tyco

Electronics

Power Resistors for High Power and Dynamic Braking

CGS

CITEC

HOLSWORTHY

NEOHM

SIGMA INDUCTORS

Tyco Electronics is one of the major business units of Tyco International Ltd. (NYSE:TYC, LSE:TYI, BSX:TYC). Headquartered in Harrisburg, Pennsylvania, USA, Tyco Electronics is the world's largest passive electronic components manufacturer, and a world leader in cutting-edge wireless technologies, fiber optic active components, and complete power systems. The company has facilities located in 51 countries serving customers in the aerospace, automotive, computer, communications, consumer electronics, industrial and power industries.

Tyco Electronics provides advanced technology products from over thirty well-known and respected product brands, including Agastat, Alcoswitch, AMP, AMP NETCONNECT, Buchanan, CII, CoEv, Critchley, Elcon, Elo TouchSystems, HTS, M/A-COM, Madison Cable, OEG, Potter & Brumfield, Raychem, Schrack, Simel and TDI Batteries.

power resist

Model CJS

Tyco Electronics' already impressive product portfolio now includes a comprehensive range of innovative power resistors, in wirewound, thick-film, foil and thin film technologies. Key markets cover rail, aerospace, HVDC, automotive, marine and industrial. The industrial market comprises motion control, drives and inverters, power supplies, general industrial electronics and induction furnaces.

Standard products, custom designs and complete resistor assemblies are available, in power ranges from 10W to 1500W. Delivering cutting edge solutions, Tyco Electronics' power resistor solutions encompass products that incorporate an integral heatsink to meet the more demanding requirements of the power switching industry, resistors for braking drives applications offered as drop-in replacements to competitive products, braking resistors from 500 to1500W that eliminate the need for heatsinks, as well as a range of foil technologies that target heavy duty applications that require higher pulse ratings.

High power resistor products are manufactured in a state-of-the-art factory based in the Czech Republic, providing Tyco Electronics with a strategic, centralised facility that caters to the European market.

ors

Models Avaiable

- CJS
- BPR
- TJH
- CFH
- ME/TG
- R3000

Model R3000

Model HS/HPV

Model BDS

Model BPR

- HS/HPV
- BDR
- BDS
- R5000
- MRF
- HVR

MODEL CJS

The CJS is a mineral filled, aluminium housed resistor designed for both braking of drives and for high power loads.
The case can be internally earthed for extra safety.

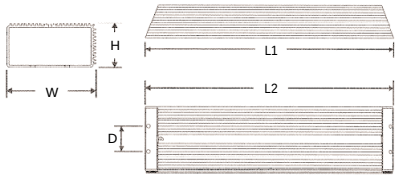
- **Designed for dynamic braking**
- **Fully insulated and sealed**
- **Low inductance possible**
- **Fastons or wire leads**
- **Custom designs welcome**

General Specifications

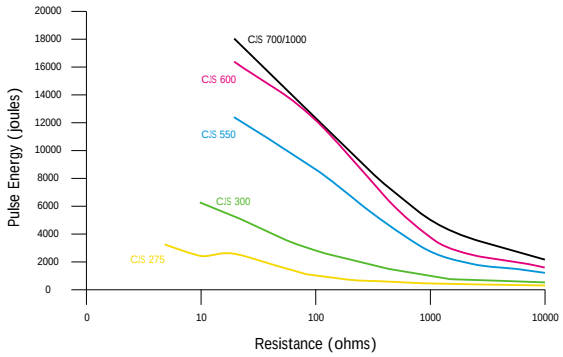
	CJS 275	CJS 300	CJS 550	CJS 600	CJS 700	CJS 1000
Power on Heatsink (W)	275	300	550	600	700	1000
Power Free Air (W)	175	225	325	450	525	525
Resistance Range	5RO-7K5	10R-13K	20R-26K	20R-32K	20R-32K	20R-36K

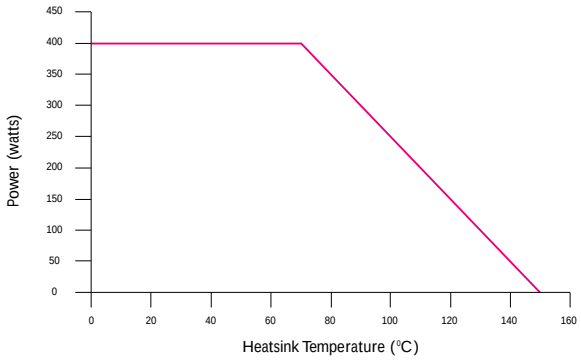
Dimensions (all mm and approximate)

