipment. Improvement in the cooling of the resistor will naturally enhance its power capability.

This range is generally approved to UL 508 (E208678), please consult Danotherm.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

The CCH and CCR are available in two versions with different protection degrees: **IP50** or **IP65**. They are both Silicone free.

CCH can be equipped with external SCREW-ON thermo watch. Both types can be offered with internal thermo watch, please see separate datasheet.





The resistors are designed as follows:

The resistor elements are wire wound on mica support sheets. The outer housing is an aluminium profile insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by the mica construction. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with quarts sand or MgO. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

The standard cables are 300 mm AWG 16/14 Style 1659 PTFE, nature colour. We can supply cables in specified length, colours and mounted with cable shoes or connectors.

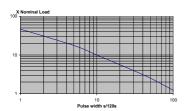
The resistors are approved to UL 508 for USA and Canada. All thermal data in this data sheet complies to UL 508 (no further reduction is required)

If screw terminals are required please ask for our datasheets on the CCR-V XXX BT or CCR XXX DT resistors with connection boxes.

If higher impulse or average load is required please consider the **CBR** or **CBT** types which have higher weight and thereby higher heat capacity / length.

PULSE LOAD

The curve show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse width from 1 to 120 seconds.

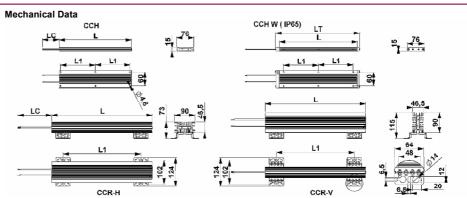


For further optimization DANOTHERM offers individual thermal electric circuit models for all types and ohm values. With these models can the temperature of the resistor wire and resistor surface be simulated during any pulse load conditions with a standard software like PSpice. Alternatively offers Danotherm to make thermal simulation for our customers

Ratings:

TYPE	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ	
CCH	w	Surface	Load in	Load in	Load in	Load in	Const	(±5%)	
CCR-H	@40°C	temp.	1s each	5s each	10s each	40s each	sec.	±10%	
Profile Horizontally	Approved	°C.	120s	120s	120s	120s			
CCR-V	UL508	@40°C	P1/120	P5/120	P10/120	P40/120			
Profile Vertically	:711 us		kW	kW	kW	W			
	0 3 44 00		@40°C	@40°C	@40°C	@40°C			
CCH 110	100	250	2	1.8	1.0	300	1000	2-1000	
CCH 166	160	255	3.2	2.88	1.6	480	1000	4-1200	
CCH 216	200	255	4	3.6	2.0	600	1000	6-1500	
CCH 270	260	255	5.1	4.59	2.55	770	1000	9-1700	
CCH 320	300	260	6	5.4	3.0	900	1000	10-2000	
CCH 420	390	270	7.8	7.02	3.9	1170	1000	13-2000	
CCH 520	480	285	9.6	8.64	4.8	1440	1000	16-2000	
CCH 620	570	295	11.4	10.2	5.7	1710	1000	20-2000	
CCR-H/CCR-V 116	185	250	4.5	2.5	1.2	550	1000	2-1000	
CCR-H/CCR-V 172	260	250	11	3.5	2.5	1000	1000	4-1200	
CCR-H/CCR-V 222	330	255	15.5	4.45	3.75	1300	1000	6-1500	
CCR-H/CCR-V 276	400	260	18	5.4	4.5	1800	1000	9-1700	
CCR-H/CCR-V 326	500	265	23	6.7	5.9	2000	1000	10-2000	
CCR-H/CCR-V 426	635	275	28	8.57	7.0	2700	1000	13-2000	
CCR-H/CCR-V 526	815	285	38	11	9.0	3500	1000	16-2000	
CCR-H/CCR-V 626	1045	290	43	14.1	11	4500	1000	20-2000	
General Specificati									
Temperature Coeff						<±100ppm			
Dielectric strength:						VAC 1 minut			
Working Voltage:					UL: 600V ; C		1100VDC		
Isolation Resistance	e:					> 20 MΩ			
Overload:	10 x in 10s / 120s; 40 x in 1s / 120s								
Environmental:	-40 °C – 90 °C								
De-rating :	Linear: $40^{\circ}C = P_N \text{ to } 90^{\circ}C = 0.75^{\circ}PN$								
Thermo watch (exte	ernal) :		_	200°C (Optional 130 °C/160°C/180°C), 2A, 250VAC, NC					
Approvals		•				UL 508	•	·	

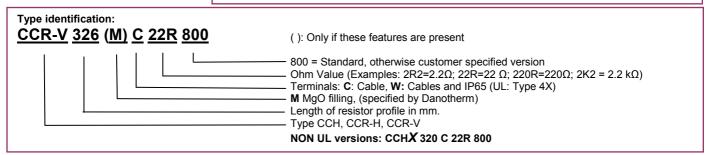
PN: NOMINAL POWER WITH NATURAL COOLING WITHOUT INTERNAL THERMO WATCH and: CCH mounted in a horizontal position; CCR-V and CCR-H mounted in a vertical position. For data for resistors with internal thermo watch, please ask for special data sheet.

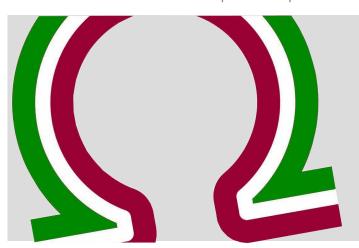


The **IP 65** versions require longer aluminium profiles (**L**): CCH W +35mm; CCR W +29mm. The total resistor length (**LT**) will be additional 27mm longer than the profile length (**L**). **LT = L + 27mm**. CCH and CCH W have the same distance **L1** between the mounting points.

CCH for heat sink cooling requires extra mounting holes to assure sufficient thermal contact. The distance between mounting points (L1) should be about 100mm and can be made according to customer specification. The table shows our standard sizes, other sizes are possible. The weight in the table refers to IP 50 versions.

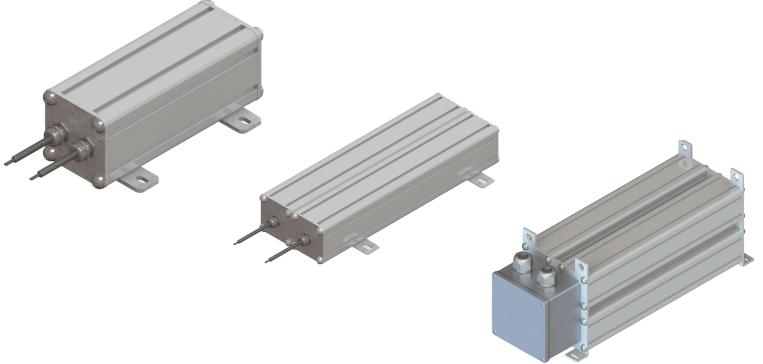
ı	Type			IP65	W	Type			IP65	IP65	w
۱		L	L1	L	kg		L	L1	L	L1	kg
١		±2mm	±0.5mm	±2mm			±2mm	±2mm	±2mm	±2mm	
١	CCH 110	110	98	145	0.22	CCR-H/CCR-V 116	116	-	145	-	0.52
١	CCH 166	166	154	201	0.35	CCR-H/CCR-V 172	172	72	201	91	0.78
١	CCH 216	216	204	251	0.48	CCR-H/CCR-V 222	222	122	251	141	1.00
١	CCH 270	270	258	305	0.62	CCR-H/CCR-V 276	276	176	305	195	1.25
١	CCH 320	320	2x154	355	0.79	CCR-H/CCR-V 326	326	226	355	245	1.47
١	CCH 420	420	2x204	455	1.05	CCR-H/CCR-V 426	426	326	455	345	1.92
١	CCH 520	520	2x241.5	555	1.30	CCR-H/CCR-V 526	526	426	555	445	2.37
١	CCH 620	620	2x291.5	655	1.55	CCR-H/CCR-V 626	626	526	655	545	2.83
1											





HVB70

Aluminium high pulse power air cooled Resistor 570kJ - 2200kJ



HVB70 style resistors are high pulse load resistors used in with IP65 or IP66 ingress protection degree. crowbar and high energy dump applications like in Wind turbines. They are very compact and therefore can be used in applications where space is an issue.

The **high pulse load energy** is absorbed by the wire and then data. transferred to the filling, which is normally quartz sand. In general the temperature of the housing will stay very low.

The HVB70 range is build up with one or multiple extruded minimum maintenance aluminium profiles. The connection can be with 1 meter of cable (other lengths are possible) or with a connection box

The maximum pulse load energy strongly depends on the resistor wire and with that the ohm value. Please, ask for separate datasheet with the ohm value you require to get precise

The resistors have a low thermal drift, low noise level, are very compact, have no life parts on the outside and require





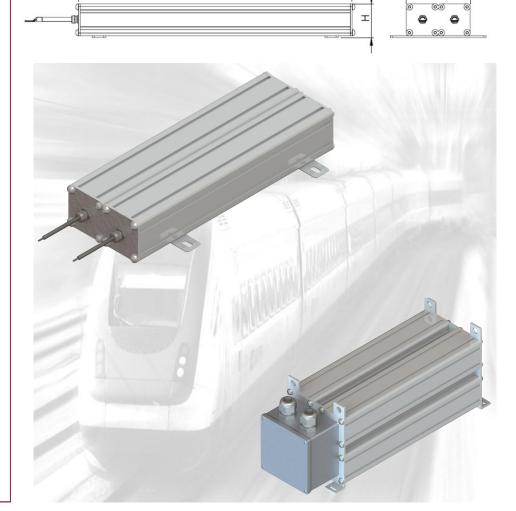
Low Voltage Ride Through (LVRT) is an important new requirement for wind farms to remain connected and actively contribute to system stability during a wide range of network faults. Fault ride-through specifications listed in modern transmission and distribution grid codes, specify that wind-turbine generators must remain connected to electricity networks at voltage levels well below nominal. The series dynamic braking resistor dissipates active power and boosts generator voltage, potentially displacing the need for pitch control and dynamic reactive power compensation.

Other applications are dynamic braking in railway, snubbers in chopper chopper contols and rectifiers and in crowbar systems.

Main characteristics are:

- Compact
- Cool surface
- High pulse capability
- High vibration capability
- No live parts outside
- High IP class
- Low noise level
- High dielectric strength

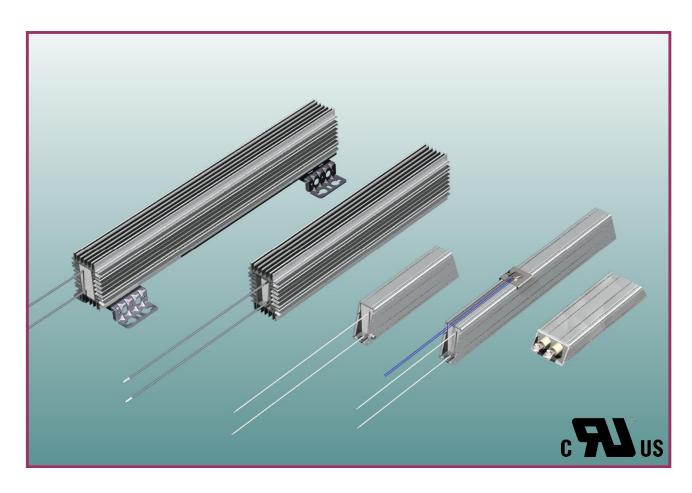
HVB70										
Туре	Ohm value [Ω] ±5%	Energy [kJ]	Weight [kg]							
HVB70.400.2	0.3 - 500	570	<u>+</u> 9							
HVB70.400.4	0.2 - 500	1.100	±13.5							
HVB70.400.6	0.15 - 500	1.700	±27							
HVB70.400.8	0.1 - 500	2.200	±40.5							
General Specifications										
Insulation resistance	all types	1Ω @ 5000 VDC								
Dielectric strength	all types	18.000 VA	.C @ 50Hz 1 min							
	400.2	12.000 VAC @ 50Hz 1 min								
Protection degree		IP	65 / IP66							
Dimensions	A [mm]	C [mm]	H [mm]							
HVB70.400.2	400	140	74							
HVB70.400.4	400	150	148							
HVB70.400.6	400	230	148							
HVB70.400.8	400	340	148							





α ALPHA CBH / CBV / CBR

ALUMINIUM HOUSED COMPACT BRAKE RESISTORS



CBH, CBV and CBR belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS are electrically insulated and with small dimensions so that they easily can be fitted into compact constructions. They are especially designed to endure high pulse loads compared to the average load.

The steady state power range span from **100W** to **1700W** steady state load and they can withstand pulse loads of up to 60 times these values for one second every 120 seconds.

These types is generally approved to UL 508 (E208678), please consult Danotherm.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

The resistors comply with IP50 giving electrical and thermal protection. The **CBR** are also available in an IP65 version. The resistors are Silicone free.

CBH and CBV can be equipped with CLIP-ON thermo watch. All tree types can be offered with internal thermo watch, please see separate datasheet.





The resistors are designed as follows:

The resistor elements are wire wound on mica support sheets. Lower ohmic values are however made with helix wound elements mounted in a ceramic support part. The outer housing is an aluminium profile isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by the mica construction or the ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with quarts sand. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

The standard cables are 300 mm AWG 18 - 10 Style 1659 PTFE, nature colour. We can supply cables in specified length, colours and mounted with cable shoes or connectors.

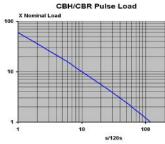
The resistors are approved to UL 508 for USA and Canada. All thermal data in this data sheet complies with UL 508 (no further reduction is required)

If screw terminals or higher protection classes are required please use our CBR or CBT resistors with connection boxes.

The highest protection class is IP65 / Type 4X, and the power range goes up to 6 kW.

PULSE LOAD

The curve show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse width from 1 second to 40 seconds.



For further optimization offers Danotherrn individual thermal electric circuit models for all types and ohm values. With these models can the temperature of the resistor wire and resistor surface be simulated during any pulse load conditions with a PSpice. standard soft ware like Alternatively offers Danotherm to make the thermal simulation for our customers

Ratings

TYPE	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ
CBH/CBV	W	Surface	Load in	Load in	Load in	Load in	Const	±10%
CBR-V / CBR-H	@40°C	temp.	1s each	5s each	10s each	40s each	sec	(±5% on
-V: Profile vertically	Approved	°C	120s	120s	120s	120s	(Steady	request)
-H: Profile horizontally	UL508	@40°C	P1/120	P5/120	P10/120	P40/120	state)	
	c 91 us		kW	kW	kW	W		
	0 2 - 03		@40°C	@40°C	@40°C	@40°C		
CBH / CBV 165 C	110	230	5.5	1.8	1.0	330	1000	0.5 Ë 1000
CBH / CBV 215 C	155	230	8.5	3.0	1.65	475	1000	0.8 Ë 1500
CBH / CBV 265 C	200	230	12.5	4.0	2.2	540	1000	1.5 Ë 2000
CBH / CBV 335 C	270	230	18.0	6.0	3.1	800	1000	1.8 Ë 2000
CBH / CBV 405 C	330	240	25.0	8.3	4.5	1000	1000	2.0 Ë 2000
CBR-V/CBR-H 125 C	222	250	13.3	4.0	2.22	660	1000	0.5 Ë 1000
CBR-V/CBR-H 175 C	311	270	18.6	5.6	3.11	930	1000	0.8 Ë 1500
CBR-V/CBR-H 225 C	400	300	24	7.2	4.0	1200	1000	1.5 Ë 2000
CBR-V/CBR-H 295 C	525	340	31.5	9.4	5.2	1570	1000	1.8 Ë 2000
CBR-V/CBR-H 365 C	650	250	39	11.7	6.5	1950	1000	2.0 Ë 2000
CBR-V/CBR-H 426 C	980	270	58	17	9.8	2940	1000	2.4 Ë 40
CBR-V/CBR-H 526 C	1220	300	73	21.9	12	3660	1000	3.0 Ë 45
CBR-V/CBR-H 626 C	1460	340	87	26	14	4300	1000	3.5 Ë 50
CBR-V/CBR-H 726 C	1700	250	100	30	17	5100	1000	4.0 Ë 55

Pulse Ratings for short pulses depend on the ohmic value. (Resistors with lower resistance values have more resistor wire than resistors with higher resistance values). The ratings in this table refer to resistors of about 40 OHMS.

General Specifications	
Temperature Coefficient:	<±100ppm
Dielectric strength:	3500VAC 1 minute
Working Voltage:	UL: 600VAC / CE: 690VAC; 1100VDC
Isolation Resistance:	> 20 M Ω
Overload:	10 x in10 s / 120 s; 60 x in 1 s / 120 s
Environmental:	-40 °C Ë 90 °C
De-rating :	Linear: $40^{\circ}C = P_N \text{ to } 90^{\circ}C = 0.75^{\circ}PN$
External Thermo watch	Mounted with CLIP-ON bracket:
(Internal thermo watch types see special data sheet.	200°C (Optional 130°C/160°C/ 180°C), 2A, 250V, NC
Approvals	UL 508

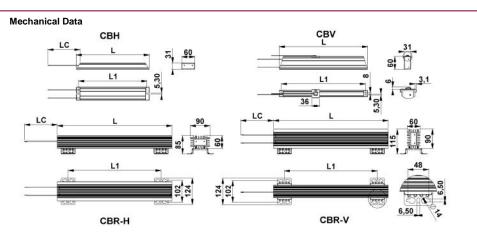
PN: NOMINAL POWER WITH NATURAL COOLING WITHOUT INTERNAL THERMO WATCH and:

For CBV and CBH mounted in a horizontal position

For CBR-V and CBR-H mounted in a vertical position.

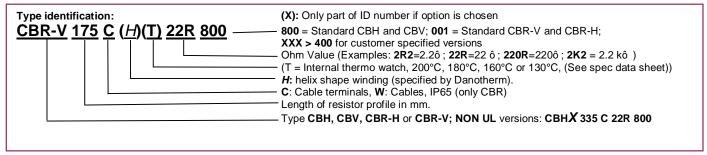
Please ask for special datasheet if resistors with internal thermo watch are required!

Color code for thermo watch cables: 130 °C: brown / 160°C: blue / 180°C: orange / 200°C: white



The external CLIP-ON thermo watch shown on CBV is also available for CBH. Internal thermo watch require 25 - 35 mm longer resistor profile, please require special data sheet.

Туре	L±2	L1 ± 2	Weight	Туре	L±2	L1 ± 2	Weight
CBH / CBV 165 C	165	146	0.39	CBR-V/CBR-H 225	225	125	1.8
CBH / CBV 215 C	215	196	0.63	CBR-V/CBR-H 295	295	195	2.3
CBH / CBV 265 C	265	246	0.88	CBR-V/CBR-H 365	365	265	2.8
CBH / CBV 335 C	335	316	1.2	CBR-V/CBR-H 426	426	326	3.2
CBH / CBV 405 C	405	386	1.5	CBR-V/CBR-H 526	526	426	3.8
CBR-V/CBR-H 125	125	-	1.2	CBR-V/CBR-H 626	626	526	4.5
CBR-V/CBR-H 175	175	75	1.5	CBR-V/CBR-H 726	726	626	5.2



α ALPHA CCR-DT

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS IP 21



CCR-V XXX DT belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS is electrically insulated and can easily be integrated in compact constructions and it is specially constructed for high pulse loads compared to the average load

loads compared to the average load.

The resistors comply with IP21 / 1X giving electrical and thermal protection. The resistors are Silicone free. The power range is from 140 W to 2900 W steady state load and pulse loads of 60 times compared to the nominal load in

one second each 120s. Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation. All types are equipped with thermo watch. This range is generally approved to UL 508 (E208678), please consult Danotherm





ALPHA CCR DT is a range of compact Aluminum Profile Brake Resistors with protection class IP21. The resistors are supplied with an internal 200°C thermostat and equipped with a connection box, which contains cable glands and cable connection to the resistor and the thermostat.

Connection

Power cables are connected through a pg16 cable gland with integrated braid connection. The range of outer diameter of the power cable is 15- 18mm. The power cables $(0.5 - 10 \text{ mm}^2)$ are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw. The cable for the temperature switch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3 -7mm

High Temperature Warning

The CCR DT resistors have a "High Temperature" warning label on the profile. The resistors can optionally be supplied with a Protecting Grating



Ratings Resistors with 200°C T.W.