	L1	L2	H	W	D	W (g)
CJS 275	200	190	55	58	-	1050
CJS 300	280	270	55	58	-	1500
CJS 550	280	270	55	84	40	2200
CJS 600	340	330	54	84	40	2750
CJS 700	400	390	52	103	40	3800
CJS 1000	400	385	103	52	30	3800



Pulse Energy versus Resistance





Characteristics

Standard Resistance Tolerance	±5% (others by request)
Long Term Stability	< 5% over 1000 hours - 1.5 hours on 0.5 hours off
Temperature Coefficient	±150ppm/°C
Insulation Voltage	5.0 kV or AC peak
Insulation Resistance	100M ohms at 250V
Element Voltage	3 kV AC, RMS max (do not exceed when applying pulse overload)
Short Time Overload	100 x 1 second, 20 x 5 seconds, 10 x 10 seconds (not 275 and 1000)

MODEL BPR

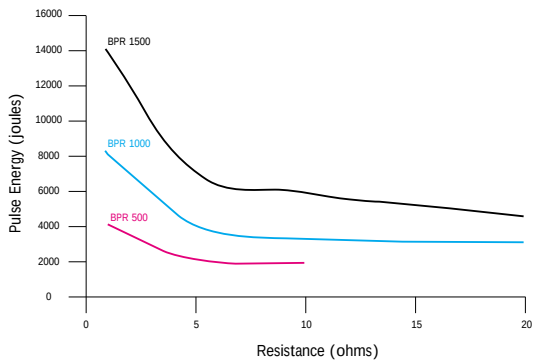
The BPR is a high power resistor designed for braking drives in cranes or lifts where no heatsinking is available.
Low ohmic bulk foil versions are available to order.

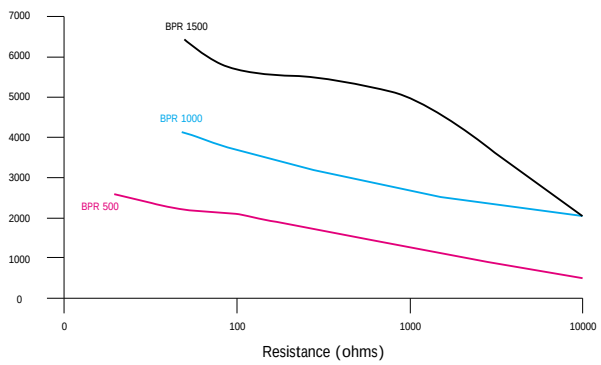
- **Designed for dynamic braking**
- **Up to 1500 watts continuous power**
- **Up to 14000 joules at 1 ohm**
- **No heatsink necessary**
- **Custom designs welcome**

General Specifications			
	BPR 500	**BPR 1000**	**BPR 1500**
Resistance Range	1 ohm - 25K ohms	1 ohm - 47K ohms	1 ohm - 60K ohms
Resistance Tolerance	±10%	±10%	±10%
Continuous Rated Power	500 watts	1000 watts	1500 watts
Stability at Rated Power	R < 4% in 1000 hours, R < 6% in 2000 hours		
Surface Temperature		330°C (at rated power)	
Maximum Working Voltage		2000v dc / ac rms	

Dimensions (all mm and approximate)			
	Length	Width	Height
BPR 500	200	100	60
BPR 1000	350	100	60
BPR 1500	500	100	60

Pulse Energy versus Resistance





Characteristics	
Operating Temperature	-55°C to +350°C
Humidity Withstand	Sealing to IP64 optional
Cooling	Standard cooling by natural air convection
Housing	Aluminium (anodised)
Insulation	mica
Element	ni / cr or cu / ni

MODEL TJH

The TJH range of resistors is an aluminium housed wirewound power resistor and has been designed to withstand high adiabatic pulses for its size. They have a high power dissipation capacity with the appropriate heatsink and a high protection grade (IP54).

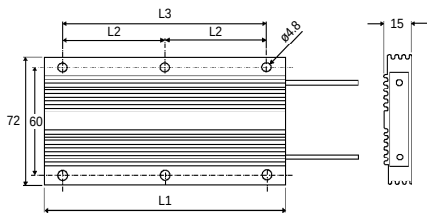
For the TJH 250 an overload pulse of 2000 watts for 2 seconds was applied on a 2% cycle. That is on for 2 seconds and off for 98 seconds.

General Specifications

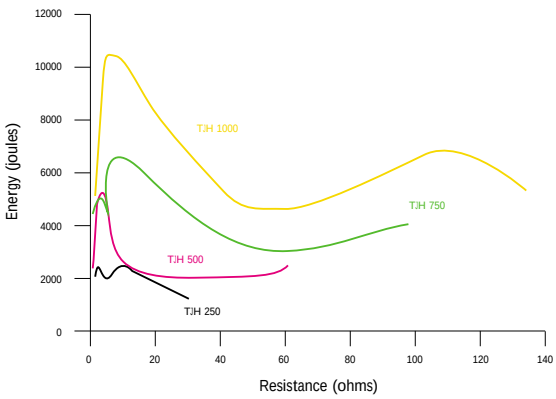
	TJH 250	TJH 500	TJH 750	TJH 1000
Power Rating	250W	500W	750W	1000W
Max Free Air (Without Heatsink)	100W	200W	200W	240W
@ Case Surface Temperature	220°C	270°C	220°C	220°C
Resistance Range	1-30R	1-60R	1-100R	1-130R
Standard Tolerance	±10%	±10%	±10%	±10%
Insulation Voltage ACrms	3KV	3KV	3KV	3KV
Insulation Resistance GOhm	< 500	< 500	< 500	< 500
Series Inductance µH	3.2	5.4	6.1	6.5
Overload Rating	20 x rated power for 1 second every minute			
Overload Rating	4 x rated power for 5 seconds every minute			
Heatsink Rating				0.38°C/W

Dimensions (all mm and approximate)

	L1	L2	L3
TJH 250	110		90
TJH 500	190	85	
TJH 750	270	125	
TJH 1000	350	165	



Adiabatic Pulse Power (Duration <0.2sec)



MODEL CFH

The CFH is a range of high power braking resistors with a mineral filling to IP65. Special technology is used for the element material leading to very high energy absorbsion capabilities in short pulses.

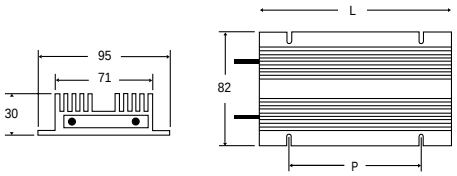
- **Up to 2200 watts on heatsink**
- **24000 joules braking capacity**
- **Up to 4kV element voltage**
- **Low inductance versions possible**
- **Four versatile sizes (3 illustrated)**

General Specifications

	CFH 500	CFH 750	CFH 1100
Resistance Values ±5%	R5-18K ohms	R5-27K ohms	R5-27K ohms
Continuous Power (watts)	500 W	750 W	1100 W
Temperature Rise	375°C	375°C	385°C
Continuous Power with Heatsink	850 W	1300 W	1800 W
Continuous Power with Water Cooled Heatsink	1000 W	1500 W	2200 W

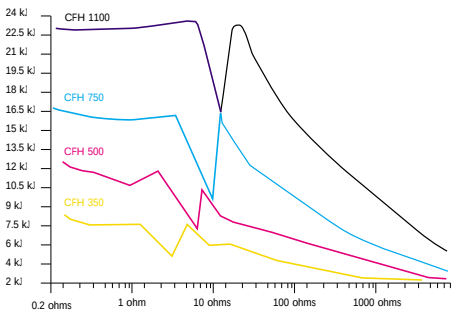
Dimensions (all mm and approximate)

	Package Length (L)	Mounting Hole Pitch (P)
CFH 500	160	110
CFH 750	220	140
CFH 1100	320	240



General Specifications

	CFH 500	CFH 750	CFH 1100
Absorbed Energy at 250°C Δ t	70000 J	100000 J	150000 J
Absorbed Energy (5 second overload)	28000 J	40000 J	60000 J
Inductance at 1000hz	7-70µh	10-100µh	20-200µh
Limiting Element Voltage	2.5kV	3.5kV	4.0kV
Parasitic Capacitance (1-100 khg) pf	300-75	450-120	500-200
Insulation Resistance (100vdc)	> 10000 M ohm	> 10000 M ohm	> 10000 M ohm



MODEL ME/TG

These tubular resistors are designed for dissipating high power within limited overall dimensions. The nickel-chrome winding is completely protected by several coats of cement or enamel, which are fired to produce a resistor, capable of withstanding adverse conditions.