TYPE CCR-V DT	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	R Ω - kΩ			
-V: Profile vertically	W	Surface	Load in	Load in	Load in	Load in	Const.	±5%,			
-H: Profile horizontally,	@40°C	temp.	1 s each	5 s each	10s each	40 s each	sec.	±10%			
optional, same power as -H D: Box IP21	Approved	°C	120s.	120 s.	120 s.	120 s	(Steady	i i			
H: High Pulse (HELIX)	UL508	@40°C	P1/120	P5/120	P10/120	P40/120	state)				
T: Internal T.W.	c FL °us		kW	kW	kW	kW					
281 Configuration*)	C 2		@40°C	@40°C	@40°C	@40°C					
CCR-V 135 D T 281	140	230	6.3	1.9	1.5	0.50	1000	4 – 0.4			
CCR-V 191 D T 281	190	230	8.5	3.1	1.9	0.70	1000	5 – 0.5			
CCR-V 241 D T 281	250	230	11.2	4	2.5	0.75	1000	10 – .5			
CCR-V 295 D T 281	300	230	13.5	4.8	3.0	0.9	1000	10 – 0.8			
CCR-V 345 D T 281	380	240	17.1	6.1	3.8	1.1	1000	10 – 1.0			
CCR-V 445 D T 281	480	250	21.6	7.8	4.8	1.4	1000	16 – 1.2			
CCR-V 545 D T 281	620	270	27.9	10.4	6.2	1.8	1000	20 – 1.4			
CCR-V 645 D T 281	790	300	35.5	12.8	8	2.4	1000	20 –1.6			
CCR-V 345 D T 282	760	250	34	12.3	7.7	2.2	1000	5 – 0.5			
CCR-V 445 D T 282	960	270	43	15.5	9.7	2.8	1000	8- 0.6			
CCR-V 545 D T 282	1240	300	55	20	12.5	3.7	1000	10 - 0.8			
CCR-V 645 D T 282	1580	340	71	25	16	4.7	1000	10 - 0.8			
CCR-V 345 D T 283	1140	250	51	18	11.5	3.4	1000	3 – 0.3			
CCR-V 445 D T 283	1440	270	64	23	14.5	4.3	1000	5 – 0.3			
CCR-V 545 D T 283	1860	300	83	30	18	5.5	1000	6.5 - 0.3			
CCR-V 645 D T 283	2370	340	106	38	24	7.1	1000	6.5 - 0.3			
CCR-V 720 D T 283	2900	350	116	41	27	8.7	1000	6.5 - 0.3			
General Specificatio											
	Temperature Coefficient:					<±100ppm					
Dielectric strength:	2500VAC 1 minute										
Working Voltage:				UL: 600VAC / CE: 690VAC; 1100VDC							

PN: NOMINAL POWER WITH NATURAL COOLING and mounted in a vertical position

SURFACE TEMPERATURE: 195°C @ 40°C AMB near Connector Box and Thermostat. *) Configuration: 2X1: ONE resistor profile; 2X2 TWO resistor profiles; 2X3 THREE resistor profiles X specifies thermostat temperature: X=5: 130°C; X=6: 160°C; X=7: 180°C; X=8: 200°C; X=0 no thermostat. 3XX: Resistors with protection grid

Europower Compon

000

COCO

器

COCO

EU COM SOM ET COM BOTHER IS

> 20 MΩ

5-10x in10 sec; 25-35 x in 1 s

-40 °C - 90 °C Linear: $40^{\circ}C = P_N \text{ to } 70^{\circ}C = 0.5^{*}PN$

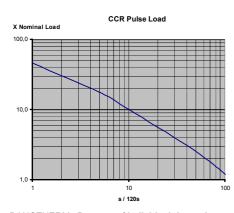
N.C. 2A. 250V

UL 508

NB: As alternative to the two and three profile versions please consider the CBT type.

PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the CCR resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 sec and a pulse width from one second to 40 sec.



DANOTHERM. By mean of individual thermal models we can simulate the rises of temperatures in the components and on the surfaces during and between specified pulses.

Mechanical Data

Isolation Resistance:

Thermo watch contact

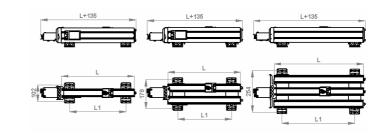
Overload:

Derating :

Approvals

Environmental

Resistors with one, two and three resistor profiles



Туре	L±2	L1 ± 2	Weight	Туре	L±2	L1 ± 2	Weight
CCR-V 135 D T 281	135	-	1,3 Kg	CCR-V 345 D T 282	345	245	4 Kg
CCR-V 191 D T 281	191	91	1,8 Kg	CCR-V 445 D T 282	445	345	5g
CCR-V 241 D T 281	241	141	2,0 Kg	CCR-V 545 D T 282	454	445	6 Kg
CCR-V 295 D T 281	295	195	2,1 Kg	CCR-V 645 D T 282	645	545	7 Kg
CCR-V 345 D T 281	345	245	2,5 Kg	CCR-V 345 D T 283	345	345	8 Kg
CCR-V 445 D T 281	445	345	2,9 Kg	CCR-V 445 D T 283	445	345	9Kg
CCR-V 545 D T 281	545	445	3,6 Kg	CCR-V 545 D T 283	545	445	10 Kg
CCR-V 645 D T 281	645	545	4,3 Kg	CCR-V 645 D T 283	645	545	11Kg
CCR-V 720 D T 281	720	620	5 Kg	CCR-V 720 D T 283	720	620	12Kg

Type identification:

If you have chosen a CBR Brake Resistor with IP21 protection it is necessary to specify the size (length), the configuration (Number of profiles) and the ohm value.

Please specify your CBR Brake resistor as follows



Configuration: See above, or if XXX > 400: Customer specified version

Ohm Value (: $2R2=2.2\Omega$; $22R=22~\Omega$; $220R=220\Omega$; $2K2=2.2~k\Omega$) Standard: 10%

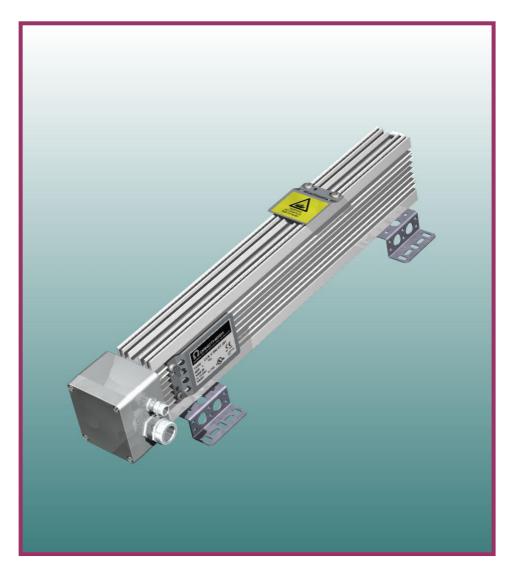
T With Thermostat

Length of resistor profile in mm.

More configurations (IP23, IP50, Protection grid) can be supplied, please consult Danotherm Electric A/S for further details.

α ALPHA CCR-BT

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS IP 65 / 4X



CCR-V XXX BT belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS is electrically insulated and can easily be integrated in compact constructions and it is specially constructed for high pulse loads compared to the average load.

The resistors comply with IP65 / 4X giving electrical and thermal protection. The resistors are Silicone free.

The power range is from 140 W to 2900 W steady state load and pulse loads of 60 times compared to the nominal load in

one second each 120s. Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation. All types are equipped with thermo watch. This range is generally approved to UL 508 (E208678), please consult Danotherm





ALPHA CCR BT is a range of compact Aluminum Profile Brake Resistors with protection class IP65. The resistors are supplied with an internal 200°C thermo watch and equipped with a connection box, which contains cable glands and cable connection to the resistor and the thermostat.

Connection

Power cables are connected through a M25 cable gland with integrated screen connection. The range of outer diameter of the power cable is 9.0-16.6mm.

The power cables (0.5 – 10 mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw. The cable for the temperature switch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3 –

High Temperature Warning

The CCR BT resistors have a "High Temperature" warning label on the connector box. The resistors can optionally be supplied with a Protecting Grating



Ratings: TYPE CCR-V BT Max Pulse Pulse Pulse Pulse Time R Ω - kΩ -V: Profile vertically ±5%, ±10% Surface Load in Load in Load in Load in Const. -H: Profile horizontally, @40°C 10s each temp. 1 s each 5 s each 40 s each sec. **B:** Box IP65 Approved 120 s. 120 s 120s. 120 s. (Steady **UL508** @40°C P1/120 P5/120 P10/120 P40/120 state) H: High Pulse (HELIX) T: Internal T.W. c**FL** us kW kW 281 Configuration*) @40°C @40°C @40°C @40°C CCR-V 135 B T 281 140 0.50 1000 CCR-V 191 B T 281 190 230 8.5 1.9 0.70 1000 5 - 0.5 3.1 CCR-V 241 B T 281 230 1000 10 – .5 250 11.2 0.75 CCR-V 295 B T 281 230 13.5 4.8 3.0 300 0.9 1000 10 - 0.8 CCR-V 345 B T 281 380 240 17.1 6.1 3.8 1.1 1000 10 – 1.0 CCR-V 445 B T 281 250 21.6 7.8 480 4.8 1.4 1000 16 - 1.2 CCR-V 545 B T 281 270 27.9 10.4 6.2 1.8 1000 20 – 1.4 620 CCR-V 645 B T 281 790 300 35.5 12.8 8 2.4 1000 20 -1.6 CCR-V 345 B T 282 760 250 34 12.3 7.7 2.2 5 – 0.5 1000 2.8 CCR-V 445 B T 282 960 270 43 15.5 9.7 1000 8- 0.6 CCR-V 545 B T 282 1240 300 55 20 3.7 1000 10 - 0.812.5 CCR-V 645 B T 282 1580 340 25 10 - 0.8 71 16 4.7 1000 CCR-V 345 B T 283 18 1140 250 51 11.5 3.4 1000 3 - 0.3CCR-V 445 B T 283 1440 270 23 4.3 1000 5 - 0.364 14.5 CCR-V 545 B T 283 1860 300 83 30 5.5 6.5 - 0.318 1000 CCR-V 645 B T 283 2370 340 106 38 24 7 1 1000 6.5 - 0.3CCR-V 720 B T 283 2900 350 116 41 27 8.7 1000 6.5 - 0.3

General Specifications Temperature Coefficient: <±100ppm 2500VAC 1 minute Dielectric strength: Working Voltage: Isolation Resistance: UL: 600VAC / CE: 690VAC; 1100VDC > 20 MQ 5-10x in10 sec; 25-35 x in 1 s Overload: Environmental: -40 °C - 90 °C Linear: $40^{\circ}C = P_N \text{ to } 70^{\circ}C = 0.5^{*}PN$ Derating Thermo Watch Contact: N.C. 2A, 250V Approvals UL 508

EUROBSWEI COMBONEN

₩ ₩

COCO

COCO

(3)

CÓCÓ

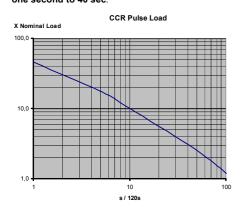
PN: NOMINAL POWER WITH NATURAL COOLING and mounted in a vertical position SURFACE TEMPERATURE: 195°C @ 40°C AMB near Connector Box and Thermostat.

*) Configuration: <u>2X1: ONE</u> resistor profile; <u>2X2 TWO</u> resistor profiles; <u>2X3 THREE</u> resistor profiles **X** specifies thermostat temperature: **X=5**: 130°C; **X=6**: 160°C; **X=7**: 180°C; **X=8**: 200°C **3**XX: resistors with protection grid

NB: As alternative to the two and three profile versions please consider the **CBT** types.

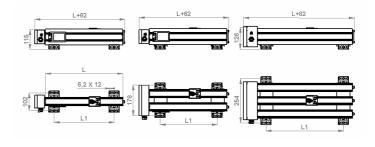
PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the CCR resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 sec and a pulse width from one second to 40 sec.



For SPECIFIC load conditions please contact DANOTHERM. By mean of **individual thermal models** we can simulate the rises of temperatures in the components and on the surfaces during and between specified pulses.

Mechanical Data Resistors with one, two and three resistor profiles



Туре	L±2	L1 ± 2	Weight	Туре	L±2	L1 ± 2	Weight
CCR-V 135 B T 281	135	-	1,3 Kg	CCR-V 345 B T 282	345	245	4 Kg
CCR-V 191 B T 281	191	91	1,8 Kg	CCR-V 445 B T 282	445	345	5g
CCR-V 241 B T 281	241	141	2,0 Kg	CCR-V 545 B T 282	454	445	6 Kg
CCR-V 295 B T 281	295	195	2,1 Kg	CCR-V 645 B T 282	645	545	7 Kg
CCR-V 345 B T 281	345	245	2,5 Kg	CCR-V 345 B T 283	345	345	8 Kg
CCR-V 445 B T 281	445	345	2,9 Kg	CCR-V 445 B T 283	445	345	9Kg
CCR-V 545 B T 281	545	445	3,6 Kg	CCR-V 545 B T 283	545	445	10 Kg
CCR-V 645 B T 281	645	545	4,3 Kg	CCR-V 645 B T 283	645	545	11Kg
CCR-V 720 B T 281	720	620	5 Ka	CCR-V 720 B T 283	720	620	12Ka

Type identification:

If you have chosen a CBR Brake Resistor with IP65 protection it is necessary to specify the size (length), the configuration (Number of profiles) and the ohm value.

Please specify your CBR Brake resistor as follows

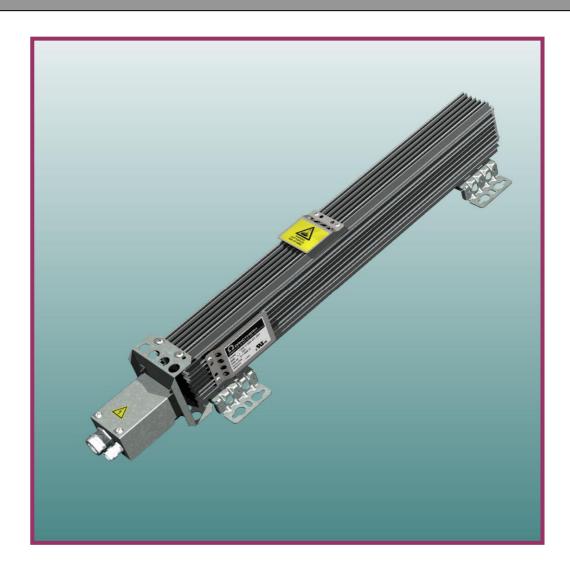


Configuration: See above or if XXX > 400: Customer specified version
 Ohm Value (Examples: 2R2=2.2Ω; 22R=22 Ω; 220R=220Ω) 10% is standard.
 Length of resistor profile in mm.

More configurations (IP23, IP50, Protection grid) can be supplied, please consult Danotherm Electric A/S for further details.

α ALPHA CBR-DT

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS IP 21



CBR-V XXX DT belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS is electrically insulated and can easily be integrated in compact constructions. It is specially constructed for high pulse loads compared to the average load.

The resistors comply with IP21 / 1X giving electrical and thermal protection. The resistors are Silicone free.

The power range is from 280 W to 3400 W steady state load and pulse loads of 60 times compared to the nominal load in

one second each 120s. Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation. All types can be equipped with thermo watch. This range is generally approved to UL 508, (E208678) please consult Danotherm:



ALPHA CBR DT is a range of compact Aluminum Profile Brake Resistors with protection class IP21. The resistors are supplied with an internalthermo watch (Max. temperature 200 °C) and equipped with a connection box, which contains cable glands and cable connection to the resistor and the thermo watch.

Connection

Power cables are connected through a pg16 cable gland with integrated braid connection. The range of outer diameter of the power cable is 15-18mm.

The power cables (0.5 - 10 mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw The cable for the thermo watch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3

High Temperature Warning

The CBR BT resistors have a "High Temperature" warning label on the profile. The resistors can optionally be supplied with a Protecting Grating



Ratings: Resistors with 200°C thermo watch.

TYPE CBR-V DT	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ		
-V: Profile vertically	w	Surface	Load in	Load in	Load in	Load in	Const.	±10%		
D: Box IP21	@40°C	temp.	1 s each	5 s each	10s each	40 s each	sec.	(±5% on		
H: High Pulse (HELIX) T: Internal Thermostat	Approved	°C	120s.	120 s.	120 s.	120 s	(Steady	request)		
281 Configuration*)	UL508	@40°C	P1/120	P5/120	P10/120	P40/120	state)			
201 Configuration)	c FL °us		kW	kW	kW	kW	i e			
			@40°C	@40°C	@40°C	@40°C				
CBR-V 160 D T 281	280	230	12.6	4.54	2.84	0.84	1000	0.5-1000		
CBR-V 210 D T 281	360	230	16.2	5.83	3.65	1.08	1000	0.8 - 1500		
CBR-V 260 D T 281	450	230	20	7.2	4.56	1.35	1000	1.5 – 2000		
CBR-V 330 D T 281	570	230	25.6	6.24	5.75	1.70	1000	1.8 – 2000		
CBR-V 400 D T 281	680	240	30	10	6.85	2.04	1000	2.0 - 2000		
CBR-V 460 D T 281	790	250	35	12.7	7.9	2.23	1000	2.4 – 40		
CBR-V 560 D T 281	960	270	43	15.4	9.7	2.8	1000	3.0 – 45		
CBR-V 660 D T 281	1130	300	50	18	11	3.3	1000	3.5 - 50		
CBR-V 760 D T 281	1290	340	58	20	12.6	3.8	1000	4.0 - 55		
CBR-V 460 D T 282	1400	250	70	25	15	4.4	1000	1.2 – 20		
CBR-V 560 D T 282	1720	270	86	30	19	5.6	1000	1.6 – 22		
CBR-V 660 D T 282	2034	300	101	36	22	6.6	1000	1.5 – 25		
CBR-V 760 D T 282	2300	340	116	41	25	7.6	1000	2.0 –27		
CBR-V 460 D T 283	2090	250	105	38	23	6.7	1000	1.5 – 13		
CBR-V 560 D T 283	2530	270	129	46	29	8.4	1000	1.8 – 15		
CBR-V 660 D T 283	3120	300	152	54	34	9.9	1000	2.2 – 17		
CBR-V 760 D T 283	3410	340	174	62	37	11	1000	2.4 – 18		
General Specificatio	ns									
Temperature Coeffic	ient:					<±100ppm				
Dielectric strength:					250	00VAC 1 min	ute			
Working Voltage:				UL: 600VAC / CE: 690VAC; 1100VDC						
Isolation Resistance	:			> 20 MΩ						
Overload:				5-10x in10 sec; 25-35 x in 1 s						
Environmental:				-40 °C − 90 °C						
Derating :				Linear: 40° C = P_{N} to 70° C = 0.5^{*} PN						
Thermo watch conta	ıct.					NC, 2A, 250V	1			

Approvals UL 508 PN: NOMINAL POWER WITH NATURAL COOLING, 200°C T.W. and mounted in a vertical position.

SURFACE TEMPERATURE: 200°C @ 40°C AMB near Connector Box and Thermostat

 $\textbf{Configurations:} \ \underline{\textbf{2X1: ONE}} \ \textbf{resistor profile;} \ \underline{\textbf{2X2 TWO}} \ \textbf{resistor profiles;} \ \underline{\textbf{2X3 THREE}} \ \textbf{resistor profiles.}$ X specifies thermo watch temperature: X=5: 130°C; X=6: 160°C; X=7: 180°C; X=8: 200°C; X=0: No thermostat 3XX: Resistors with protection grid

EUROPOWEL COMPONEN

COCO

₩ ₩

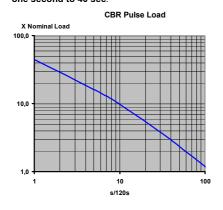
COCO

EU COM SOM ET COM BOTHER IS

NB: As an alternative to the two- and three profile versions please consider the CBT type

PULSE LOAD

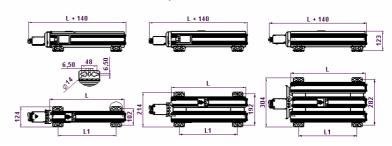
The curves show the pulse load ability compared to the nominal load for the CCR resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 sec and a pulse width from one second to 40 sec



For all other load conditions please contact DANOTHERM. By mean of individual thermal models we can simulate the rises of temperatures in the components and on the surfaces during and between specified pulses.

Mechanical Data

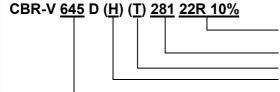
Resistors with one, two and three resistor profiles



Туре	L±2	L1 ± 2	Weight	Type	L±2	L1 ± 2	Weight
CBR-V 160 D T 281	160	70	1,3 Kg	CBR-V 460 D T 282	460	360	7,5 Kg
CBR-V 210 D T 281	210	110	1,8 Kg	CBR-V 560 D T 282	560	460	9 Kg
CBR-V 260 D T 281	260	160	2,4 Kg	CBR-V 660 D T 282	660	560	10,5 Kg
CBR-V 330 D T 281	330	230	3,0 Kg	CBR-V 760 D T 282	760	660	11,9 Kg
CBR-V 400 D T 281	400	300	3,5 Kg				
CBR-V 460 D T 281	460	360	3,9 Kg	CBR-V 460 D T 283	460	360	11 Kg
CBR-V 560 D T 281	560	460	4,6 Kg	CBR-V 560 D T 283	560	460	13,2 Kg
CBR-V 660 D T 281	660	560	5,4 Kg	CBR-V 660 D T 283	660	560	15,5 Kg
CBR-V 760 D T 281	760	660	6,1 Kg	CBR-V 760 D T 283	760	660	18 Kg

Type identification:

If you have chosen a CBR Brake Resistor with IP21 protection it is necessary to specify the size (length), the configuration (Number of profiles) and the ohm value. Please specify your CBR Brake resistor as follows



Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22\Omega$; $220R=220\Omega$; $2K2=2.2 k\Omega$ (10%)

Configuration: (See above) or if XXX > 400: customer specified version

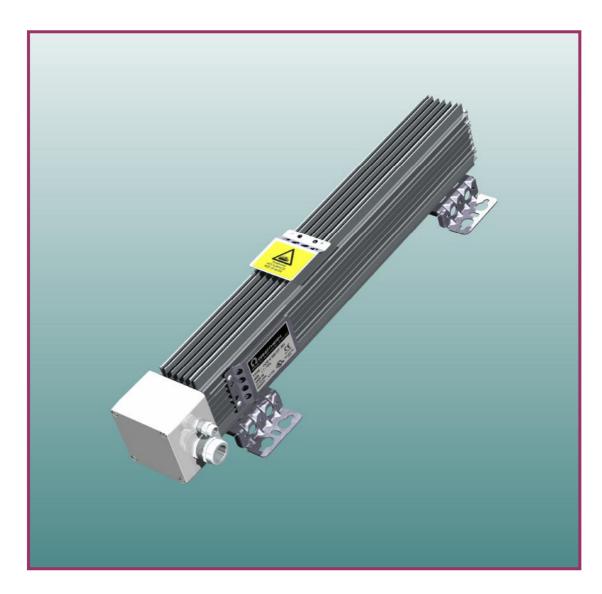
T With Thermostat

H indicates if HELIX winding is used. Specified by DANOTHERM Length of resistor profile in mm.

More configurations and types (IP65, IP50, Protection grid) can be supplied, please consult Danotherm Electric A/S for further details.