- **Enamel or cement coating**
- **To 750 watts continuous**
- **Adjustable or ferrule ends**
- **Tape wound for pulse duty**
- **Custom designs welcome**

Dimensions (all mm and approximate)

	M 30	M 40	M 45	M 60 L	M 60 S	M 90 L	M 90 S
Tube Length	51	102	51	89	70	165	102
Tube Diameter	20	20	33	23	33	23	33

	M 130	M 150	M 180	M 220	M 320	M 380
Tube Length	152	178	216	267	267	305
Tube Diameter	34	34	34	34	47	47

Standard & Tapped

	Watts (380°C)	Values
ME 30	35	2R2-5K0
ME 40	65	4R7-10K
ME 45	65	4R7-10K
ME 60 L	70	4R7-10K
ME 60 S	70	4R7-10K
ME 90 L	125	10R-22K
ME 90 S	125	10R-22K
ME 130	175	10R-22K
ME 150	195	12R-22K
ME 220	230	22R-22K
ME 320	320	22R-22K
ME 360	450	33R-22K
ME 380	500	47R-22K

Extra fixed tappings, with terminal bands protected by vitreous coating are available in a majority of the sizes above

Low Ohmic - Tape Wound

	Watts (380°C)	Values
MT 30	44	RO2-2R0
MT 40	80	R15-4R5
MT 45	80	R20-4R5
MT 60 L	90	R20-4R5
MT 60 S	90	R20-4R5
MT 90 L	185	R30-9R0
MT 90 S	185	R30-9R0
MT 130	215	R70-9R0
MT 150	245	R80-10R
MT 220	285	1R0-20R
MT 320	400	1R0-20R
MT 360	580	1R5-30R
MT 380	625	1R5-30R

On this type of resistor, the continuous power rating can be approximately 20% greater than that of the equivalent size type 'ME' wirewound

Adjustable Resistors

	Watts (380°C)	Values
MA 30	35	2R2-5K0
MA 40	65	4R7-10K
MA 60 L	70	4R7-10K
MA 60 S	70	4R7-10K
MA 90 L	125	10R-22K
MA 90 S	125	10R-22K
MA 130	175	10R-22K
MA 150	195	12R-22K
MA 180	230	22R-22K
MA 220	320	22R-22K
MA 320	450	33R-22K
MA 380	500	47R-22K

Enamelled resistors are available with an adjustable tapping clip which can be moved along the tube creating a variable resistance

Ferrule End Resistors

	Watts (380°C)	Values
MF 30	35	2R2-5K0
MF 40	65	4R7-10K
MF 60 L	70	4R7-10K
MF 60 S	70	4R7-10K
MF 90 L	125	10R-22K
MF 90 S	125	10R-22K
MF 130	175	10R-22K
MF 150	195	12R-22K
MF 180	230	22R-22K
MF 220	320	22R-22K

Flexible wire ends can be taken into live ferrule ends. We can also offer dead ferrule ends (type MD)
Special mounting clips are needed

MODEL R5000 SERIES

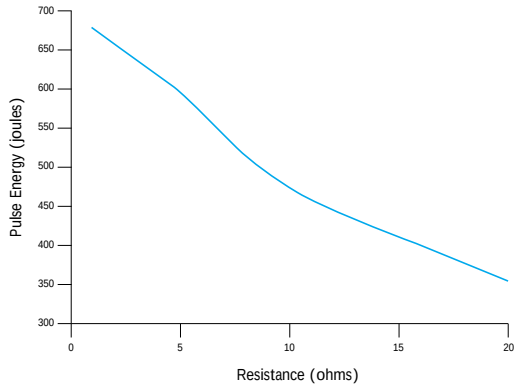
A small neat low profile braking resistor designed for a high power to size ratio. Custom designs are possible. Internal fusing can be offered as standard. The unit can be sealed.

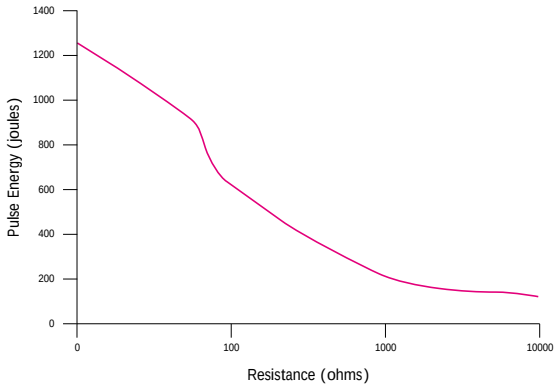
- **Designed for dynamic braking**
- **Low profile, internally fused**
- **250 watts at 20°C heatsink**
- **1244 joules at 10 ohm resistance**
- **Custom designs welcome**

General Specifications	
Resistance Range	R05 to 10K
Resistance Tolerance	±10%
Power Rating	250 watts at 20°C (with heatsinking)
Isolation Voltage	500 volts DC or AC peak (can be uprated)
Working Voltage	500 volts DC or AC peak
Temperature Coefficient	20ppm/°C to 150ppm/°C (to design)
Electrical Stability	ΔR5% after 1000 hours at full power
Inductance	< 1µh
Current Capability	5 amps continuous pulsing (wave form specified)
Fuse Rating (where fitted)	Fuses at over 3 times current within 5 seconds

Dimensions (all mm and approximate)			
	Length	Width	Height
	180	41	9

Pulse Energy versus Resistance





	Characteristics
Terminal Strength	5KG pull strength
Casing	Anodised aluminium
Element	Nickel chromium, nickel copper or stainless steel
Seal	Silicone (by request)
Thermal Shock Withstand	-50°C to ±125°C
Humidity Withstand	96% RH at 40°C - 56 days (sealed versions)

MODEL HS/HPV

The HS is the flagship product for Tyco Electronics Components. Power ratings from 5 watts to 1000 watts (with suitable heatsink).
Extended voltage creep and high working voltages.
Custom designs welcome.

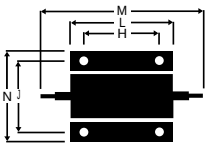
- **12 convenient sizes**
- **High insulation voltages**
- **Bs - cecc approved**
- **Available from distribution**
- **Custom designs welcome**

General Specifications

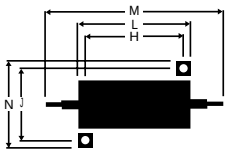
	Power Dissipation at 25°C		Ohmic Value		Std max working voltage* (dc/ac rms)	Dielectric Strength (ac peak)	Stability (% resistance)	Surface Temp. Rise mounted on standard heatsink
	With Heatsink	Without Heatsink	Minimum	Maximum	Voltage	Voltage	Change 1000 hrs	°c/w
HSA 5	10	5.5	R051	10K	160	1400	1	5.5
HSA 10	16	8	R051	15K	265	1400	1	5.0
HSA 25	25	12.5	R051	36K	550	2500	1	4.4
HSA 50	50	20	R051	86K	1250	2500	1	2.9
HSC 75	75	45	R10	50K	1400	5000	2	1.2
HSC 100	100	50	R10	75K	1900	5000	2	1.1
HSC 150	150	55	R10	100K	2500	5000	2	1.0
HSC 200	200	50	R10	50K	1900	5000	3	0.75
HSC 250	250	60	R10	68K	2200	5600	3	0.65
HSC 300	300	75	R10	82K	2500	5600	3	0.61
HPV 500	500	100	R5	32K	2500	4800	3	0.6
HPV 1000	1000	200	IR0	50K	2500	4800	3	0.6

* can be uprated

Dimensions (all mm and approximate)



HSA 75 - HSC 150



HSA 5 - 50

	HSA 5	HSA 10	HSA 25	HSA 50	HSC 75	HSC 100	HSC 150	HSC 200	HSC 250	HSC 300	HPV 500	HPV 1000
H ± 0.3	11.3	14.3	18.3	39.7	29.0	35.0	58.0	35.0	44.5	52.0	76.2	97.0
J ± 0.3	12.4	15.9	19.8	21.4	37.0	37.0	37.0	57.2	57.2	59.0	63.5	63.5
L max	17.0	21.0	29.0	51.0	49.0	65.5	98.0	90.0	109.0	128.0	136.0	225.0
M max	30.0	36.5	51.8	72.5	71.0	87.5	122.0	143.0	163.0	180.0	225.0	365.0
N max	17.0	21.0	28.0	30.0	47.5	47.5	47.5	73.0	73.0	73.0	78.0	78.0
P max	9.0	11.0	15.0	17.0	26.0	26.0	26.0	45.0	45.0	45.0	57.0	57.0