α ALPHA CBR-BT

ALUMINIUM HOUSED
COMPACT BRAKE RESISTORS IP 65 / 4X



CBR-V XXX BT belonging to our medium range of ALPHA ALUMINIUM HOUSED COMPACT BRAKE RESISTORS is electrically insulated and can easily be integrated in compact constructions. It is specially constructed for high pulse loads compared to the average load.

The resistors comply with **IP65** / **4**X giving electrical and thermal protection. The resistors are Silicone free.

The power range is from 280 W to 3400 W steady state load and pulse loads of 60 times compared to the nominal load in

one second each 120s. Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire and on the surface for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation. All types are equipped with thermo watch. This range is generally approved to UL 508 (E208678), please consult Danotherm:





www.danotherm.dk

ALPHA CBR BT is a range of compact Aluminum Profile Brake Resistors with protection class IP65. The resistors are supplied with an internal thermo watch (Max. temperature 200 °C) and equipped with a connection box, which contains cable glands and cable connection to the resistor and the thermo watch.

Connection

Power cables are connected through a M25 cable gland with integrated screen connection. The range of outer diameter of the power cable is 9.0- 16.6mm.

The power cables (0.5 – 10 mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw.

The cable for the thermo watch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3 -

High Temperature Warning

The CBR BT resistors have a "High Temperature" warning label on the resistor profile. The resistors can optionally be supplied with a Protecting Grating



Ratings: Resistors with 200 °C thermo watch.

TYPE CBR-V BT	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	R Ω - kΩ
-V: Profile vertically	w	Surface	Load in	Load in	Load in	Load in	Const.	±10%
-H: Profile horizontally,	@40°C	temp.	1 s each	5 s each	10s each	40 s each	sec.	(±5% on
optional, same power as -H B: Box IP65	Approved	°C	120s.	120 s.	120 s.	120 s	(Steady	request)
H: High Pulse (HELIX)	UL508	@40°C	P1/120	P5/120	P10/120	P40/120	state)	1041000,
T: Internal Thermostat	c FL °us	Ŭ	kW	kW	kW	kW	,	
281 Configuration*)	C # 100		@40°C	@40°C	@40°C	@40°C		
CBR-V 160 B T 281	280	230	12.6	4.54	2.84	0.84	1000	0.5-1000
CBR-V 210 B T 281	360	230	16.2	5.83	3.65	1.08	1000	0.8 - 1500
CBR-V 260 B T 281	450	230	20	7.2	4.56	1.35	1000	1.5 – 2000
CBR-V 330 B T 281	570	230	25.6	6.24	5.75	1.70	1000	1.8 – 2000
CBR-V 400 B T 281	680	240	30	10	6.85	2.04	1000	2.0 - 2000
CBR-V 460 B T 281	790	250	35	12.7	7.9	2.23	1000	2.4 – 40
CBR-V 560 B T 281	960	270	43	15.4	9.7	2.8	1000	3.0 – 45
CBR-V 660 B T 281	1130	300	50	18	11	3.3	1000	3.5 - 50
CBR-V 760 B T 281	1290	340	58	20	12.6	3.8	1000	4.0 - 55
CBR-V 460 B T 282	1400	250	70	25	15	4.4	1000	1.2 – 20
CBR-V 560 B T 282	1720	270	86	30	19	5.6	1000	1.6 – 22
CBR-V 660 B T 282	2034	300	101	36	22	6.6	1000	1.5 – 25
CBR-V 760 B T 282	2300	340	116	41	25	7.6	1000	2.0 –27
CBR-V 460 B T 283	2090	250	105	38	23	6.7	1000	1.5 – 13
CBR-V 560 B T 283	2530	270	129	46	29	8.4	1000	1.8 – 15
CBR-V 660 B T 283	3120	300	152	54	34	9.9	1000	2.2 – 17
CBR-V 760 B T 283	3410	340	174	62	37	11	1000	2.4 – 18
General Specification								
Temperature Coeffic	ient:			<±100ppm				
Dielectric strength:				2500VAC 1 minute				
Working Voltage:			UL: 600VAC / CE: 690VAC; 1100VDC					
Isolation Resistance:			> 20 MΩ					
Overload:				5-10x in	10 sec; 25-35	x in 1 s		
Environmental:					-40 °C – 90 °C)		
Derating:					Linear: 40	°C = P _N to 70°	°C = 0.5*PN	
Thermo watch conta	ict			NC, 2A, 250V				
Approvals			UL 508					

PN: NOMINAL POWER WITH NATURAL COOLING and mounted in a vertical position and equipped with 200°C **T.W.** SURFACE TEMPERATURE: 195°C @ 40°C AMB near Connector Box and Thermostat

EUROBSWEI COMBONEN

₩ ₩

COCO

ecos (Sign

EU COM SOM ET COM BOTHER IS

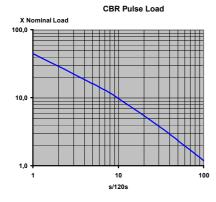
Configurations: <u>2X1: ONE</u> resistor profile; <u>2X2 TWO</u> resistor profiles; <u>2X3 THREE</u> resistor profiles. X specifies thermo watch temperature: X=5: 130°C; X=6: 160°C; X=7: 180°C; X=8: 200°C.

3XX: Resistors with protection grading.

NB: As an alternative to the two- and three profile versions please consider the CBT type

PULSE LOAD

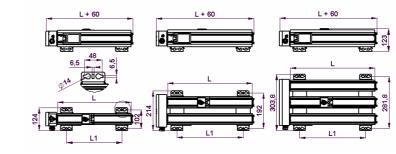
The curves show the pulse load ability compared to the nominal load for the CCR resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 sec and a pulse width from one second to 40 sec



other load conditions please contact DANOTHERM. By mean of individual thermal models we can simulate the rises of temperatures in the components and on the surfaces during and between specified pulses

Mechanical Data

Resistors with one, two and three resistor profiles

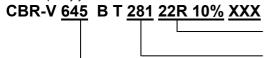


Type	L±2	L1 ± 2	Weight	Type	L±2	L1 ± 2	Weight
CBR-V 160 B T 281	160	70	1,3 Kg	CBR-B 460 B T 282	460	360	7,5 Kg
CBR-V 210 B T 281	210	110	1,8 Kg	CBR-B 560 B T 282	560	460	9 Kg
CBR-V 260 B T 281	260	160	2,4 Kg	CBR-B 660 B T 282	660	560	10,5 Kg
CBR-V 330 B T 281	330	230	3,0 Kg	CBR-B 760 B T 282	760	660	11,9 Kg
CBR-V 400 B T 281	400	300	3,5 Kg				
CBR-V 460 B T 281	460	360	3,9 Kg	CBR-B 460 B T 283	460	360	11 Kg
CBR-V 560 B T 281	560	460	4,6 Kg	CBR-B 560 B T 283	560	460	13,2 Kg
CBR-V 660 B T 281	660	560	5,4 Kg	CBR-B 660 B T 283	660	560	15,5 Kg
CBR-V 760 B T 281	760	660	6,1 Kg	CBR-B 760 B T 283	760	660	18 Kg

Type identification:

If you have chosen a CBR Brake Resistor with IP21 protection it is necessary to specify the size (length), the configuration (Number of profiles) and the ohm value.

Please specify your CBR Brake resistor as follows

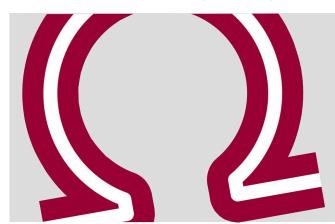


XXX indicates if any customer specified details have been added (XXX > 400)

Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22~\Omega$; $220R=220\Omega$; $2K2=2.2~k\Omega$) 10% is standard

Configuration: (See above.) Length of resistor profile in mm.

More configurations (IP23, IP50, Protection grid) can be supplied, please consult Danotherm Electric A/S for further details.



CBT-H / CBT-V **ALPHA Aluminium Housed Compact Brake Resistors** 6.0kW - 110kW (30kJ - 550kJ) / body case style 5/120s pulse load



The CBT-H and CBT-V with optional integrated thermal supervi- and resistance values. By using these models, it is possible to constructions and are specially designed to withstand very high solutions for all applications. pulse-loads such as those encountered in industrial drive systems.

Steady-state power ratings range from 455W to 4070W per body and up to 20 resistor bodies can be combined into one unit. The pulse-load capability is up to 125 times the nominal power rating defined as a one-second pulse every 120 seconds, depending on ohmic value and resistor type.

Danotherm has developed thermal models for all resistor types

sion from the Danotherm high-power range of ALUMINIUM- predict the temperature rises of both the resistor element and HOUSED COMPACT BRAKE ALPHA RESISTORS are electrically the housing surface for all possible loads. Using these tools, insulated compact resistors. They are easily fitted into compact Danotherm provides customer support to determine optimal

> CBT resistors are optionally available with different terminal boxes for various cable sizes, from IP20 to IP65. Special datasheets are available on request.



The resistors are designed as follows:

Resistor elements for high-resistance types are wire-wound on mica support sheets. Lower resistance elements are made with helixwound wire elements mounted in special ceramic fixtures. The outer housing is an aluminium case electrically insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrically in the housing by ceramic insulators which ensures symmetric expansion of the resistors and a maximal surge-withstand capability. Aluminium profiles with fixed resistor elements are filled with Al_2O_3 or SiO_2 . This ensures a minimal change of resistor surfacetemperature even at maximal pulse rating (minimized temperature cycles). Standard cables are 300 mm AWG 10 - AWG 4, 1000V but non-standard cables (different types, lengths, connectors ...) can be supplied on request.

Mounting	feet
----------	------

Long housings (>400mm) have thermal expansion-relief mounting feet. When a resistor is heated to its maximal temperature the length can increase by up to 2 mm. The preferred mounting position is vertical. The mounting feet are able to relieve this stress: those on the lower (i.e. cable) side are fixed whereas those on the upper end have thermal stress-relief.

Accessories

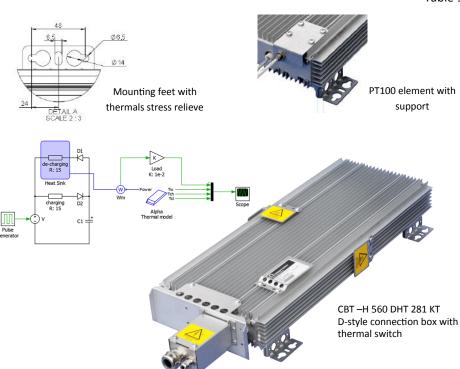
The resistor can be customized with respect to the following features: connection style (open terminals or connection box), IP class, horizontal or vertical mounting, thermal supervision (a PT-100 temperature sensor or NC thermal switch) can be fitted, in which case the maximal surface-temperature near the cables will be 200°C.

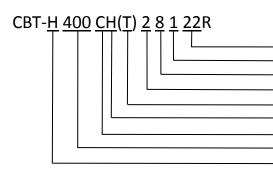
Thermal simulations

A power-time graph of the application is the start for each resistor selection. Danotherm is able to predict resistor temperature by using sophisticated simulation models.

fo.		Pn [W] @ 40°	C According U	L508			
	1 body			Pn [W] @ 40°C			
CBT-BH(T)-XXX	Pn [W] @ 40°C According UL508	max body temp.	R [Ω] min - max	1 body	2 bodies	3 bodies	4 bodies
TS: Thermal switch	no TS	[°C]	± 10%	TS 200°C	no TS, m	ax body ter	np. 250°C
CBT 180	455	270	0,015 - 15	410			
CBT 210	585	270	0,02 - 30	530			
CBT 260	830	280	0,04 - 50	750			
CBT 330	1350	280	0,065 - 80	1225			
CBT 400	1650	290	0,07 - 100	1495	2200	3000	4000
CBT 460	1900	300	0,09 - 140	1725	2800	4200	5600
CBT 560	2310	310	0,12 - 170	2095	3500	5200	6900
CBT 660	2720	320	0,15 - 210	2470	4200	6300	8400
CBT 760	3200	330	0,18 - 250	2905	5000	7200	9600
CBT 860	3640	340	0,2 - 300	3305	5500	8000	10800
CBT 960	4070	350	0,25 - 340	3695	6900	9000	12000
	General specifications						
Temperature Coefficient:			< ± 100 ppm				
Dielectric strength			3500 VAC @ 1 minute				
Isolation Resistance:				> 2	0 MΩ / bod	у	

Table 1





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

Ohm value (Examples: $2R2 = 2.2 \Omega$, $22R = 22 \Omega$, $220R = 220 \Omega$, $2k2 = 2.2 k\Omega$

Number of bodies 1, 2, 3 or 4

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

• 0=cable connection; 2=connection box

T = Thermal switch (NC)

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

Connector; rail terminals: **K** = IP00; Box: **D** = IP20; **B** = IP65, **C** = cable version Length of resistor in mm. (210, 260, 330, 400, 460, 560, 660, 760, 860, 960)

H = Horizontal mounting feet, **V** = Vertical mounting feet



	General	specifications
De-rating cable version		Linear: 40°C = Pn@250°C to 70°C = 0,85 * Pn@250°C
De-rating TW 200°C version		Linear: 40°C = Pn@200°C to 70°C = 0,80 * Pn@200°C
De-rating TW 180°C version		Linear: 40°C = 0,85 * Pn@200°C to 70°C = 0,75 * Pn@200°C
De-rating vertical mounting		no de-rating
De-rating horizontal mounting		0,8 * Pn
	1000 m	no de-rating
De-rating at high altitudes	1500 m	0,94 * Pn
	3000 m	0,82 * Pn
		It is recommended to keep a distance of 200mm to the nearest object to prevent heating of a neighbour
Mounting instructions		component.
, and the second		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.
		The nominal power of the resistors refers to cooling
Cooling		conditions with Free Natural Air Cooling.
		Acc. To EN 60068-2-6
		frequency range 1 - 100Hz
Vibration		Accelleration / Amplitude
	1 - 13 Hz	± 1mm
	13 - 100 Hz	@ ± 0,7G
Corrosive resistance		Acc. EN 60721-2-1: C2 medium
		To minimize EMC interference screened cables are
Connection recommendations		recommended, in particular with any PWM brake pattern.
Resistance tolerance		± 10%
Working voltage	cable version	UL: 1000VAC, IEC: 1000VAC / 1400VDC
working voltage	conn. Box	UL: 600VAC, IEC: 690VAC / 1100VDC
Time constant for heating up resistor		1000 - 3000s
Thermo watch (optional)	_	130 / 160 / 180 / 200 °C, 2A, 250 VAC NC
Minimum measuring voltage	itch	2V
Minimum measuring current	<u>8</u>	10mA
Insulation resistance	Thermal switch	> 20MΩ / body
Rated current / voltage	her	2,5A @ 250 VAC cos φ=1
Dielectric voltage	-	2500VAC
Temperature requirements on cables	IP 21	80°C
remperature requirements off cables	IP 65	90°C

Table 2



B-box Single-body



D-box



G-box



B-box Multiple-body

Applications

CBT compact Alpha brake-resistors are able to withstand repetitive high pulse-loads. Applications are typically brake resistors for elevators, escalators, cranes, winches, conveyor belts or any other industrial medium-power drive system.

In the pulse-load table (Table 13) for a 5 ohm resistor at 40°C ambient, with various duty cycles and a period of 120 seconds, the maximum temperature at the cable side is not allowed to exceed 250°C and the peak internal resistance wire temperature is not allowed to exceed 1000°C.

For applications with single pulse-loads (and long thermal time constants), the use of the CBS range of compact brake resistors, is recommended.

Connection box size D and B (single-body case styles)

Single-body case styles can be fitted with D or B-type terminal boxes. The power cables are connected through an M25 cable gland with integrated screen (braid) connection with a clamping diameter range from 9.0-16.6mm. The power cables (0.5-10mm²) are connected to a terminal block with screw connections. The protection earth (PE) is connected directly to the connector box with a screw. The cable for thermal supervision is connected to a terminal block (0.5-4mm²) via an M12 gland with clamping range 3-7mm. The Dtype terminal box has an IP 20 rating for horizontal mounting or IP 21 for vertical mounting. The B-type terminal box is available in IP54 and IP65 classes.

Connection box size G and B (multiple-body)

Multiple-body housings can be fitted with Gtype or B-type terminal boxes. Power cables are connected through an M40 cable gland with integrated screen (braid) connection with a clamping diameter range of 19-28mmØ. The power cables (2-50mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw. The cable for the thermal supervision is connected to a terminal block (0.5-4mm²) via an M12 gland with clamping diameter range of 3-7mm and class IP 54 or IP65. The G-type terminal box has an IP 20 rating for horizontal mounting or IP 21 for vertical mounting. The B-type box is available in IP54 and IP65 ratings.

Multiple-body case styles

In the standard range, up to 4 resistors can be mounted in one set of brackets. Multiple-body resistors can be fitted with G or BG terminal boxes or with flying cables. For each standard construction, dimensional drawings are given in this brochure but custom resistors are also available.



Horizontal mounting feet

	9 7	
single-body style case		
with cables	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-H 180 C(H)T 0X1	180	70
CBT-H 210 C(H)T 0X1	210	110
CBT-H 260 C(H)T 0X1	260	160
CBT-H 330 C(H)T 0X1	330	230
CBT-H 400 C(H)T 0X1	400	300
CBT-H 460 C(H)T 0X1	460	360
CBT-H 560 C(H)T 0X1	560	460
CBT-H 660 C(H)T 0X1	660	560
CBT-H 760 C(H)T 0X1	760	660
CBT-H 860 C(H)T 0X1	860	760
CBT-H 960 C(H)T 0X1	960	860

Table 3

Vertical mounting feet

single-body style case		
with cables	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 180 C(H)T 0X1	180	70
CBT-V 210 C(H)T 0X1	210	110
CBT-V 260 C(H)T 0X1	260	160
CBT-V 330 C(H)T 0X1	330	230
CBT-V 400 C(H)T 0X1	400	300
CBT-V 460 C(H)T 0X1	460	360
CBT-V 560 C(H)T 0X1	560	460
CBT-V 660 C(H)T 0X1	660	560
CBT-V 760 C(H)T 0X1	760	660
CBT-V 860 C(H)T 0X1	860	760
CBT-V 960 C(H)T 0X1	960	860

Table 4

48 DETAIL A 300 +30 300 0 L + 24 PE M6 +30 300 0 R7 L1 48 DETAIL A

R7

6,5

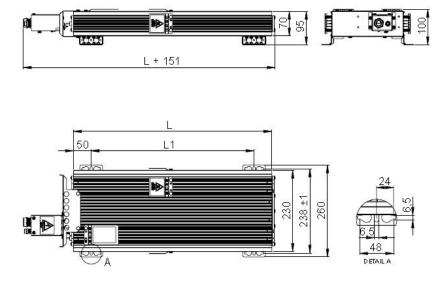
230 238 ±1 260

L + 24

CBT D box connections

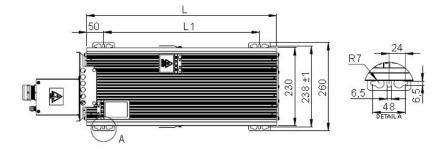
single-body style case		
with D-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-H 180 D(H)T 2X1	180	70
CBT-H 210 D(H)T 2X1	210	110
CBT-H 260 D(H)T 2X1	260	160
CBT-H 330 D(H)T 2X1	330	230
CBT-H 400 D(H)T 2X1	400	300
CBT-H 460 D(H)T 2X1	460	360
CBT-H 560 D(H)T 2X1	560	460
CBT-H 660 D(H)T 2X1	660	560
CBT-H 760 D(H)T 2X1	760	660
CBT-H 860 D(H)T 2X1	860	760
CBT-H 960 D(H)T 2X1	960	860

Table 5



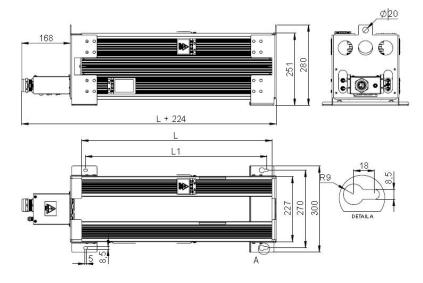






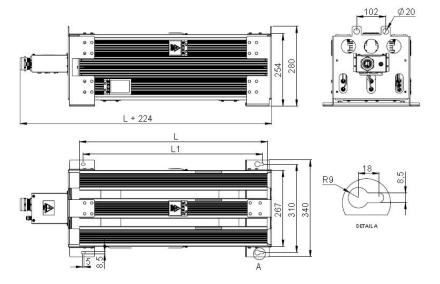
single-body style case		
with G-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-H 180 G(H)T 2X1	180	70
CBT-H 210 G(H)T 2X1	210	110
CBT-H 260 G(H)T 2X1	260	160
CBT-H 330 G(H)T 2X1	330	230
CBT-H 400 G(H)T 2X1	400	300
CBT-H 460 G(H)T 2X1	460	360
CBT-H 560 G(H)T 2X1	560	460
CBT-H 660 G(H)T 2X1	660	560
CBT-H 760 G(H)T 2X1	760	660
CBT-H 860 G(H)T 2X1	860	760
CBT-H 960 G(H)T 2X1	960	860

Table 6



double-body style case		
with G-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 400 G(H)T 2X2 xxR KT	400	370
CBT-V 460 G(H)T 2X2 xxR KT	460	430
CBT-V 560 G(H)T 2X2 xxR KT	560	530
CBT-V 660 G(H)T 2X2 xxR KT	660	630
CBT-V 760 G(H)T 2X2 xxR KT	760	730
CBT-V 860 G(H)T 2X2 xxR KT	860	830
CBT-V 960 G(H)T 2X2 xxR KT	960	930

Table 7



triple-body style case		
with G-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 400 G(H)T 2X3 xxR KT	400	370
CBT-V 460 G(H)T 2X3 xxR KT	460	430
CBT-V 560 G(H)T 2X3 xxR KT	560	530
CBT-V 660 G(H)T 2X3 xxR KT	660	630
CBT-V 760 G(H)T 2X3 xxR KT	760	730
CBT-V 860 G(H)T 2X3 xxR KT	860	830
CBT-V 960 G(H)T 2X3 xxR KT	960	930

Table 8



single-body style case		
with B-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-H 180 B(H)T 2X1	180	70
CBT-H 210 B(H)T 2X1	210	110
CBT-H 260 B(H)T 2X1	260	160
CBT-H 330 B(H)T 2X1	330	230
CBT-H 400 B(H)T 2X1	400	300
CBT-H 460 B(H)T 2X1	460	360
CBT-H 560 B(H)T 2X1	560	460
CBT-H 660 B(H)T 2X1	660	560
CBT-H 760 B(H)T 2X1	760	660
CBT-H 860 B(H)T 2X1	860	760
CBT-H 960 B(H)T 2X1	960	860

Table 9

double-body style case		
with B-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 400 B(H)T 2X2 xxR KT	400	370
CBT-V 460 B(H)T 2X2 xxR KT	460	430
CBT-V 560 B(H)T 2X2 xxR KT	560	530
CBT-V 660 B(H)T 2X2 xxR KT	660	630
CBT-V 760 B(H)T 2X2 xxR KT	760	730
CBT-V 860 B(H)T 2X2 xxR KT	860	830
CBT-V 960 B(H)T 2X2 xxR KT	960	930

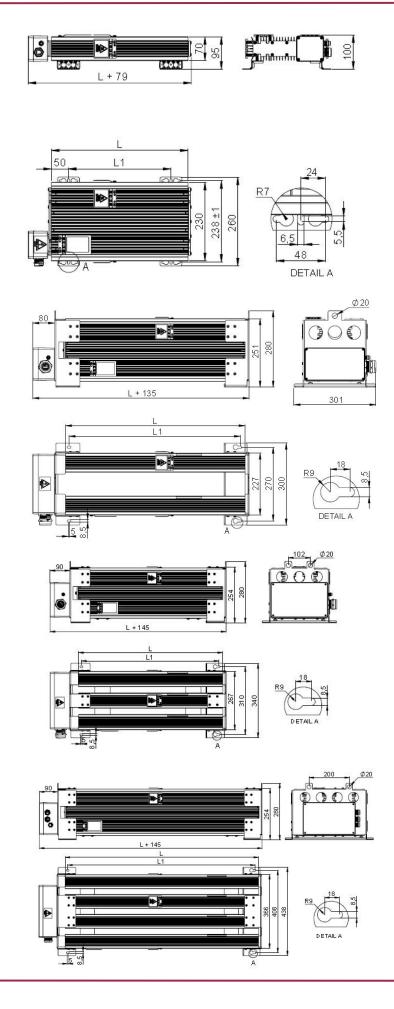
Table 10

triple-body style case		
with B-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 400 B(H)T 2X3 xxR KT	400	370
CBT-V 460 B(H)T 2X3 xxR KT	460	430
CBT-V 560 B(H)T 2X3 xxR KT	560	530
CBT-V 660 B(H)T 2X3 xxR KT	660	630
CBT-V 760 B(H)T 2X3 xxR KT	760	730
CBT-V 860 B(H)T 2X3 xxR KT	860	830
CBT-V 960 B(H)T 2X3 xxR KT	960	930

Table 11

four-body style case		
with B-box	L±2	L1 ± 2
Туре	[mm]	[mm]
CBT-V 400 B(H)T 2X4 xxR KT	400	370
CBT-V 460 B(H)T 2X4 xxR KT	460	430
CBT-V 560 B(H)T 2X4 xxR KT	560	530
CBT-V 660 B(H)T 2X4 xxR KT	660	630
CBT-V 760 B(H)T 2X4 xxR KT	760	730
CBT-V 860 B(H)T 2X4 xxR KT	860	830
CBT-V 960 B(H)T 2X4 xxR KT	960	930

Table 12





CBT-CH(T)			s qua	re pulse ea	ach 120 se	conds, amb	ient temp.	= 40°C		
	duty1second [kW]	Max s urfa ce temp. [°C]	duty 5 second [kW]	Max surface temp. [°C]	duty 10 s econd [kW]	Max surface temp. [°C]	duty 20 se cond [kW]	Max surface temp. [°C]	duty 40 s econd [kW]	Max surface temp. [°C]
CBT 180	24.1	160	6	190	3.5	200	2.1	230	1.3	250
CBT 210	41	190	10.1	220	5.8	240	3.5	260	1.9	270
CBT 260	78	230	17.9	250	9.9	270	5.4	280	2.7	280
CBT 330	121	240	27.5	250	15.5	270	8.6	280	4.3	280
CBT 400	168	260	37	270	20.7	290	10.7	290	5.3	290
CBT 460	218	280	48	290	24.5	300	12.3	300	6.1	300
CBT 560	265	290	58	300	30	310	15.1	310	7.7	310
CBT 660	313	290	69	310	37	320	18.3	320	9.2	320
CBT 760	370	310	82	320	43	330	21.4	330	10.7	330
CBT 860	435	320	95	330	49	340	24.5	340	12.3	340
CBT 960	510	330	111	350	55	350	27.6	350	13.8	350
			trian	gle pulse e	ach 120 se	conds, aml	bient temp.	= 40°C		
	duty 1 second [kW]	Max s urfa ce temp. [°C]	duty 5 second [kW]	Max surface temp. [°C]	duty 10 s econd [kW]	Max surface temp. [°C]	duty 20 se cond [kW]	Max s urface temp. [°C]	duty 40 s econd [kW]	Max surface temp. [°C]
CBT 180	49	170	12.4	200	7.2	210	4.2	230	2.5	250
CBT 210	83	200	20.5	230	11.8	250	6.8	270	3.6	270
CBT 260	153	240	36	260	19.8	270	10.2	280	5.1	280
CBT 330	238	240	56	260	31	280	16.5	280	8.3	280
CBT 400	328	260	75	280	40	290	20.2	290	10.1	290
CBT 460	425	280	93	300	46	300	23.2	300	11.6	300
CBT 560	520	290	114	310	57	310	28.4	310	14.2	310
CBT 660	610	300	136	320	68	320	34	320	17	320
CBT 760	720	310	160	330	80	330	40	330	20	330

Table 13

340

350

Pulse load

CBT 860

CBT 960

845

990

330

340

182

205

340

350

ODT OLIVE

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.

91

102

340

350

45

51

340

350

22.7

25.6

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 (but these are only examples). The table shown (Table 13) is based on a 5 ohm resistor with 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.

Ingress Protection

The Ingress Protection rating (IP) value depends on the resistor and on the connection style. The basic IP rating for resistors is IP 50 but by the addition of gaskets, they can be increased to IP 54 or IP 65 which is also possible for resistors with flying leads. For resistors with connection box type B, the maximal IP value is 65. Resistors with connection boxes D and G have an IP 21 rating when mounted vertically and IP 20 when mounted horizontally.

IP values and their type-tests are well defined; for instance "IP 65" means dust cannot penetrate the box or if dust occurs internally, it will not influence the electrical properties. It should be able to withstand water jets from any direction with a certain pressure during 3 minutes; however, it does not mean that it can withstand continuous rain! If the resistor is used outdoors, then it should be protected against direct rain.

IP 65 rated resistors can be cleaned with a high pressure hose, but this can only be done when the resistor is at 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 resistors combined into one compact configuration with pulse-withstand capability of 1MW (5MJ) and also OEM versions with a maximum of 20 resistors. Depending on the electrical connection, the IP class ranges from IP 20 to IP 65. Connections can be via a terminal box, DIN-rail terminals or cable lugs. These resistor types are also offered in high voltage versions and with higher ohmic values.

The salient features of Alpha resistors are that they have:

- small dimensions
- cool surfaces in operation
- high pulse-load capabilities
- high vibration capabilities
- no external electrically-live parts
- high IP classes
- fail-safe capabilities (on request)
- low noise levels.



Pnom. = 455 - 4070W Single-body resistor CBT-H 560 DHT IP 21, Connection D-box



Danotherm Electric A/S is a NIBE company



Pnom. = 410—3695 W single-body resistor (281) with B-box

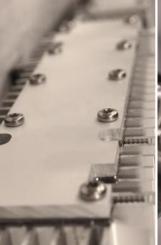
Pnom. = 4000—12000 W four-body unit (284) with B-box















Danotherm Electric A/S Naesbyvej 20 2610 Roedovre Denmark

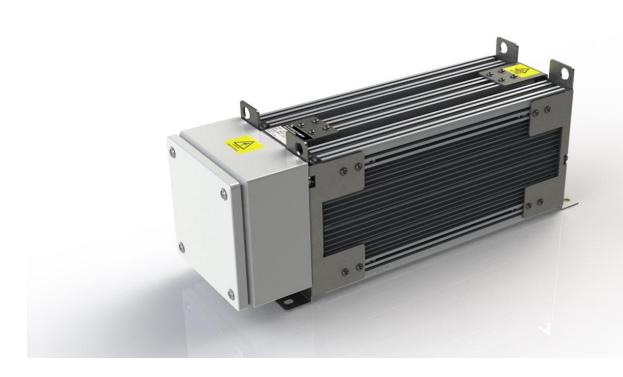


CBS-H / CBS-V

Compact Alpha Power Resistor

12.7kW - 230kW

(64kJ - 1.2MJ) / profile 5/1800s pulse load



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

profile and up to 20 profiles can be combined in one unit. The pulse load capability is up to 200 times the nominal power for one second every hour, depending on the ohm value and resistor wire, making several MW's as pulse load available. The total cool down is about one hour for all resistors.

(Energy Dump Resistors) for Wind Turbines are available. In fact, the CBS range is most suited for this application.

Danotherm has developed thermal models for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and on the surface for The steady state power range span from 410W to 3565W per all possible load applications. We offer our assistance to customers to find the optimum solution for any situation.

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



The resistors are designed as follows:

The resistor elements for high resistance types are wire wound on mica support sheets. Lower resistance elements are made with helix wound wire elements mounted in special designed ceramic fixtures. The outer housing is an aluminium profile isolated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with Al₂O₃ or SiO₂. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a pulse load.

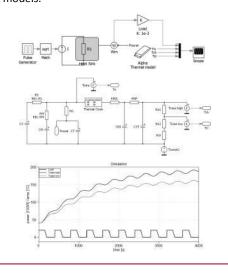
The standard cables are 300 mm AWG 10 – AWG 4, 1000V. We can supply cables in specified length and mounted with cable shoes or connectors as required.

Accessories

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

Thermal simulations

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



		W] @ 40°C Accord		1					
	1 profile		1 profile	2 profiles	3 profiles	4 profiles			
CBS-BH(T)-XXX	Pn [W] @ 40°C According UL508 Max surface 250°C	RΩ	Max surface temp 200 °C	Max surface temp 250 °C	Max surface temp 250 °C	Max surface temp 250 °C			
TW: Thermal watch	no TW	± 10%	TW	no TW	no TW	no TW			
CBS 180	410	0,015 - 15	315						
CBS 210	580	0,02 - 30	445						
CBS 260	850	0,04 - 50	685						
CBS 330	1135	0,065 - 80	870	1930	2700	3630			
CBS 400	1375	0,07 - 100	1055	2340	3300	4400			
CBS 460	1585	0,09 - 140	1215	2700	3800	5000			
CBS 560	1925	0,12 - 170	1480	3270	4620	6100			
CBS 660	2270	0,15 - 210	1745	3860	5500	7300			
CBS 760	2770	0,18 - 250	2130	4700	6650	8800			
CBS 860	3190	0,2 - 300	2450	5400	7660	10200			
CBS 960	3565	0,25 - 340	2740	6060	8500	11300			
	G	eneral specific	ations						
Temperature Coe	fficient:		< ± 100 ppm						
Dielectric strengt	h	standard		3500 VAC @ 1 minute					
Dielectric strengt	11	On demand		6000 VAC @ 1 minute					
Working voltage		standard		1000 VAC / 1400 VDC					
Isolation Resistan	ice:		> 20 MΩ / profile						
Overload:@ 1 sec	rerload:@ 1 sec pulse / hour 80 - 200 x (depending on resistor)				or)				



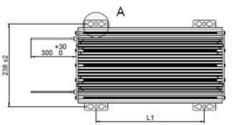
Overload:@ 5 sec pulse / hour

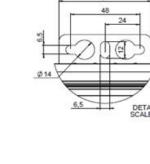
De-rating TW 200°C version

De-rating TW 180°C version

Thermo watch (optional)

Environmental: De-rating cable version





30 - 60 x (depending on resistor)

- 40 °C - 90 °C

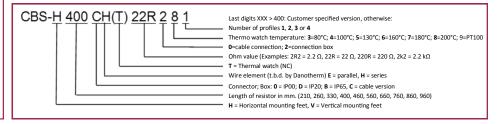
Linear: 40°C = Pn@250°C to 70°C = 0,85 * Pn@250°C

Linear: 40°C = Pn@200°C to 70°C = 0,80 * Pn@200°C

Linear: 40° C = 0,85 * Pn@200°C to 70° C = 0,75 * Pn@200°C

130 / 160 / 180 / 200 °C, 2A, 250 VAC NC

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





CBS-CH(T)		Multiple square pulses each 120 seconds										
	P1/120 kW@40°C	Max surface temp. °C @ 40°C	P5/120 kW@40°C	Max surface temp. °C @ 40°C	P10/120 kW@40°C	Max surface temp. °C @ 40°C	P20/120 kW@40°C	Max surface temp. °C @ 40°C	P40/120 kW@40°C	Max surface temp. °C @ 40°0		
CBS 180	23	125	7,4	165	4,3	180	2,4	200	1,4	210		
CBS 210	37	150	11	190	6,2	210	3,5	220	2	240		
CBS 260	57	180	16,3	220	9,1	240	5,1	250	2,8	260		
CBS 330	84	190	23,5	240	13,1	250	7,2	260	4	280		
CBS 400	118	220	31,5	260	17,3	270	9,5	290	5,2	300		
CBS 460	154	230	39	260	21,3	270	11,6	290	6,3	300		
CBS 560	204	250	50	280	27	290	14,7	300	7,9	310		
CBS 660	240	240	60	270	33	290	17,7	300	9,6	310		
CBS 760	280	250	70	280	38	290	20,5	300	11,1	320		
CBS 860	344	260	83	290	45	300	24	310	13	320		
CBS 960	360	270	89	300	49	310	26	320	14	340		
				One sing	gle square pu	lse each 1800	seconds					
	P 1 second [kW]	Max surface temp.	P 5 seconds [kW]	Max surface temp.	P 10 seconds [kW]	Max surface temp.	P 20 seconds [kW]	Max surface temp.	P 40 seconds [kW]	Max surface temp.		
CDC 400	22		100 17	- 10		12	100 100	127	20 22	32		
CBS 180	32 55	55 CF	12,7	70 80	8,2	75 90	5,2 8	85	3,4	100		
CBS 210 CBS 260	89	65 70	20,3 32,3	90	12,8 20,3	100	12,6	100 110	5,2 8,2	110 130		
CBS 330	138	75	49	95	30,8	110	19,2	120	12,3	140		
CBS 400	204	80	69	110	43	120	26,5	130	17	160		
CBS 460	288	85	92	110	56	120	34,3	140	21,5	160		
CBS 560	396	90	124	110	75	130	46	140	28,5	160		
CBS 660	468	90	148	110	91	130	56	140	35	160		
CBS 760	544	90	174	110	107	130	66	140	42	170		
CBS 860	712	100	218	120	132	130	80	150	50	170		
CBS 960	720	100	230	120	142	140	87	150	55	180		
CD3 300	720	100	230			ulse each 1800		130		100		
Λ.												
	P 1 second [kW]	Max surface temp.	P 5 seconds [kW]	Max surface temp.	P 10 seconds [kW]	Max surface temp.	P 20 seconds [kW]	Max surface temp.	P 40 seconds [kW]	Max surface temp.		
CBS 180	66	60	27,8	70	18,3	80	11,4	90	7,3	100		
CBS 210	114	60	44,5	80	28,5	90	17,5	100	11,1	120		
CBS 260	188	70	70	90	45	100	27,5	120	17,5	140		
CBS 330	290	80	106	100	68	110	42	130	26,5	150		
CBS 400	424	80	150	110	95	130	58	140	36,5	160		
CBS 460	600	90	200	110	123	130	74,5	140	46	160		
CBS 560	832	90	268	120	164	130	99	150	61,5	170		
CBS 660	976	90	320	120	198	130	120	150	75	170		
CBS 760	1136	90	376	120	234	130	142	150	89	170		
CBS 860	1488	100	472	120	288	140	174	150	107	180		
CBS 960	1504	100	496	130	308	140	190	160	118	180		
$(t) = P_{max} \cdot e^{-t/t}$				ngle logoritmic			111 - 121		$E = \sigma.P$			
	Tau = 1 s energy [kJ]	Max surface temp.	Tau = 5 s energy [kJ]	Max surface temp.	Tau = 10 s energy [kJ]	Max surface temp.	Tau 20 s energy [kJ]	Max surface temp.	Tau = 40 s energy [kJ]	Max surface temp.		
CBS 180	52,5	65	107	90	134	100	172	110	228	130		
CBS 210	88	75	166	100	204	110	260	130	344	150		
CBS 260	140	80	260	110	324	130	408	150	540	175		
	1			400		4.40		4.00		100		

Pulse load

CBS 330

CBS 400

CBS 460

CBS 560

CBS 660

CBS 760

CBS 860

CBS 960

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

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

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



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

We have standard solutions for 1 up to 4 profiles combined in one compact configuration with pulse withstand capability of 1MW (5MJ) and OEM version with maximum 20 profiles. Depending on the electrical connection, the IP class ranges from IP 20 to IP 65. Connection can be box, DIN-rail terminals or cable version. We also offer this type of resistor in high voltage style and higher ohm values (available Autumn 2013).

Main features for Alpha resistors:

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



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



Danotherm Electric A/S is a NIBE company



CBS-V 530 SHT 283

unit CBS

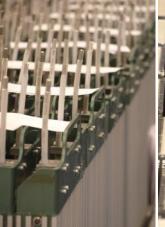
Pnom. = 2700—8500 W triple (282)
Pnom. = 3630—11300 W quadruple (284)
Connection Box with 3 cable glands 1x thermostat
and 2x Resistors , IP 54 protection class

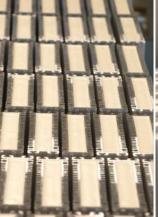


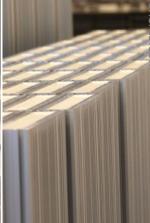
CBS-H 460 BHT 284





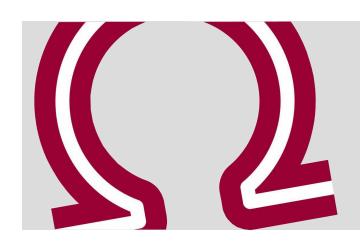








Danotherm Electric A/S Naesbyvej 20 2610 Roedovre Denmark



CMQ

Compact Alpha Power Resistor 14.5kW - 504kW

(73kJ - 2.5MJ) / body case style 5/1800s pulse load



The CMQ-H and CMQ-V resistors with optional integrated thermal supervision from the Danotherm high power range of ALU-MINIUM-HOUSED COMPACT BRAKE ALPHA RESISTORS are electrically insulated compact resistors. They can easily be fitted into compact constructions and are especially designed to withstand high pulse-loads. The aluminium construction ensures that surface temperatures are kept low (see Table 3) such that any accumulated dust will not burn and trigger smoke alarms.

Steady-state power ratings range from **510W** to **4450W** per optimum solution for their designs. body case style and up to 20 bodies can be combined in one unit. The pulse-load capability is up to 380 times the nominal power for a duty cycle of one second per hour, depending on the ohmic value and resistor wire, which allows several MWs of pulse-load to be absorbed. CMQ resistors have thermal time- These special data-sheets are available on request. constants of about one hour.

Specially reinforced versions are available for Low Voltage Ride Through - LVRT as Energy Dump Resistors for Wind Turbine applications.

Danotherm has developed thermal models for all resistor types and resistor values which allow the prediction of temperature rise of both the internal resistor wire and the housing surface for all possible load profiles. This simulation capability is part of Danotherm's applications support to help customers find the

CMQ resistors are optionally available with different terminal boxes for various cable sizes and from IP20 to IP54 and in special cases, to IP65.



Table 1

Construction

The resistors are designed as follows:

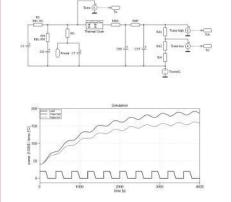
The resistor elements are made with helixwound wire elements mounted in special ceramic fixtures. The outer housing is an extruded aluminium profile electrically insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrically in the housing by ceramic insulators which ensures symmetric expansion of the resistors and a maximal surge-withstand capability. Aluminium housings with fixed resistor elements are filled with Al₂O₃ or SiO₂. This ensures a minimal change of resistor surfacetemperature even at maximal pulse rating (minimized temperature cycles). Standard cables are 300 mm AWG 10 - AWG 4, 1000V but non-standard cables (different types, lengths, connectors ...) can also be supplied, on request.

Accessories

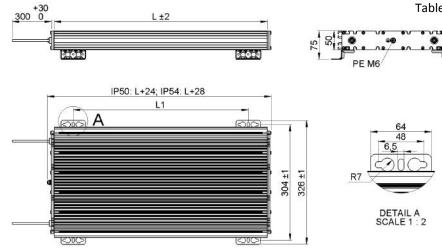
The resistor can be customized with respect to the following features: connection style (open terminals or connection box), IP class, horizontal or vertical mounting, thermal supervision (a PT-100 temperature sensor or NC thermal switch) can be fitted, in which case the maximal surface-temperature near the cables will be 200°C.

Thermal simulations

A power-time graph of the application is the start for each resistor selection which Danotherm inputs to thermal simulation models. The CMQ Compact Alpha Power Resistor has a very high pulse-load capability for 1 second, exceeding 380 times the steadystate load power (depending on resistor type and ohmic value). This makes the CMQ ideal for high pulse-load application like LVRT (Low Voltage Ride Through) and other high loaddumps from drives applications. Danotherm uses sophisticated simulation models that predict the behaviour of the power resistors under any given load conditions. This shortens the user's design-time and ensures the highest reliability because the resistor can be customized to the exact application requirements.