MODEL BDR

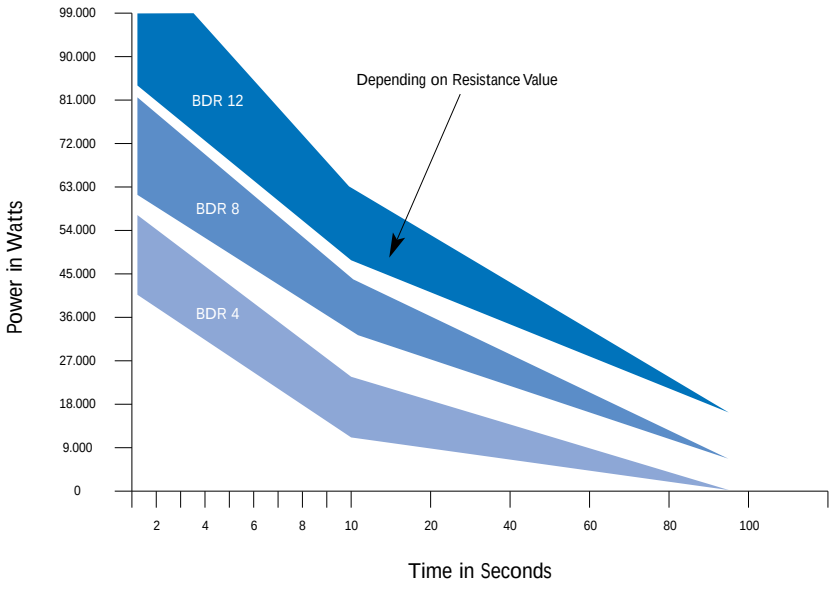
The BDR is suitable when continuous power up to 12000 watts is needed to load banks. A white ventilated box will include one or more resistors in a group. High braking loads are also possible.

- **Dissipates up to 12000 watts**
- **Overloads up to 60000 watts**
- **High continuous current**
- **Designed for dynamic braking**
- **Custom designs welcome**

General Specifications			
	BDR 4	**BDR 8**	**BDR 12**
Dielectric Strength	4500V rms	4500V rms	4500V rms
Rated Power	4000 W	8000 W	12000 W
Insulation Resistance	> 10000 MΩ	> 10000 MΩ	> 10000 MΩ
Resistance Values ±5%	2R-150R	2R-150R	2R-150R
Overload	5 times rated power for 5 seconds		

Dimensions (all mm and approximate)			
	Length	Width	Height
BDR 4	600	100	250
BDR 8	600	160	250
BDR 12	600	200	250

Overload versus Application Time



MODEL BDS

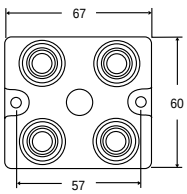
The BDS is a non-inductive thick film power resistor offering continuous powers up to 400 watts (on a suitable heatsink).
A modern functional package, with high voltage insulation and an excellent partial discharge rating.

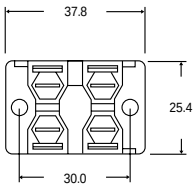
- **Values R47 to 1 meg ohm**
- **Voltage single shot 12KV**
- **Options for internal circuitry**
- **Non-inductive for fast switching**
- **Available from distribution**

General Specifications

	250 / 400 Watts	100 Watts (to 227)
Resistance Range	0R47-1M (4 terminal below 1R)	0R20-1M (4 terminal below 1R)
Resistance Tolerance	±10%, 5% (tighter by discussion)	±10%, 5% (tighter by discussion)
t.c.r. - R > 1 ohm	250 ppm°C	250 ppm°C
t.c.r. - R < 1 ohm	150 ppm°C	150 ppm°C
Rated Power Heatsink Temperature at 100°C	250 watts (400 watts) at 70°C	100 watts at 60°C max heatsink
Parallel Capacitance	40 pf	40 pf
Capacitance to Earth	120 pf	120 pf
Series Inductance	40 nH maximum	40 nH maximum
Limiting Element Voltage	5kv max dc/ac rms	2.5kv dc/ac rms
Isolation Voltage (terminal to heatsink)	7 kv dc/ac rms	2.5 kv dc/ac rms
Single shot 1.5/50µs	up to 12 kv	4.0 kv
Insulation Resistance at 500V DC	> 100g ohms	> 100g ohms
Partial Discharge	< 5pC at 7 kv	< 10pC at 2.5 kv