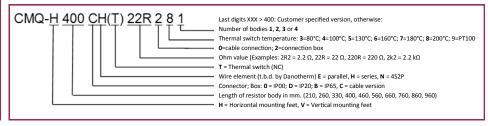


ia		Pn [W] @ 40°0	According UL508				
CMQ-BH(T)-XXX	1 body Pn [W] @ 40°C According UL508 Max surface 250°C	RΩ	1 body Max surface temp 190 °C	2 bodies Max surface temp 250 °C	3 bodies Max surface temp 250 °C	4 bodies Max surface temp 250 °C	
TS: Thermal switch	no TS	± 10%	TS	no TS	no TS	no TS	
CMQ 210	725	0,02 - 30	555				
CMQ 260	1060	0,04 - 50	855				
CMQ 330	1420	0,065 - 80	1090				
CMQ 400	1720	0,07 - 100	1320	2925	4350	5800	
CMQ 460	1980	0,09 - 140	1520	3375	5000	6650	
CMQ 560	2400	0,12 - 170	1850	4090	6050	8050	
CMQ 660	2840	0,15 - 210	2180	4825	7100	9450	
CMQ 760	3450	0,18 - 250	2660	5875	8500	11300	
CMQ 860	3990	0,2 - 300	3060	6750	10000	13300	
CMQ 960	4450	0,25 - 340	3420	7575	11200	14900	
	· · · · · · · · · · · · · · · · · · ·	General s	pecifications		*	X.	
Temperature Coeffic	ient:		< ± 100 ppm				
Dielectric strength		Standard On demand			@ 1 minute @ 1 minute		
Working voltage		Standard		1000 VAC	/ 1400 VDC		
Isolation Resistance:				> 20 MΩ	፲ / body		
Overload:@1 sec pul	lse / hour		80) - 225 x (deper	nding on resisto	or)	
Overload:@5 sec pul	se / hour		3	0 - 60 x (depen	ding on resisto	r)	
Environmental:				- 40 °C	- 90 °C		
De-rating cable versi	on		Linear: 40°	°C = Pn@250°C	to 70°C = 0,85 *	Pn@250°C	
De-rating TW 200°C v	ersion		Linear: 40°	°C = Pn@190°C	to 70°C = 0,80 *	Pn@190°C	
De-rating TW 180°C v	ersion		Linear: 40°C =	0,85 * Pn@190	°C to 70°C = 0,7	75 * Pn@190°C	
De-rating vertical mo	unting			no de	-rating		
De-rating horizontal	mounting			0,8	* Pn		
Thermal switch (opti	onal)		130 /	160 / 180 / 200	°C, 2A, 250 VA	C NC	



Туре	L ± 2 [mm]	L1 ± 2 [mm]
CMQ-H 210 CH(T) 0(X)1 XXR KT	210	110
CMQ-H 260 CH(T) 0(X)1 XXR KT	260	160
CMQ-H 330 CH(T) 0(X)1 XXR KT	330	230
CMQ-H 400 CH(T) 0(X)1 XXR KT	400	300
CMQ-H 460 CH(T) 0(X)1 XXR KT	460	360
CMQ-H 560 CH(T) 0(X)1 XXR KT	560	460
CMQ-H 660 CH(T) 0(X)1 XXR KT	660	560
CMQ-H 760 CH(T) 0(X)1 XXR KT	760	660
CMQ-H 860 CH(T) 0(X)1 XXR KT	860	760
CMQ-H 960 CH(T) 0(X)1 XXR KT	960	860

Table 2





CMQ-CH(T)				square pulse	e each 120 seco	nds, ambien	t temp. = 40°C			
	duty1second [kW]	Max surface temp. [°C]	duty 5 second [kW]	Max surface temp. [°C]	duty 10 second [kW]	Max surface temp. [°C]	duty 20 second [kW]	Max surface temp.	duty 40 second [kW]	Max surface temp. [°C]
CMQ 210	53.7	205	17.3	265	9.2	270	4.6	270	2.3	270
CMQ 260	95	230	26.9	275	13.4	275	6.7	275	3.4	275
CMQ 330	135	245	36.3	280	18.1	285	9	280	4.5	280
CMQ 400	182	265	45	290	22.5	290	11.3	290	5.6	290
CMQ 460	263	295	53	295	26.3	295	13.1	295	6.6	295
CMQ 560	310	300	65	305	32.5	305	16.3	305	8.1	305
CMQ 660	390	315	77.5	315	38.8	315	19.4	315	9.7	315
CMQ 760	470	325	95	325	47.5	325	23.8	325	11.9	325
CMQ 860	550	335	110	335	55	335	27.5	335	13.8	335
CMQ 960	620	345	125	345	62.5	345	31.3	345	15.6	345
CIVIQ 300	020	343	di .		each 1800 sec		W	343	13.0	343
		Manager			Cucii 1000 Sec		1 temp 40 C	Manager		Manager
	duty1second	Max surface temp.	duty 5 second	Max surface temp.	duty 10 second	Max surface temp.	duty 20 second	Max surface temp.	duty 40 second	Max surface temp.
	[kW]	[°C]	[kW]	[°C]	[kW]	[°C]	[kW]	[°C]	[kW]	[°C]
CMQ 210	75	70	32	95	22	110	14.8	130	9.9	160
CMQ 260	144	75	56	105	38.5	125	25.5	150	16.8	180
CMQ 330	202	80	76	110	55	135	39	165	26.3	200
CMQ 400	284	85	101	110	74	140	52.5	175	35.5	210
CMQ 460	476	100	160	135	109	160	72	190	46.5	220
CMQ 560	532	100	174	125	124	155	87	190	58.5	230
	704	105	222	135	156	160	109	200	73	240
CMQ 660										
CMQ 760	920	110	282	140	194	170	134	210	89	250
CMQ 860	1264	125	380	160	252	190	168	225	107	260
CMQ 960	1712	140	504	175	324	200	204	235	128	270
	triangle pulse each 1800 seconds, ambient temp. = 40°C									
	duty 1 second [kW]	Max surface temp.	duty 5 second [kW]	Max surface temp. [°C]	duty 10 second [kW]	Max surface temp. [°C]	duty 20 second [kW]	Max surface temp. [°C]	duty 40 second [kW]	Max surface temp. [°C]
CMQ 210	158	70	65	95	47.5	115	32.5	140	21.5	165
CMQ 260	300	80	116	110	82	130	56	160	36.8	190
CMQ 330	420	80	152	110	112	135	83	170	58	210
CMQ 400	592	85	204	115	148	140	110	180	79	220
CMQ 460	992	100	332	135	230	165	157	200	102	235
CMQ 560	1100	100	356	130	248	155	182	200	129	245
CMQ 660	1455	105	456	135	316	165	228	205	161	250
CMQ 760	1888	115	584	145	400	175	284	215	196	260
CMQ 860 CMQ 960	2625 3520	130 140	792 1056	160 180	528 688	195 210	364 448	235 245	238	280
$p(t) = P_{\rm m}$		2.0			0 seconds (e-cı				200	
1	I	Maxsurface		Maxsurface	Ī	Maxsurface	I	Maxsurface	Ī	Max surfac
	Tau 1 second	temp.	Tau 5 second	temp.	Tau 10 second	temp.	Tau 20 second	temp.	Tau 40 second	temp.
	[kJ]	l°d	[kJ]	[°C]	[kJ]	l.d	[kJ]	[%]	[kJ]	[%]
CMQ 210	126	90	292	150	400	180	532	220	704	250
CMQ 260	236	110	508	180	696	210	912	250	1152	280
CMQ 330	316	110	680	180	1016	230	1440	270	1600	280
CMQ 400	432	120	896	190	1344	240	1952	290	1984	290
CMQ 460	720	150	1424	230	1952	280	2304	300	2304	300
CMQ 560	776	140	1520	220	2224	270	2880	300	2912	300
CMQ 660	1008	160	1936	230	2784	290	3456	320	3456	320
	1000	200	2500	200	2704	250	0 200	020	5750	320
-	1312	170	2448	250	3488	300	4032	330	4096	3.30
CMQ 760	1312	170	2448	250	3488	300	4032	330	4096 4608	330
-	1312 1792 2416	170 200 230	2448 3264 4224	250 280 320	3488 4480 5120	300 330 350	4032 4608 5120	330 340 350	4096 4608 5120	330 340 350

Table 3

Pulse-load

The ability to withstand pulse-loads varies with resistor size and length and diameter of the internal resistor wire. As such, it is impossible to create standard graphs that would apply for most customers' applications. In some cases, the load-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 (but these are only examples). The table shown above is based on a 5 ohm resistor with standard wire thickness. Depending on the application, resistor construction can be adapted to optimally match the application.

In the table above, the peak power for a train of pulses of 1 to 40 seconds duty time (on-time) and cycle times of 120 seconds or 1800 seconds be found, corresponding to the duty cycle which brings the resistor wire temperature to its rated thermal maximum of 1000°C.



Danotherm offers standard solutions for one to six resistor bodies combined in one compact *resistor unit* with pulse-withstand capability of 3MW (15MJ) and also OEM versions with a maximum of 20 bodies. Depending on the electrical connection, the IP class ranges from IP 20 to IP 65. Connection can be via a terminal box, DIN-rail terminals or cable lugs. These resistor types are also offered in high-voltage versions.

The salient features of Alpha resistors are that they have:

- small dimensions
- low-temperature surfaces in operation
- high pulse-load capabilities
- high vibration capabilities
- no external electrically-live parts
- high IP classes
- fail-safe capabilities (on request)
- low noise levels.



Triple-body unit CMQ-V XXX BHT 283
Pnom. = 4350—11200 W, IP 54
Connection box with 3 cable glands



Danotherm Electric A/S is a NIBE company



CMQ-H XXX BHT 282

unit CMQ-BHT

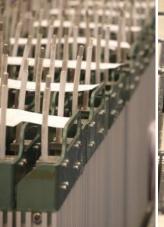
Pnom. = 2925—7575 W double-body unit (282)
Pnom. = 5800—14900 W four-body unit (284)
B-type Connection Box with 3 cable glands
IP 54 protection class

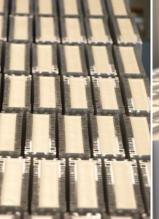


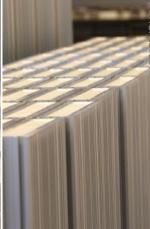
CMQ-H XXX BHT 284









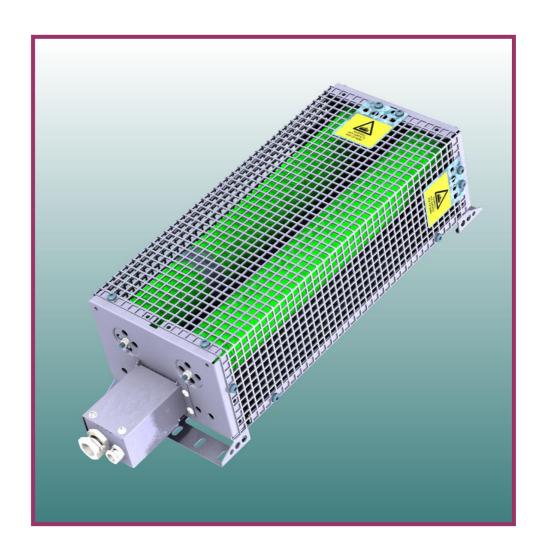




Danotherm Electric A/S Naesbyvej 20 2610 Roedovre Denmark

SIGMA-UL

CERAMIC WIRE WOUND BRAKE RESISTORS IP 21 (Preliminary Datasheet)









SIGMA ZRF 55/... 0A8X is a range of Ceramic Wire Wound Brake Resistors mounted in IP21 / Type 1X housings and equipped with Thermostats for temperature warning.

Connection

Power cables are connected through a pg16 cable gland with integrated braid connection. The range of outer diameter of the power cable is 15-18mm.

The power cables (0.5 – 10 mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw. The cable for the temperature switch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3 – 7mm.



Mounting According the ULapproval the resistors must be mounted vertically. The protection class is then IP21. Mounted horizontally the protection class is IP20.

Ratings:

Derating :

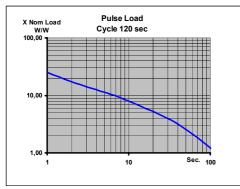
Approvals

TYPE ZRF-XXX	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	RΩ-kΩ	
0A8X	W	Surface	Load in	Load in	Load in	Load in	Const.	±5%,	
	@40°C	temp.	1 s each	5 s each	10s each	40 s each	sec.	±10%	
	Approved	°C	120s.	120 s.	120 s.	120 s	(Steady		
	UL508	@40°C	P1/120	P5/120	P10/120	P40/120	state)		
	C(UL)us		kW	kW	kW	kW			
			@40°C	@40°C	@40°C	@40°C			
ZRF 55/ 300 0A81	430	375	8	4.8	3.5	1.2	330	1 – 0.4	
ZRF 55/ 400 0A81	575	375	12	6	4.5	1.6	330	1.5 – 0.9	
ZRF 55/ 500 0A81	725	375	18	8	6	2	330	2.2 - 1.2	
ZRF 55/ 600 0A81	875	375	22	10	7	2.6	330	2.5 - 1.5	
ZRF 55/ 400 0A82	900	375	24	12	9	2.7	330	3.0 - 1.8	
ZRF 55/ 500 0A82	1130	375	36	16	12	3.3	330	4.0 - 2.2	
ZRF 55/ 600 0A82	1365	375	44	20	14	3.9	330	5.5 - 3.0	
ZRF 55/ 500 0A83	1545	375	54	24	18	4.5	330	6.5 - 3.6	
ZRF 55/ 600 0A83	1860	375	66	30	21	5.5	330	6.8 - 4.5	
ZRF 55/ 500 0A84	2060	375	72	32	24	6	330	2.0 - 4.8	
ZRF 55/ 600 0A84	2480	375	88	40	28	9.5	330	2.8 - 6.2	
ZRF 55/ 500 0A86	3065	375	105	56	36	9	330	3.3 - 6.8	
ZRF 55/ 600 0A86	3690	375	130	60	52	11	330	3.5 – 10	
ZRF 55/ 500 0A89	4030	375	160	70	54	12	330	1.5 - 6.8	
ZRF 55/ 600 0A89	4855	375	180	85	60	14	330	1.8 – 10	
General Specification	ns								
Temperature Coeffic	cient:					<±100ppm			
Dielectric strength:					250	0VAC 1 minu	te		
Working Voltage:					UL: 600VAC	/ CE: 690VAC	; 1100VDC		
Isolation Resistance) :			> 20 MΩ					
Overload:				5-10x in10 sec; 25-35 x in 1 s					
Environmental:					-4	0 °C - 90 °C			

PN: NOMINAL POWER WITH NATURAL COOLING and mounted in a vertical position

PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the ZRF resistors under the following conditions: The load is a periodic pulse load with a constant **period time** of **120 sec** and a pulse width from **one second to 40 sec**.



Typical values

For all other load conditions and more accurate values please contact DANOTHERM. By mean of **individual thermal models** we can simulate the rises of temperatures in the components and on the surfaces during and between specified pulses.

	, G	
		A
	E E	B E

Linear: 40° C = P_N to 70° C = 0.5^{*} PN

UL 508

Туре	A ± 2	B1 ± 2	C±2	D±1	E±3	F ± 3	Weight
ZRF 55/ 300 0A81	97	350	142	64	326	435	2,5 Kg
ZRF 55/ 400 0A81	97	450	142	64	426	535	3,0 Kg
ZRF 55/ 500 0A81	97	550	142	64	526	635	3,5 Kg
ZRF 55/ 600 0A81	97	650	142	64	626	735	4,0 Kg
ZRF 55/ 400 0A82	188	450	142	150	426	535	5,0 Kg
ZRF 55/ 500 0A82	188	550	142	150	526	635	5,5 Kg
ZRF 55/ 600 0A82	188	650	142	150	626	735	6,5 Kg
ZRF 55/ 500 0A83	279	550	142	240	526	635	7,8 Kg
ZRF 55/ 600 0A83	279	650	142	240	626	735	8,5 Kg
ZRF 55/ 500 0A84	188	550	252	150	526	635	9,5 Kg
ZRF 55/ 600 0A84	188	650	252	150	626	735	11 Kg
ZRF 55/ 500 0A86	274	550	252	240	526	635	14 Kg
ZRF 55/ 600 0A86	274	650	252	240	626	735	15 Kg
ZRF 55/ 500 0A89	274	550	342	240	526	635	17 Kg
ZRF 55/ 600 0A89	274	650	342	240	626	735	18 Kg

Type identification:

If you have chosen a SIGMA ZRF Brake Resistor with IP21 protection it is necessary to specify the size (length of resistor components), the configuration (Number of components) and the ohm value.

Please specify your CBR Brake resistor as follows

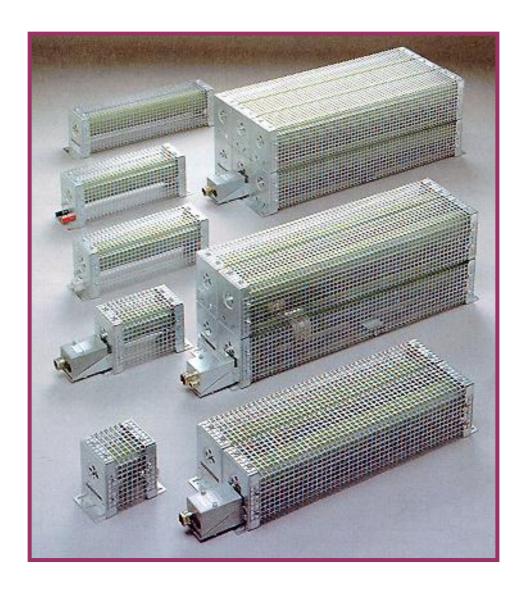


Configuration: 0A81 = One Resistor Components; 0A82 = Two Resistor Comp.
 0A83 = Three Resistor components

Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22\Omega$; $220R=220\Omega$; $2K2=2.2 k\Omega$)

Length of resistor tube in mm.

Σ SIGMA Modular Wire Wound Brake Resistors



Σ SIGMA - Modular Wire Wound Brake

SIGMA is our range of MODULAR BRAKE RESISTORS. Thanks to the modular construction it is possible also at small quantities to supply an optimum solution to any problem concerning startor brake resistors in connection with frequency converters.

The resistor components consist of fully welded wire wound ceramic resistors, which is a well-known and approved technology.

The base material is corderite, which is a type of ceramic with a very high resistance to temperature changes and the wire is coated with aluminium phosphate to protect the wire and conduct the heat developed in the wire on to the ceramic core. Aluminium-phosphate is stable at 700°C.

The modular resistor cages comply with IP20 and give electrical and thermal protection

The resistors have a nominal load from 100W and upward and are particularly suitable for pulse load of 10 – 20 time or more compared to the nominal load because of the ceramic core material and an extra high weight of wire.

We have developed **thermal models** corresponding to all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire for all possible load situations. Danotherm offers our assistance to our customers to find the optimum solution for any situation.

Each SIGMA-MODULE is supplied with resistor components corresponding to the actual load and according to the mechanical sizes shown in the table. In principle as many components as necessary can be mounted together.

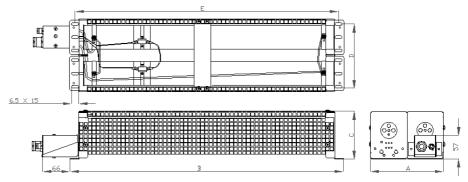
The modules can be supplied as open resistors (only resistor and mounting brackets) or with protection grating according to IP20 and with a ceramic housing connector or with a connector box. Further more it is possible to have a thermostat which works as a temperature watch and high voltage versions >400VDC.

Thermostats

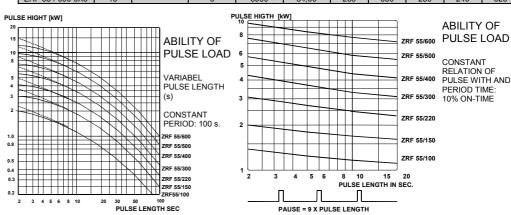
The thermostat, which surveys the temperature on the resistor element, is equipped with a NC switch for warning the frequency converter if the resistor is over loaded.

It is mounted on lower side of one or more resistor elements and has directly thermal contact. The standard switching temperature is 260°C. Other (lower) temperatures are possible. If the thermostat is connected to the coil of a contactor, it can work as a thermal fuse. The switch is specified to 250/380VAC, 10/5A.

The thermostat is isolated from the resistor via the ceramic housing. For voltages >400VDC the thermostat is isolated with a double MICA strip.



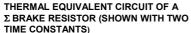
Туре	Weight	Ohmic Value Rmin – Rmax	Number of Resistors	Nominal Load	Pulse Load 10% E.D. 10 sec	Width A	Length B	High C	Mount. Holes D	Mount. Holes E
	Kg	mΩ- KΩ		W	kW	mm	mm	mm	mm	mm
ZRF 20 / 140 0X1	0.8	180 - 82	1	100	0,55	89	210	115	64	186
ZRF 30 / 152 0X1	1.0	120 - 82	1	150	0,92	89	210	115	64	186
ZRF 55 / 100 0X1	1.1	120 - 47	1	180	1,25	89	160	115	64	135
ZRF 55 / 100 0X2	1.7		2	360	2,50	176	160	115	150	135
ZRF 55 / 100 0X3	2.5		3	540	3,60	265	160	115	240	135
ZRF 55 / 100 0X4	3.2		4	570	4,10	176	160	230	150	135
ZRF 55 / 100 0X6	4.6		6	850	6,10	265	160	230	240	135
ZRF 55 / 150 0X1	1.2	270 - 56	1	250	1,70	89	210	115	64	186
ZRF 55 / 150 0X2	2.0		2	500	3,40	176	210	115	150	186
ZRF 55 / 150 0X3	3.2		3	750	5,00	265	210	115	240	186
ZRF 55 / 150 0X4	3.8		4	800	5,80	176	210	230	150	186
ZRF 55 / 150 0X6	5.7		6	1200	8,70	265	210	230	240	186
ZRF 55 / 220 0X1	2.1	560 - 75	1	330	2.60	89	270	115	64	246
ZRF 55 / 220 0X2	2.9		2	650	5,20	176	270	115	150	246
ZRF 55 / 220 0X3	4.1		3	1000	7,80	265	270	115	240	246
ZRF 55 / 220 0X4	5.0		4	1100	8,60	176	270	230	150	246
ZRF 55 / 220 0X6	7.2		6	1500	12,50	265	270	230	240	246
ZRF 55 / 300 0X1	2.2	680 - 100	1	450	3,60	89	350	115	64	326
ZRF 55 / 300 0X2	3.5		2	900	7,20	176	350	115	150	326
ZRF 55 / 300 0X3	5.1		3	1300	10,80	265	350	115	240	326
ZRF 55 / 300 0X4	6.3		4	1500	12,00	176	350	230	150	326
ZRF 55 / 300 0X6	9.0		6	2200	18,00	265	350	230	240	326
ZRF 55 / 400 0X1	2.4	1000 - 150	1	600	4,80	89	450	115	64	426
ZRF 55 / 400 0X2	4.2		2	1200	9,60	176	450	115	150	426
ZRF 55 / 400 0X3	5.6		3	1800	14,40	265	450	115	240	426
ZRF 55 / 400 0X4	7.6		4	2000	16,00	176	450	230	150	426
ZRF 55 / 400 0X6	11		6	3000	24,00	265	450	230	240	426
ZRF 55 / 500 0X1	3.0	1200 - 180	1	800	5,80	89	550	115	64	526
ZRF 55 / 500 0X2	4.6		2	1600	11,60	176	550	115	150	526
ZRF 55 / 500 0X3	7.2		3	2400	17,40	265	550	115	240	526
ZRF 55 / 500 0X4	8.9		4	2600	19,00	176	550	230	150	526
ZRF 55 / 500 0X6	13.2		6	3800	28,50	265	550	230	240	526
ZRF 55 / 600 0X1	3.5	1500 - 200	1	1000	7,00	89	650	115	64	626
ZRF 55 / 600 0X2	5.8		2	2000	14,00	176	650	115	150	626
ZRF 55 / 600 0X3	7.6		3	3000	21,00	265	650	115	240	626
ZRF 55 / 600 0X4	10.4		4	3200	22,50	176	650	230	150	626
ZRF 55 / 600 0X6	15		6	5000	34,00	265	650	230	240	626

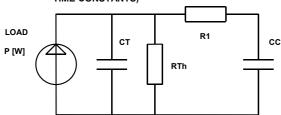


Σ SIGMA - Modular Wire Wound Brake

PULSE LOAD SIMUATIONS

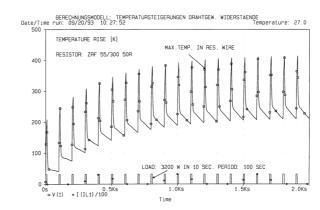
For all our resistor components DANOTHERM can supply a thermal model as an equivalent circuit. With this model it is possible by using standard software (like. PSpice) to calculate temperature rises in the resistor during any pulse load. By using this tool Danotherm will always be able to offer the optimum Σ -brake resistor. **Please contact Danotherm for assistance.**





CT: THERMAL CAPACITY OF WIRE [Ws/K]
CC: THERMAL CAPACITY OF CERAMIC CORE [Ws/K]
RTh: THERMAL RESISTANCE, COMPONENT / AIR [K/W]

R1: INTERAL THERMAL RESISTANCE [K/W]



R	CC=1	55/100 60Ws/K 2.08K/W	CC=2	55/150 40Ws/K 1.39K/W	ZRF 5 CC=35 RTh=0			55/300 80Ws/K .70K/W		55/400 0Ws/K .52K/W	ZRF 5 CC=80 RTh=0		ZRF 55 CC=960 RTh=0.3	Ws/K
W	CT Ws/ K	R1 K/W	CT Ws/K	R1 K/W	CT Ws/K	R1 K/W	CT Ws/K	R1 K/W	CT Ws/K	R1 K/W	CT Ws/K	R1 K/W	CT Ws/K	R1 K/W
10	4.2	.2	8.2	0.14	18	0.092	30	0.069	45	0.051	58	0.022	60	0.016
20	4.0	.21	8.4	0.13	12	0.093	22	0.067	37	0.05	54	0.023	55	0.02
50	2.7	.23	5.8	0.13	12	0.088	23	0.066	29	0.047	49	0.04	75	0.035
100	2.2	.19	5.5	0.13	9.6	0.085	19	0.065	26	0.047	47	0.038	47	0.033
200	1.8	.18	4.5	0.13	7.6	0.085	18	0.061	23	0.046	39	0.037	47	0.033
300	1.7	.18	3.6	0.12	6.7	0.084	11	0.061	18	0.046	28	0.037	39	0.032
500	1.2	.18	2.9	0.12	6	0.082	11	6.06	16	0.045	19	0.037	30	0.03
1000	.75	.18	2.4	0.12	5.2	0.082	9.2	0.058	12	0.044	15	0.036	22	0.03

By ordering please give us the following information:

- Resistor value
- PMAX (Max. Pulse load in kW)
- Pulse with in sec. (square load)
- Pulse shape (other than square)Period time or frequency
- Working voltage and
- Version according to the TYPE IDENTIFICATION

MATERIALS:

Only the best materials have been used when producing the resistors and they need no particular service in use.

Resistor:

Ceramic Core: 20-30 mm Ø Steatite C221

55 mm Ø Corderite

Resistor Wire: CrAIFe / CrNi / CuNi

Terminals: FeNi42

Coating: Aluminiumphosphate

Resistor Cage:

Mounting Bracket: Steel, hot galvanised 1,5mm

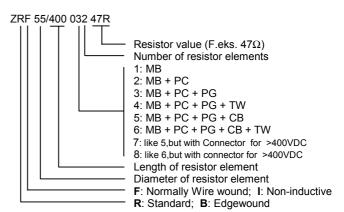
Protection grating: Steel, hot galvanised 1,5mm, perforated

Connectors: Porcelain

Cables: Silicone (Silicone less possible)

Resistor tolerance: Standard: ± 10%

TYPE IDENTIFICATION:

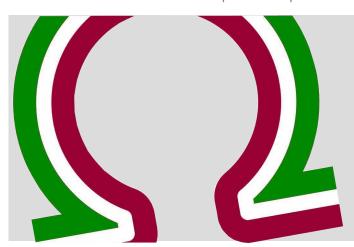


MB: Mounting Bracket PC: Porcelain connector PG: Protecting Grating TW: Temperature Watch CB: Connector Box

Examples of type names of Σ modules:

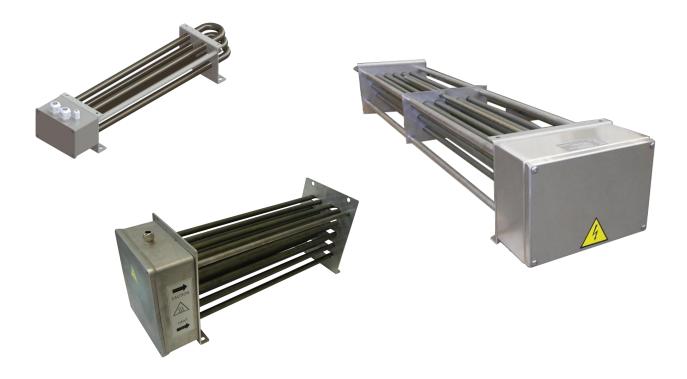
- ZRF 55/X00 02X is a resistor module with mounting brackets and porcelain connector and X resistors.
- ZRF 55/X00 06X is a resistor module with protection grating, connector box and thermostat.





GxxRT16

Stainless steel high power air cooled Resistor 7kW - 25kW



GxxRT16 style resistors are medium to high power resistors for constant load as in Filter applications and long braking cycles (example cranes). The GxxRT16 is constructed with Ø16mm tubular resistor elements, bended in U-shape and welded into two supports. On one with high overload capability. Special configurations are on request side there is the electrical connection box in IP65 or higher.

The whole construction is made of stainless steel (AISI 304 - 316 -321) which ensures long lifetime. The connection box can be stainless steel or aluminium. The GxxRT16 has no life parts, so there is no danger at all for electrical shock. Standard there is a temperature protection for the R-elements as well as a condensation protection in the connection box.

The GxxRT16 resistors are designed for natural convection and are available in three types, using 3 – 9 or 10 resistor tubes in different length for different power. Maximum rated power is 7 - 21 - 25kW, (12-18 tubes – split configurations – start or delta configurations...). The electrical connection box can be equipped with different cable glands, depending on your application.

The GxxRT16 is a very safe and industrial resistor.





The GxxRT16 series can be used when medium to high power dissipation is required without the need of a ventilator which is always a weak link in industrial environment. Typical applications are brake resistors for cranes, dump resistors for small wind turbines, deck equipment for ships...

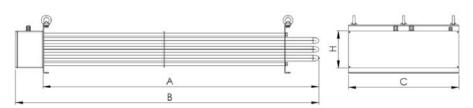
The high dielectric value (3.500V/50Hz @ 1min) allows this resistor to be used in combination with chopper circuits on the DC-link from motor drives (up to 1.100VDC). The GxxRT16 has low inductance which is positive in this type of application. Very low noise level is another advantage from this series.

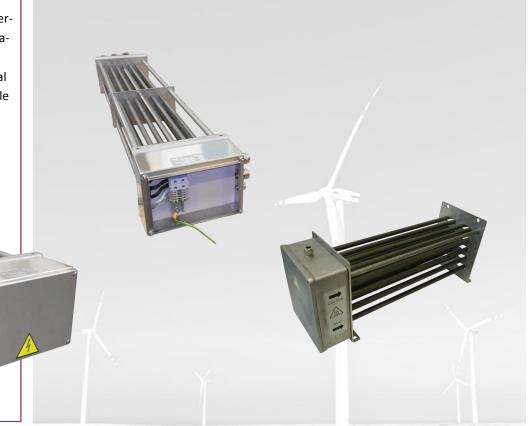
Outdoor installation of the GxxRT16 resistors offers you the advantage of easy installation as well as efficient energy dissipation. As the outside of the complete resistor has no life parts, there is no danger at all for electrocution. Safety regulations are therefore limited to the thermal aspect only.

Connection box

The connection box can be fitted with different cable glands as per customers specifications. Either in nickel plated copper or in stainless steel. Inside the box the electrical connections can be DIN rail terminals, cable lugs or threaded rods.

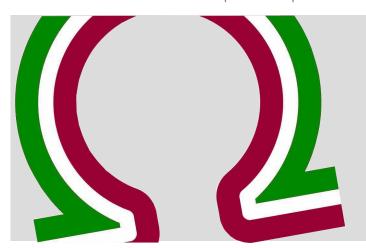
GxxRT16	GxxRT16						
Туре		Ohm value [Ω]	Power P _n	Weight			
Туре		±5%	[kW]	[kg]			
G03RT16.1950		2 - 60	7	7			
G09RT16.1950		2 - 40	21	30			
G10RT16.1950		2 - 40	25	30			
General Specifications							
Insulation resistar	nce	≥2	0 MΩ @ 5.000 VD	С			
Dielectric strengtl	n	3.500 VAC @ 50Hz 1 min					
Limit element vol	tage	2.500 V					
Protection degree	9	IP65 / IP66					
Cooling		natural convection					
Dimensions	A [mm]	B [mm]	C [mm]	H [mm]			
G03RT16.1950	975	1061	142	100			
G09RT16.1950	975	1100	270	210			
G10RT16.1950	975	1077	250	316			







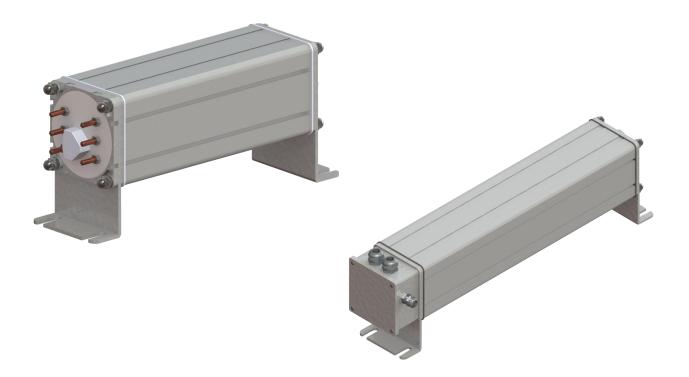
Danotherm Electric A/S Naesbyvej 20 2610 Roedovre



WHB

Aluminium low to medium power (high voltage*) water cooled Resistor 1kW - 10kW

WHB60.106 MV*



tions where space requirements are an issue. They can be box. used as filter resistors where continuous low to medium power load needs to be dissipated.

dielectric strength of 15kV.

The electrical terminals are opposite the water connections, improving liability and easy mounting.

WHB style resistors are compact aluminium housed, water The connection can be open style with cable lugs, threaded cooled resistor. They are mainly used in industrial applica- rods or bars or the unit can be fitted with an IP66 connection

WHB style resistors are build from aluminium profiles with closing plates and gaskets. For harsh environmental condi-Standard WHB have working voltages up to 2.5kV. The tions we recommend the WHBS 'fully welded' version that is WHB60.106 MV type has a working voltage up to 6kV and also able to withstand salt air conditions. (separate datasheet is available)





WHB style resistors are small to medium power resistors ranging from 1 to 10kW. Because of their compact size they are ideally suited for constant load conditions like filter applications or small brake applications in industrial systems The housing is made from extruded aluminium profile which is closed with endplates and gaskets. For harse environment we advice 'WHBS fully welded'.

The characteristic are:

- Construction made in aluminium
- Protection degree IP66
- Continuous power range from 1 to 10 kW
- Working pressure 6 bar, testing pressure 12 bar
- Maximum element voltage depends on the ohm value and type.

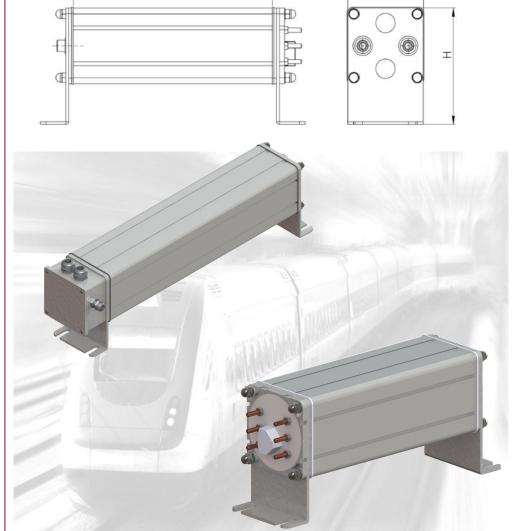
Construction

The WHBS series has 1 or three internal steel tube elements. The elements can be placed in any configuration like star or delta connection, individual or in parallel.

Connection

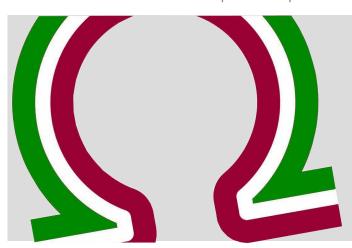
The WHBS can be equipped with or without connection box, depending on the protection degree requirement. The connection can be cable lug or threated rods.

WHB							
Туре	Ohm value [Ω] ±5%	Power P _n [kW]	Limit element voltage	Weight [kg]			
WHB 16.70	0.01 - 250	1-6	1.500 - 2.500	2.5 - 4			
WHB 16.106	0.05 - 18	5 - 10	2.500	4 - 7			
WHB 60.106	0.6	6	6.000	15			
General Specifications							
Insulation resistance		≥1.	000 MΩ @ 5.000 VDC				
Dielectric strength	Dielectric strength all types		3.500 VAC @ 50Hz 1 min				
	60.106	15.000 VAC @ 50Hz 1 min					
Protection degree		IP66					
Working pressure			6 bar				
Cooling		V	Vater/Water-glycol				
Dimensions		A [mm]	B [mm]	H [mm]			
WHB 16.70		130 - 500	110	80			
WHB 16.106		235 - 700 106		165			
WHB 60.106	·	525	106	165			



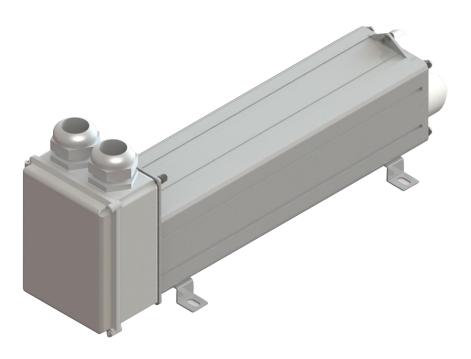


Danotherm Electric A/S Naesbyvej 20 2610 Roedovre



WHHB500

Compact High Voltage Water cooled Resistor 5kW - 40kW



ionized water, allowing a very high power per surface area, making this to 30kV. the resistors very compact.

posite side there are the water connections, making the resistor bars. easy to connect. The maximum working pressure is 6 bar and is tested at 12 bar. The internal construction of the WHHB500 provides the 'cold zone' of the resistor at the connection box side. The 'hot zone' is at the water connection side

The WHHB500 with or without connection box, is a medium power, The WHHB500 resistors are intended for medium to high power de-ionized water cooled resistor. The power ranges from 5 to and high voltage applications. They have very high dielectric 40kW. The resistor wire elements are in direct contact with the destrength. The nominal value is 20kV but it is possible to increase

WHHB500 resistors can be fitted with connection boxes or have On one side the resistor has the electrical connections, on the op- open style connectors like cable lugs, threaded rods or copper

Applications are high voltage filters and medium power brake resis-





WHHB style resistors have their active resistor elements directly in contact with the cooling liquid, in general water or waterglycol mixture. By this the heat dissipated in the resistor wire is directly transferred to the cooling medium allowing a high power density. The cooling liquid needs to be deionized to a conductivity of less than $2\mu\text{S}/cm$.

The nominal load depends on the wire thickness and the length of the wire. To secure sufficient lifetime the power/cm₂ is limited, so no cavitation of the wire will occur.

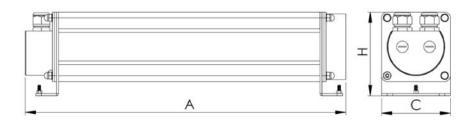
Construction

The unit is fitted with 4 resistor elements wounded on ceramic supports. The elements are placed in parallel to minimize the effect of the conduction of the cooling liquid. All metal parts are made from stainless steel AISI 304. The resistor wire is made from nickel/chrome alloy. Insulating parts are synthetic resin. The housing is an extruded aluminium profile and insulated from the inside by a tube. The dielectric strength of this tube exceeds 30kV. The normal dielectric strength for the unit is 20kV but for some special resistors it can be increased.

Pressure drop

The pressure drop inside the resistor is very low, about 0.15 bar @ 30 l/min. The water connections may have a pressure drop of the same value. It depends on the viscosity of the cooling liquid and liquid temperature.

WHHB 500						
Ohm value [Ω] ±5%	Power P _n [kW]	Limit eleme	ent voltage	Weight [kg]		
2 - 330	18 - 40 kW	4.200 VAC /	6.000 VDC	13.5		
0.1 - 0.5	10 - 28 kW	2.100 VAC /	3.000 VDC	15.8		
0.008 - 0.05	5 - 15 kW	2.100 VAC /	3.000 VDC	15.9		
General Specific	ations					
Insulation resist	ance	≥1.00	00 MΩ @ 5.000	VDC		
Dielectric streng	gth	20.000 / 28.000 VAC @ 50Hz 1 min				
Protection degre	ee	IP66				
Working pressur	re	6 bar				
Cooling		Water/Water-glycol				
Dimensions		A [mm]	C [mm]	H [mm]		
WHHB 500		615	132	160		
WHHB 500 BOX				280		



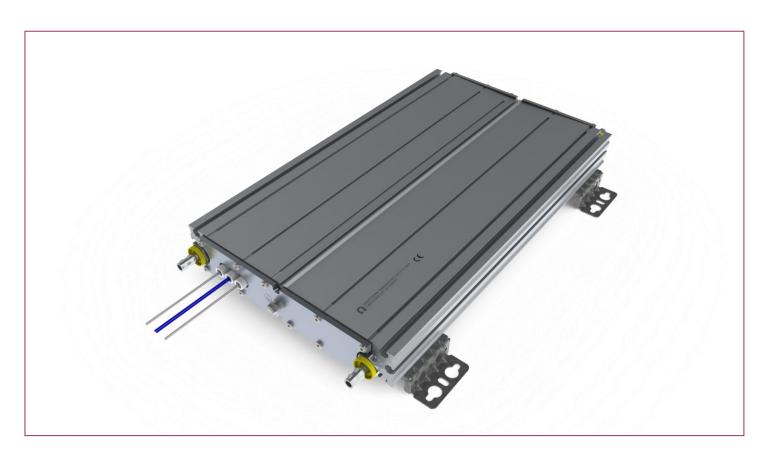




Danotherm Electric A/S Naesbyvej 20 2610 Roedovre

ALPHA CBW-H / CBW-V

ALUMINIUM HOUSED COMPACT HARMONIC FILTER RESISTOR IP50 / IP65



The **CBW** is a **Water Cooled Resistor.** It combines the advantage of water cooling with the high pulse load ability of the traditional aluminum housed Alpha resistors. The **CBW** can easily be fitted into compact constructions. It is possible to stack several resistors close without distance when resistor banks are required.

The steady state power range from 1.7kW to 6.7kW / component (depending on the cooling).

Danotherm has developed Thermal models for all resistor types and resistor values. By using these models, Danotherm is able to predict the temperature rises of the resistor wire and the surface for all possible load situations.

Danotherm offer the assistance to customers to find the optimal solution for any application.

CBW resistors are optionally available with connection box in different design for different cable sizes and from IP50 to IP65.

Applications

The water cooled resistor **CBW** is very well suited as a harmonic filter resistor where continuous power dissipation is required. For other applications like **LVRT** (Low Voltage Ride Through) for wind turbines Danotherm refer to seperate brochure for CBT/CBS - model.





Construction

The resistor elements for high resistance types are wire wound on mica support sheets. Lower resistance elements are made with helix wound wire elements. The outer housing is an aluminium profile insulated with micanite sheets on all inner surfaces. The resistor elements are fixed symmetrical in the profile by ceramic insulators. This ensures a symmetric expansion of the resistors and a maximum stability to high load impulses. The aluminium profile with the fixed resistor element is filled with quarts sand. This ensures a minimum change of the resistor surface temperature even if the resistor element reaches its maximum temperature during a

The standard cables are 300 mm PTFE, style depending on rated voltage.

Water Cooling

Water cooling is via two extruded holes/tubes along the outer edges of the profile and heat transfer via the profile.

This ensures a simple water system and that the resistors are stackable. The centre of the resistor reaches a minor temperature increase at steady state load. If this cannot be tolerated the surface can be insulated.

Resistance Value Range

Please see table 1.

Mounting

It is recommended to mount the resistors in a vertical position with the in- and outlet at the top side to prevent air bubbles to be trapped. When the channels are in parallel the outlets should be upwards. If mounted in other direction precaution must be taken to avoid air bubbles in the cooling tubes.

Cooling liquid flow

The needed cooling liquid flow depends on the cooling liquid used and the dissipated power that the liquid needs to absorb. The formula for water flow is given by:

$$Q = \frac{P \cdot 860}{\Delta T \cdot 0.85}$$

Where

Q is flow in litres per hour P is power in kW

ΔT is difference in temperature between inlet and outlet:

0,85 takes into account that not all water is effectively in contact with the cooling

If water/glycol 60%/40% is used then the outcome needs to be multiplied by a factor of 1,5.

General Specifications						
Temperature Coefficient		< ± 100ppm				
Dielectric strength:	Standard	3500 VAC @ 1 minute				
	On demand	6000 VAC @ 1 minute				
Working Voltage	Standard	1000 VAC; 1400VDC				
Isolation Resistance:		>20 MΩ				
Temperature of cooling wa	ater	0°C -80°C				
Temperature of cooling wa	ater-glycol	0°C -80°C				
Pressure:		Working: 6 bar; Test: 10 bar				
Environmental		-40°C - 90°C				
De-rating depending on wa	ater inlet temp.:	Linear: 20°C = Pn to 50°C = 0,75*Pn				
Thermo watch (optional)		30°C / 160°C / 180°C / 200°C, 2A, 250VAC NC				
PT 100 (optional)		2 Wire/ 3 Wire; With/Without Shield; Cable 300mm				

CBW-C(H) (T)	min. Ohm value [mΩ]	max. Ohm value [Ω]
CBW 210	40	2500
CBW 260	60	3500
CBW 330	90	5000
CBW 400	120	7000
CBW 460	150	8000
CBW 560	190	120
CBW 660	230	150
CBW 760	280	160

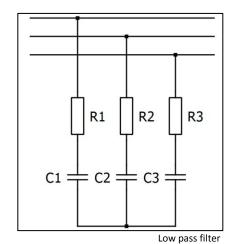
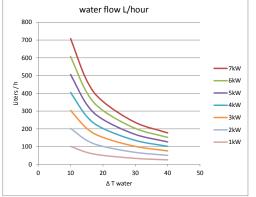


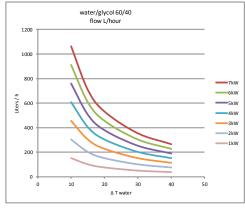
Table 1

flow I/h	ΔT water					ΔT water/glycol 60/40				
	10	15	20	30	40	10	15	20	30	40
7kW	708	472	354	236	177	1062	708	531	354	266
6kW	607	405	304	202	152	911	607	455	304	228
5kW	506	337	253	169	127	759	506	379	253	190
4kW	405	270	202	135	101	607	405	304	202	152
3kW	304	202	152	101	76	455	304	228	152	114
2kW	202	135	101	68	51	304	202	152	101	76
1kW	101	68	51	34	25	152	101	76	51	38

water/glycol 60/40

Table 2





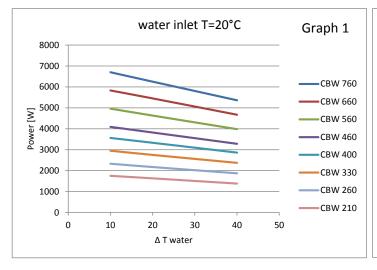


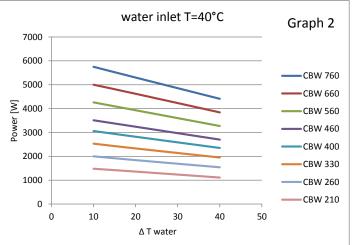
Maximum power dissipation

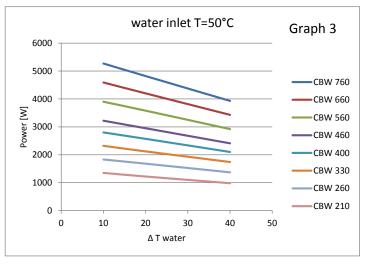
The maximum continuous power depends on the absolute value of the water inlet temperature and also on the increase of the water temperature which is directly dependent of the water flow. Table 3 shows the maximum continuous power at given water inlet temperatures and different ΔT . Graphs 1, 2 and 3 show the continuous power values at water inlet temperature of 20°C / 40°C and 50°C and all ΔT between 10 and 40°C. All values are based on the thermal model of the resistors as shown below.

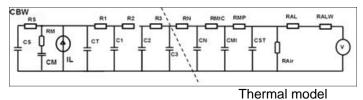
		maximum power at water inlet			*			maximum power at water inlet T=50°C [W]		
			T=20°C [V	•		T=40°C [-		<u> </u>	•
		Δ	T water [k		Δ	T water	[K]	Δ	T water [K]
	max.									
CBW-C(H) (T)	surface	10	20	40	10	20	40	10	20	40
	temp.									
CBW 210	160	1750	1630	1380	1480	1360	1110	1350	1220	980
CBW 260	170	2330	2170	1870	2000	1840	1540	1830	1680	1370
CBW 330	170	2950	2750	2370	2530	2330	1950	2320	2120	1740
CBW 400	170	3560	3330	2860	3060	2820	2350	2800	2570	2100
CBW 460	170	4090	3820	3280	3510	3240	2700	3220	2950	2410
CBW 560	170	4960	4630	3980	4260	3930	3270	3900	3580	2920
CBW 660	170	5830	5450	4670	5000	4620	3840	4590	4200	3430
CBW 760	170	6700	6250	5360	5750	5300	4410	5270	4820	3930

Table 3





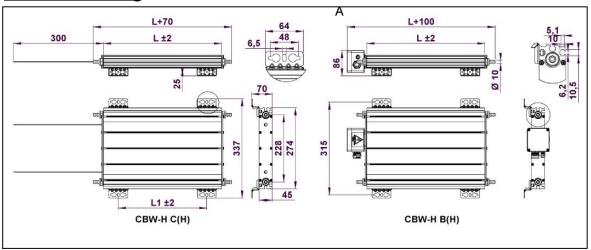




Pressure drop

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 litres per hour the pressure drop is 55mBar per channel, 110mBar in total for 2 cooling tubes in series.

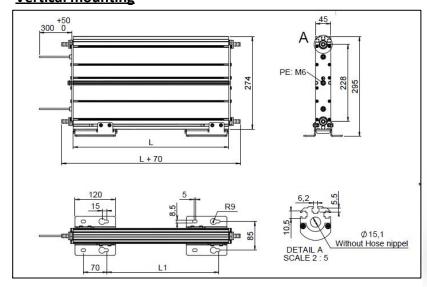
Horizontal mounting



Type	L	L1	W	Type	L	L1	W
	mm	mm	Kg	1	mm	mm	Kg
CBW-H 210 C (H) (T)	210	110	6.4	CBW-H 560 C H (T)	560	460	14.7
CBW-H 260 C (H) (T)	260	160	7.6	CBW-H 660 C H (T)	660	560	17.1
CBW-H 330 C (H) (T)	330	230	9.2	CBW-H 760 C H (T)	760	660	19.5
CBW-H 400 C (H) (T)	400	300	10.9	CBW-H 860 C H (T)	860	760	22,0
CBW-H 460 C (H) (T)	460	360	12.3	CBW-H 960 C H (T)	960	860	24,4

Longest possible type 1000mm

Vertical mounting

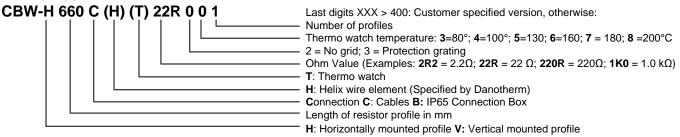


Please contact Danotherm with your request danotherm@danotherm.dk



Type identification:

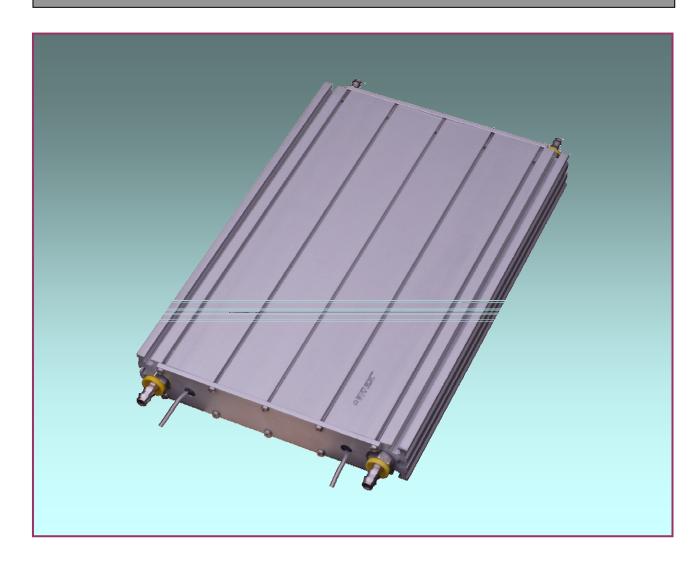
Please specify your CBW resistor as follows





Water Cooled ALPHA CBW

ALUMINIUM HOUSED COMPACT BRAKE RESISTORS IP50 / IP53 / IP65



The **CBW** is a new type of **Water Cooled Brake Resistor**. It combines the advantage of water cooling with the high pulse load ability of the traditional aluminum housed Alpha resistors. The **CBW** can easily be fitted into compact constructions. It is possible to stack several resistors close without distance when resistor banks are required.

The steady state power range span from 1.0kW to 5.7kW / component and they can withstand pulse loads of up to 30 times these values for one second every 120 seconds.

Reinforced versions for Fault Ride Through (Energy Dump Resistors) for Wind Turbines, Solar Plants and Small Power Plants are available.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to predict the temperature rises of the resistor wire and on the surface for all possible load applications. We offer our assistance to customers to find the optimum solution for any situation.

CBW resistors are optionally available with connection box in different design for different cable sizes and from IP50 to IP65, please require special data sheets.

The resistors comply with IP50 to IP65 giving electrical protection.





Construction

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

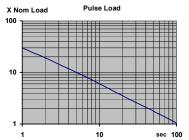
Water cooling is via two extruded holes/tubes along the outer edges of the profile and heat transfer via the profile.

This ensures a simple water system and that the resistors are stackable. The centre of the resistor reaches a minor temperature increase at steady state load. If this can not be tolerated the surface can be insulated.

The standard cables are 300 mm PTFE, style depending on rated voltage.

PULSE LOAD

The curve shows the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant period time of 120 seconds and a pulse to



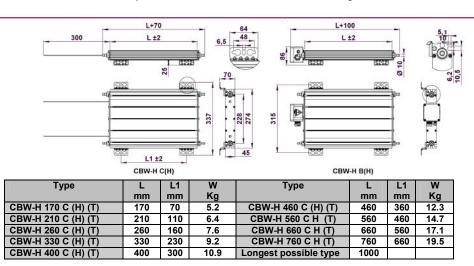
For further optimization Danotherm offers individual thermal electric circuit models for all types and ohm values. With these models the temperatures of the resistor wire and the resistor surface can be simulated during any pulse load condition with standard software like PSpice. Alternatively Danotherm offers to make the thermal simulation for our customers.

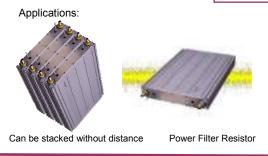
Ratings: (Provisional Data)

CBW-C (H) (T)	PN	Max	Pulse	Pulse	Pulse	Pulse	Time	R		
	kW	Surface	Load in	Load in	Load in	Load in	Const	Ω		
CBW: Profile	@40°C	temp.	1s each	5s each	10s each	40s each	sec	±10%		
	Accor-	°C	120s	120s	120s	120s	(Stea			
H: Helix Element	ding to	@40°C	P1/120	P5/120	P10/120	P40/120	dy			
T: Internal T. W	UL508	Water	kW	kW	kW	kW	state)			
		inlet	@40°C	@40°C	@40°C	@40°C				
CBW 170 C	1.0	160	30	10	6.0	2.0	1000	0.2– 1.5k		
CBW 210 C	1.4	160	42	14	8.4	2.8	1000	0.2- 2.5k		
CBW 260 C	2.0	170	60	20	12	4.0	1000	0.2- 3.5k		
CBW 330 C	2.5	170	75	25	15	5.0	1000	0.2 – 5.0k		
CBW 400 C	3.0	170	90	30	18	6.0	1000	0.2-7.0k		
CBW 460 C	3.5	170	105	35	21	7.0	1000	0.2 -8.0k		
CBW 560 C	4.2	170	137	41	23	6.7	1000	0.3 -120		
CBW 660 C	5.0	170	150	50	30	10	1000	0.4-150		
CBW 760 C	5.7	170	170	57	34	11.5	1000	0.5- 160		
General Specificatio	ns									
Temperature Coeffic	ient:				<±100ppm					
Dielectric strength:		Standard			3500VAC 1 minute					
		On Dema	nd		6000 VAC 1 minute					
Working Voltage:		Standard			1000VAC;1400VDC					
		On Dema	nd		250	0 VAC; 3500\	/DC			
Isolation Resistance):					> 20 MΩ				
Overload:					5x in 10s; 30-50 x in 1s					
Temperature of cool	ing water/	water-glyc	ol (inlet)		-20 °C - 80 °C					
Pressure					Working	6 BAR; Test	: 10 BAR	2		
De-Rating				Depe	Depends on cooling conditions, ask Danotherm					
Thermo watch, optic	nal			1	30°C/160°C/1	80°C / 200°C	, 2A, 250	V, NC		
DN: NOMINAL DOWE	D WITH CC	OLING flo	0 6 4 2	I/min/k\A/ o	nd mounted	in a vartical	nacition	with in and		

PN: NOMINAL POWER WITH COOLING flow 0.6 - 1.2 l/min/ kW and mounted in a vertical position with in- and out lets up and water connections on terminal end connected. (Water flows in series) Water can alternatively flow in parallel. When in parallel outlets must be upwards to avoid air in the cooling tubes

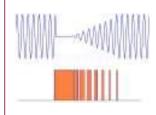
If mounted in other directions precautions must be taken to avoid air in cooling tubes.







Reinforced versions are available for Fault Ride Through / Power Dump Resistors for Wind Turbines and other power plants.



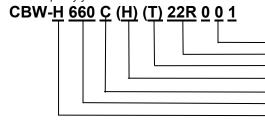
HOBOWEL COMPONENTS

₩ ₩

COXX CXXX

Type identification:

Please specify your CBW Brake resistor as follows



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

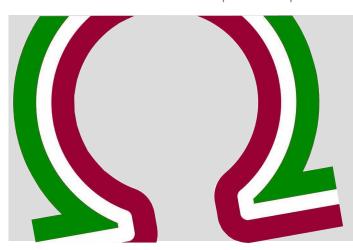
Thermo watch temperature: $3=80^\circ$; $4=100^\circ$; 5=130; 6=160; 7=180; $8=200^\circ$ C Ohm Value (Examples: $2R2=2.2\Omega$; $22R=22\Omega$; $220R=220\Omega$; 1K0=1.0 k Ω)

T: Thermo watch

H: Helix wire element (Specified by Danotherm)

Connection C: Cables B: IP 65 Connection Box

Length of resistor profile in mm H: Horizontally mounted profile



TRV

Stainless steel high power Forced air cooled Resistor 100kW - 280kW



They are mainly used as brake resistor on top of cranes in harprotect the inside of the resistor unit when not in operation. bors. Two high power ventilators provide a strong air flow that cools a number of steel tube elements.

The resistor elements are made from stainless steel tube less steel AISI304. where a resistor spiral is placed inside and filled with magnesium oxide. To prevent any humidity to penetrate the tube and degrade the insulation voltage level, the endings of the tubes are filled with resin.

All parts are made with a protection degree of IP66.

TRV style resistors are high power, forced air cooled resistors. Optional the resistor units can be equipped with shutters to

TRV style resistors are available in three sizes and several power ratings. The construction is made completely of stain-

For protection of the resistor against overload two safety devices are used to detect a too high temperature on the elements and to detect the airflow.



TRV resistors are build from a steel cabinet with stainless steel resistor tube elements in AISI316. High power fans generate a strong air flow that cool the resistor elements. All material are corrosion proof an the unit has a high ingress protection of IP66.

The unit is fitted with two safety devices, detection failure of the fan or overheating of the resistor elements.

The main application for TRV style resistors is in naval and harbor industry, for example as brake resistor mounted on top of large cranes.

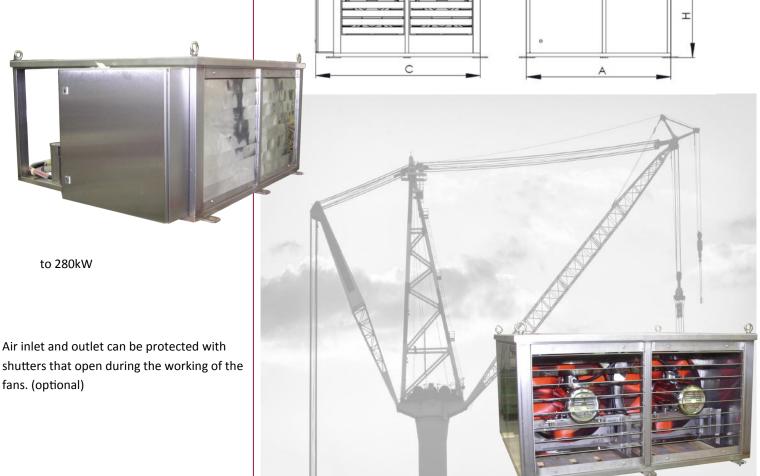
main characteristics are:

to 280kW

fans. (optional)

- Construction made completely in stainless steel (AISI304)
- Protection degree IP66
- Continuous power range from 100kW

TRV							
Туре	Power P _n [kW]	power of fans [kW]	Nr. of fans	Weight [kg]			
TRV.36.1950	100	3	2	±210			
TRV.48.1950	V.48.1950 150		2	±300			
TRV.72.1950	1950 200		4	±450			
TRV.100.1950	RV.100.1950 280		4	±550			
General Specifications							
Insulation resistance		≥300	≥300 MΩ @ 5.000 VDC				
Dielectric strength		3.500	VAC @ 50Hz :	1 min			
Protection degree			IP66				
fans			230/400 V				
Dimensions		A [mm]	C [mm]	H [mm]			
TRV.36.1950		745	1290	640			
TRV.48.1950	1040	1290	640				
TRV.72.1950		900 1340		1040			
TRV.100.1950		900	1340	1040			





Ω OHMEGA

SV14-600/ -800/ -1100- 1600- 1800

Water Cooled Stainless steel
MEDIUM POWER BRAKE RESISTORS
Standard range: 5 kW – 22 kW (steady state)



SV14/600-3, **SV14/800-3**, **SV14/1100-3**, **SV14/1600-3 and SV14/1899-3** is a range of water cooled medium power brake resistors.

The resistors consist of stainless steel tube resistors with diameter 14 mm and length 600mm to 1900mm mounted in stainless steel water tanks. The electrical connections comply with protection class IP 00 to IP 54 according to customer specifications.

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

All types can be offered with thermo watch.





Construction

The OHMEGA SV14-XXX-3 resistors are constructed as follows:

A resistor consists of a water tank (AISI 304) mounted with 3 resistor elements. The resistor elements are wire wound steel tube elements (AISI 316L) with a diameter of 14mm and a length of 600-1800 mm.

Power rating: 5 kW to 22 kW / unit.

Standard materials are:

Resistor elements: AISI 316L with NiCr resistor wire.

Water Tank: AISI 304

Connection

Power cables are connected through a M25/M40 cable gland with integrated screen connection. The range of outer diameter of the power cable is 9.0- 16.6mm/19-28mm

The power cables (2.5-10 mm²/2.5-50mm²) are connected to a terminal block with screw connections. The PE is connected directly to the connector box with a screw. The cable for the thermo watch is connected to a terminal block (0.5-4mm²) via a M12 gland with clamping range 3 – 7mm.

The Connector Box made of Aluminium has a protection class of IP54, Type B or IP65, Type BG.





Ratings:

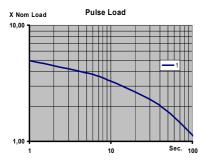
Туре	PN kW @40°C	Pulse Load in 5 s each 120 s. P5/120 W @40°C	Pulse Load in 10s each 120 s. P10/120 kW @40°C	Pulse Load in 40 s each 120 s P40/120 kW @40°C	Time Const. sec. (Element, Steady state)	R Ω ±10% Elements in parallel
SV14-600-03	5	20	15	8,5	18	2 – 50
SV14-800-03	9	36	27	16	18	2 – 50
SV14-1100-03	12	48	36	22	18	2 – 50
SV14-1600-03	19	77	58	36	18	3 – 50
SV14-1800-03	22	93	71	44	18	3 – 50

Pulse Ratings for short pulses depend on the ohmic value. (Resistors with lower resistance have more resistor wire than resistors with higher resistance). The ratings in this table refer to resistors of about 40 OHMS/element

General	
Specifications	
_	
Temperature	<±100ppm
Coefficient:	
Max resistor wire	1000 ℃
temperature:	
Dielectric strength:	2500VAC 1 minute
Working Voltage:	690VAC; 1100VDC
Isolation	> 2 MΩ
Resistance:	
Overload:	x in10 sec; x in 1 s
Environmental:	0 °C - 60 °C
Working pressure:	6 Bar
Test pressure:	10 Bar
Thermo watch	58°C - 110°C/ N.C.; 20A@240VAC
contact:	, , , ,

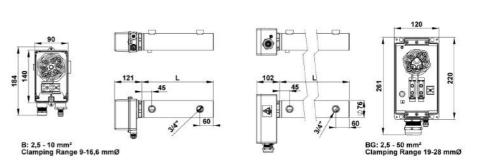
PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant **period time** of 120 sec and a pulse width from one second to 40 sec. The elements are 40 OHM

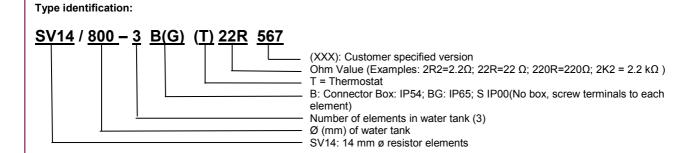


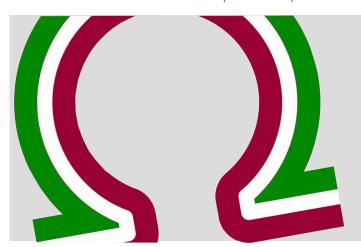
For further optimization DANOTHERM offers individual thermal electric circuit models for all types and ohm values. With these models the temperature of the resistor wire during any pulse load conditions can be simulated with a standard soft ware like P-Spice. Alternatively Danotherm offers to make thermal simulation for our customers

Mechanical Data



Type	SV14-600-3	SV14-800-3	SV14-1100-3	SV14-1600-3	SV14-1800-3		
L mm	320	465	585	850	965		
Weight (Empty)	3 Kg	4 Kg	5 Kg	7 Kg	9 Kg		
Weight incl. water	4,5Kg	6 Kg	7,5 Kg	11 Kg	13 Kg		
Heat capacity of water	6 kJ/K	8,7 kJ/K	11 kJ/K	16 kJ/K	18 kJ/K		
(no flow) kJ/K							
Min. Water flow @ PN	2,5 l/min	4,5 l/min	5,7 l/min	9 I/min	11 l/min		
(Max conf.) ΔT = 30 K							
Pressure los @ X I/min							
Water connection			3/4"				
Connection for Valve			1/8"		·		
Connector Box Type: B	Main Cables 2,5 – 10 mm², Clamping range 9 – 16,6 mmØ						
Connector Box Type BG		Main Cables 2	,5 – 50 mm² Clampir	ng range 19 – 28 mn	1		

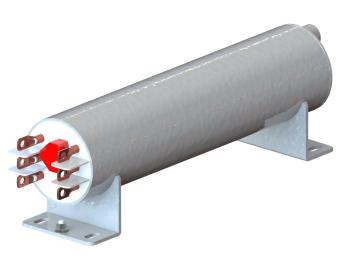




WHBS

Medium power Fully welded water cooled Resistor 2.5kW - 70W





and off-shore wind turbines where salt air conditions and can be chosen. high vibrations are constantly present. WHBS style resistors are used as brake resistor for winches, steering systems and other drive systems.

tion box. The working voltage differs per power rating and watts needs to be dissipated. ranges from 1200 to 3500V. Insulation voltage levels are up to 3.500VAC.

WHBS are compact, stainless steel, fully welded medium The water connections are selected based on the required power resistors. They are mainly used on board of vessels water flow however in principle any water connection style

Because of there compactness they are easy to install and require minimum maintenance. They are made from stainless steel AISI304 or AISI316 and suitable in harsh environ-The electrical connections can be cable lugs, threaded rods, mental conditions. In Wind turbine applications they can be copper bars. The resistor can be fitted with an IP 66 connec- used as filter resistor where a constant power of several kilo-





WHBS style resistors are medium power resistors ranging from 2.5 to 70kW. Because of their compact size they are ideally suited for constant load conditions like filter applications in wind turbines or medium power brake applications on board of vessels. The housing is made from stainless steel AISI 306 or AISI316 allowing them to be used in salted air environment.

The characteristic are:

- Construction made completely in AISI 304 or AISI316
- Protection degree IP66
- Continuous power range from 10 to 25 kW
- Working pressure 6 bar, testing pressure 12 bar
- Maximum element voltage depends on the ohm value and type.

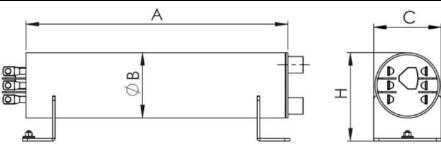
Construction

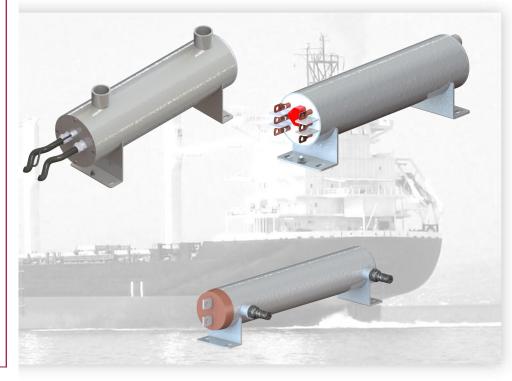
The WHBS series has 1 or three internal steel tube elements. The elements can be placed in any configuration like star or delta connection, individual or in parallel.

Connection

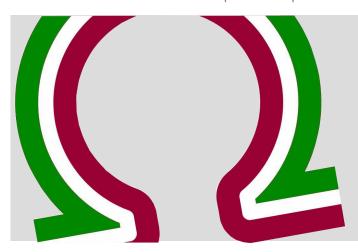
The WHBS can be equipped with or without connection box, depending on the protection degree requirement. The connection can be cable lug or threated rods.

WHBS Welded							
Туре	Ohm value [Ω] ±5%	Power P _n [kW]	Limit element voltage	Weight [kg]			
WHBS 70	0.03 - 250	2.5 - 7.5	1.500 - 2.500	2.5 - 4			
WHBS 16.3	0.01 - 50	5 - 10	2.500	4 - 9			
WHBS 16.6	2 - 30	20 - 43	1.200	12 - 25			
WHBS 16.12	2 - 30	43 - 70	1.200	20 - 30			
General Specifications							
Insulation resistance	all types	≥1.000 MΩ @ 2.500 VDC					
	WHBS 70	≥1.000 MΩ @ 5.000 VDC					
Dielectric strength		3.500) VAC @ 50Hz 1 i	min			
Protection degree			IP66				
Working pressure			6 bar				
Cooling		Wa	ater/Water-glyc	ol			
Dimensions	A [mm]	B [mm]	C [mm]	H [mm]			
WHBS 70	130 - 500	70	110	80			
WHBS 16.3	410 - 520	Ø 101.6	106	138			
WHBS 16.6	470 - 1020	Ø 114.3	115	195			
WHBS 16.12	510 - 750	Ø 168.3	170	185			



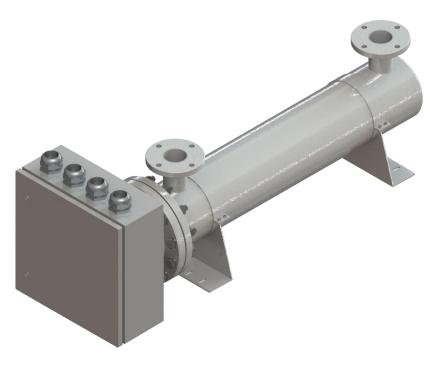






WHHDN

Stainless steel high power High voltage, water cooled Resistor 50kW - 200kW



age drive systems. The WHHDN resistors need to be cooled with strength. Standard insulation voltage is 16kV. fresh water or a mixture of water and glycol. Depending on the needed water flow suitable water connections are used. In principle, any water connection the customer prefers can be fitted on the resistor. The maximum working pressure is 6 bar and the resistors are tested at 12 bar. Inside the water tank 'turbulators' make sure all water will be in good contact with the tubes to get optimum cooling. The pressure drop is still very low and mainly determined by the water connection flanges.

The WHHDN style resistors are build up from a stainless steel tank

The WHHDN style resistors are high power, high voltage brake resis- where a number of steel tubes are fitted. The inside of the steel tors, mainly used on board of vessels as brake resistor for high volt- tubes are insulated with mica, providing a very high dielectric

> The connection box has an ingress protection degree of IP66. The high voltage terminals are common used terminals. However, if special terminals are required, this can also be arranged.

> It is possible to connect the resistor elements in any topology that is needed. This can be a star or delta configuration or a set up for a test bank load.





Construction

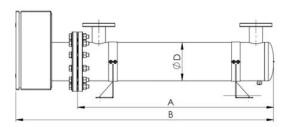
The high voltage resistors, series WHHDN have a high internal electrical insulation. This is accomplished by using large diameter steel tubes with mica insulation. By this, insulation voltage levels of 10kV up to 30kV are possible. The resistor elements can be arranged in groups to build up a load bank, a three phase circuit or any other topology.

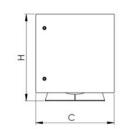
WHHDN are ideally suited for high power loads, high voltage, in harsh conditions like on board of vessels where vibration and salt air are present. They are robust, easy to install and require a minimum of maintenance.

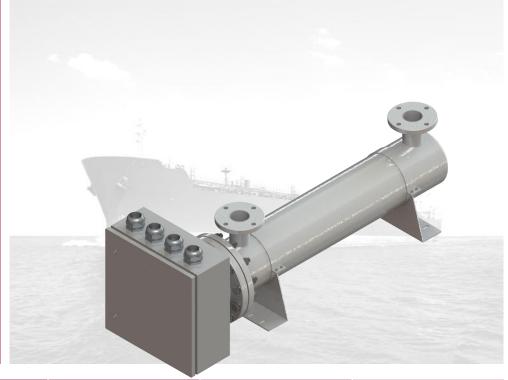
The resistors have adjustable mounting feet, making it easy to install them. Normally, the resistors are mounted horizontally but it is possible to produce a vertical construction. In case of vertical mounting, the outlet water connection is at the top side, allowing air bubbles to go out of the resistor.

Depending on the flow of water, the water connection size is determined. Water connections according customer specifications are very well possible.

WHHDN							
Туре	Ohm value [Ω] ±5%	Power P _n [kW]	Limit element voltage	Weight [kg]			
WHHDN 200	2 - 60	50 - 70	6.000	36 - 70			
WHHDN 250	2 - 40	80 - 120	6.000	110 - 140			
WHHDN 300	1 - 30	130 - 150	6.000	170 - 220			
WHHDN 400	1 - 20	160 - 200	6.000	420			
General Specifications							
Insulation resistance	all types	≥1.	≥1.000 MΩ @ 5.000 VDC				
Dielectric strength		16.0	000 VAC @ 50Hz 1 miı	n			
Protection degree			IP66				
Working pressure	type 200 / 250		8 bar				
	type 300 / 400		6 bar				
Cooling		V	Water/Water-glycol				
Dimensions	A [mm]	B [mm]	C [mm]	H [mm]			
WHHDN 200	1125	A + 350	450	500			
WHHDN 250	1130	A + 435	600	700			
WHHDN 300	1135	A + 435 600		730			
WHHDN 400	1205	A + 360	600	745			





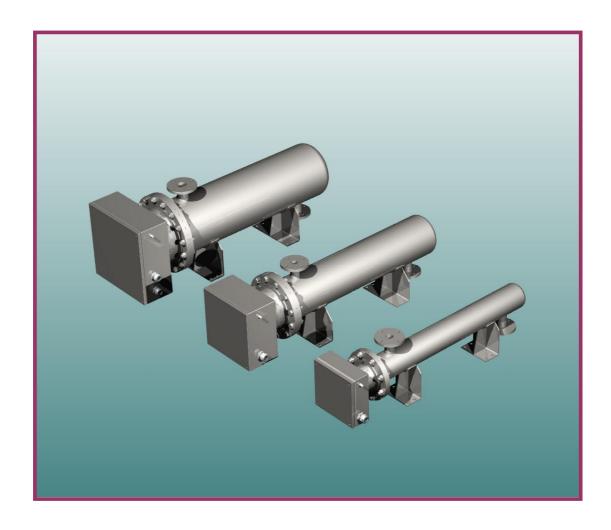




Danotherm Electric A/S Naesbyvej 20 2610 Roedovre

Ω OHMEGA V14-150/ -250/ -350

Water Cooled Stainless steel
HIGH POWER BRAKE RESISTORS
Standard range: 44kW – 250 kW (steady state)



V14-150-08, V14-250-16 and V14-350-28 is a range of water cooled high power brake resistors.

The resistors consist of stainless steel tube resistors with diameter 14 mm and length 2200mm (V14/2200) mounted in stainless (AISI 304 or AISI 316) water tanks. The electrical connections complies to protection class IP 00 to IP 65 according to customer specifications

Danotherm has developed **thermal models** for all resistor types and resistor values. By using these models we are able to calculate the temperature rises in the resistor wire for all possible load applications. We offer our assistance to our customers to find the optimum solution for any situation.

All types can be offered with thermo watch.





Construction

The OHMEGA V14-150-6 resistors are constructed as follows:

A resistor consists of a water tank mounted with a number of resistor elements. The resistors can be supplied with a number of different connections from IP00 to IP65 protection class.

The resistor elements are wire wound steel tube elements with a diameter of 14mm and a length of 2200mm. Three different standard sizes belonging to this range can be supplied covering resistors from 30kW to 250 kW / unit.

Standard materials are: Resistor elements: AISI 316L with NiCr resistor wire. Water Tank: AISI 304 Connector Box AISI 304



Ratings:

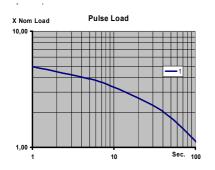
Type V14-150	PN	Pulse	Pulse Load	Pulse Load	Time	RΩ
Type V14-250	kW	Load in 5	in 10s each	in	Const.	±10%
Type V14-350	@40°C	s each	120 s.	40 s each	sec.	Elements
		120 s.	P10/120	120 s	(Element,	in parallel
		P5/120	kW	P40/120	Steady	i i
		w	@40°C	kW	state)	
		@40°C		@40°C		
V14-150-05	44	190	145	90	18	2 - 30
V14-150-06	52	225	170	110	18	1.6 - 25
V14-150-07	62	260	200	130	18	1.45 - 21
V14-150-08	70	300	230	145	18	1.25 - 18
V14-250-10	88	380	290	180	18	1 - 15
V14-250-12	105	450	340	215	18	0.84 - 12.5
V14-250-14	123	530	400	250	18	0.72 - 10.5
V14-250-16	140	600	460	280	18	0.62 - 9.3
V14-350-18	158	670	520	320	18	0.55 - 8.3
V14-350-20	176	740	570	350	18	0.5 - 7.5
V14-350-22	193	810	620	380	18	0.45 - 6.8
V14-350-24	210	880	680	420	18	0.42 - 6.2
V14-350-26	230	950	730	450	18	0.38 - 5.7
V14-350-28	250	1000	780	490	18	0.36 - 5.3

Pulse Ratings for short pulses depend on the ohmic value. (Resistors with lower resistance have more resistor wire than resistors with higher resistance). The ratings in this table refer to resistors of about 40 OHMS/element

General Specifications				
Temperature Coefficient:	<±100ppm			
Max resistor wire temperature	1000 °C			
Dielectric strength:	2500VAC 1 minute			
Working Voltage:	690VAC; 1100VDC			
Isolation Resistance:	> 2 MΩ			
Overload:	x in10 sec; x in 1 s			
Environmental:	0 °C - 60 °C			
Thermo watch:	58°C-110°C; 20A@240VAC			
Cooling (standard)	Freshwater			
Working pressure	6 Bar			
Test pressure	10 Bar			

PULSE LOAD

The curves show the pulse load ability compared to the nominal load for the resistors under the following conditions: The load is a periodic pulse load with a constant **period time** of 120 sec and a pulse width from one second to 40 sec. The elements are 40 OHM



For further optimization DANOTHERM offers individual thermal electric circuit models for all types and ohm values. With these models the temperature of the resistor wire during any pulse load conditions can be simulated with a standard soft ware like P-Spice. Alternatively Danotherm offers to make thermal simulation for our customers

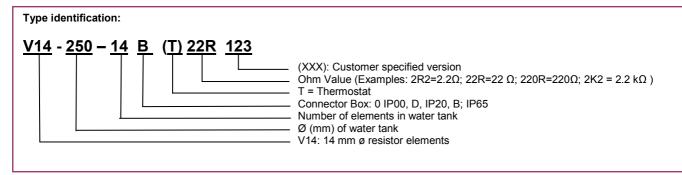
Mechanical Data 125 80 570 1597 1236 300 120 1568 1415 356 1209 1174 185 165 165 154 8

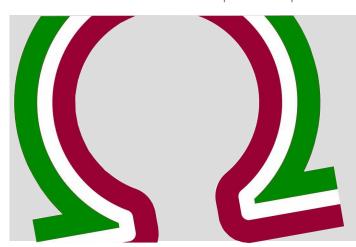
V14-350-28-BT XXR XXX

V14-250-16-BT XXR XXX

V14-150-08-BT XXR XXX

210 Kg	140 Kg	110 Kg	
310Kg	190 Kg	130 Kg	
418 kJ/K	209 kJ/K	85kJ/K	
130 l/min	70 l/min	35 l/min	
DN 65	DN50	DN50	
	310Kg 418 kJ/K 130 l/min	310Kg 190 Kg 418 kJ/K 209 kJ/K 130 l/min 70 l/min	





WHDN

Stainless steel high power **Water cooled Resistor** 25kW - 1.3MW



brake resistors for winches, steering an propulsion (dynamic positioning). Depending on the needed power rating the WHDN resistors have a tank with a diameter ranging from 100mm to 300mm. The length is also dependent on the requested power rating and can be up to 3000mm. In same power ratings you may choose between a short resistor with a large diameter or vice versa. WHDN resistors tomer specifications. are cooled with fresh water or a mixture of water-glycol. Depending on the water flow a suitable size water connector is selected. In principle, any water connection style the customer desires can be used.

The WHDN style resistors are mainly used in marine applications as Inside the water tank a number of steel tube resistor elements are fitted. This way a simple star or delta configuration is possible but also a load bank with different power steps.

> The connections are done in a stainless steel connection box. The number and size of the cable glands can be according cus-

> The WHDN resistors are made completely from stainless steel, for salty environments we recommend to use AISI316 steel.



WHDN steel tube resistors are used in applications for winches, steering systems and propulsion systems. Because of there high continuous load capability they are also used in dynamic position systems.

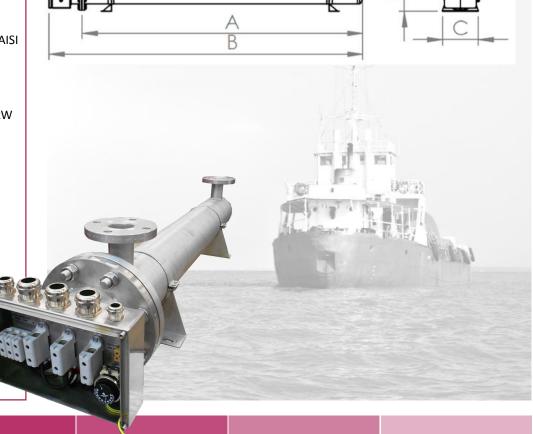
Construction

Inside a stainless steel tank steel tube resistor elements are fitted. The elements are sealed with special epoxy resin to ensure high and stable resistor insulation values. The tank is fitted with water connection flanges than can be made in any style, according to the customers specifications. A special circulation system forces the water flow to be as effective as possible for optimum cooling.

Main characteristic are:

- Construction made completely in AISI 304 or AISI316
- Protection degree IP66
- Continuous power range from 25kW to 1.3MW
- Operated pressure 12 bar
- Working voltage up to 1800 VDC.

WHDN							
Туре	Ohm value [Ω] ±5%	Power P _n [kW]	Limit element voltage	Weight [kg]			
WHDN 100	2 - 60	25 - 80	2500	36 - 70			
WHDN 150	2 - 40	80 - 180	2500	110 - 140			
WHDN 200	1 - 30	150 - 450	2500	170 - 220			
WHDN 250	1 - 15	280 - 600	2500	250 - 350			
WHDN 300	1 - 15	600 - 1300	2500	350 - 450			
General Specifications							
Insulation resistance	all types	≥1.000 MΩ @ 5.000 VDC					
	WHDN 300	≥200 MΩ @ 5.000 VDC					
Dielectric strength		3.500 VAC @ 50Hz 1 min					
Protection degree		IP66					
Working pressure	all types	10 bar					
	WHDN 300	8 bar					
Cooling		Water/Water-glycol					
Dimensions	A [mm]	B [mm]	C [mm]	H [mm]			
WHDN 100	1.000 - 1.700	A + 150	220	270			
WHDN 150	1.100 - 2.400	A + 200	300	360			
WHDN 200	1.200 - 3.000	A + 250	350	450			
WHDN 250	1.600 - 3.000	A + 250	410	500			
WHDN 300	1.650 - 2.400	A + 350	450	640			





Danotherm Electric A/S Naesbyvej 20 2610 Roedovre