Dimensions (all mm and approximate)



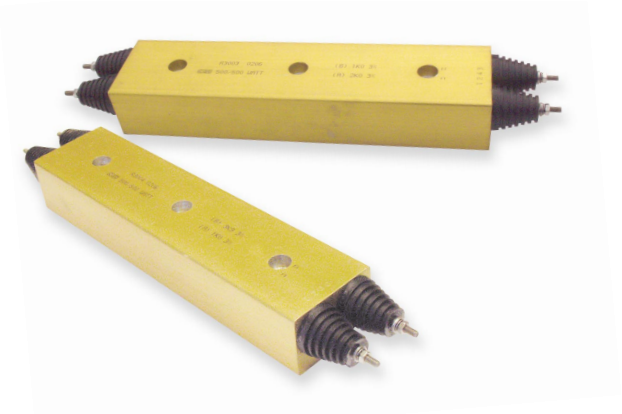


Characteristics

Endurance (rated power)	2000 cycles at rated power 30m/30m	Δ R 0.25% typically
Humidity Load Life	56 days, 40°C, 95%rh	Δ R 0.25% typically (i.r. 10g Ω)
Temperature Cycling	-55°C to +125°C, 5 cycles	Δ R 0.25% typically
Operating / Storage Temperature	-55°C to +125°C	
*Short Term Overload	3 times rated power, 10 seconds	Δ R 0.25% typically *(4 times to order)
Vibration	10/500 hz	Δ R 0.25% typically
Bump	40g 4000	Δ R 0.25% typically

HIGH POWER LOW PARTIAL DISCHARGE

MODEL R3000



This resistor has been designed for protecting thyristors from transient overloads in h.v.d.c valves. It is a rugged high power device and with a heatsink kept at 75°C can easily dissipate 1000 watts continuously. It has 12000v impulse withstand and very low inductance and capacitance. The resistor value is 44 ohms.

LOW PROFILE, HIGH BRAKING POWER

MODEL MRF

A range of high power to size resistors encapsulated in metal enclosures to IP33 and suitable for use in inverters. A 0.5°c/w heatsink will allow continuous powers up to 1300 watts and adiabatic pulsing of more than 8000 joules in a package just 195mm x 174mm x 13mm.
(yes, 13mm high!)

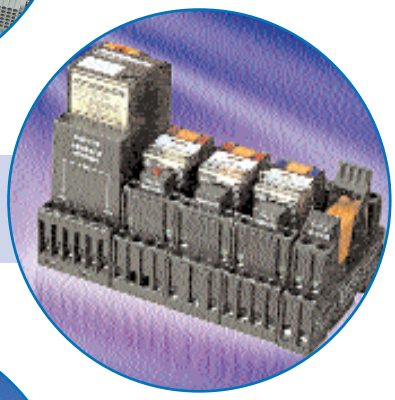
HIGH VOLTAGE, HIGH POWER, TUBULAR

MODEL HVR

High voltage resistors between 2k ohms and 1000meg ohms capable of operating at 100 watts with a voltage rating of 50kv (in oil). these are manufactured using thick film technology so very low inductance is possible. Tubes are up to a maximum of 50mm diameter and a maximum of 240mm long. Tyco Electronics Components also offer high voltage resistors in flat plate and axial formats.

ASSOCIATED PRODUCTS

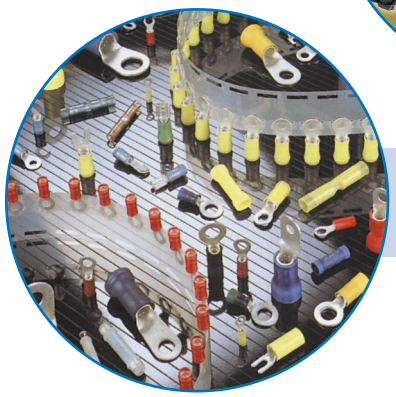
HTS Heavy Duty Connectors



Schrack Relays

Wire and Cables

Passive Components



Amp Terminals and Splices

NOTES

tyco / Electronics

Worldwide Companies

Americas

Argentina - Buenos Aires
Phone: +54-1-733-2000
Fax: +54-1-717-0988

Brazil -Sao Paulo
Phone: +55-11-861-1311
Fax: +55-11-861-0397

Canada - Toronto
Phone: +1-905-475-6222
Fax: +1-905-474-5520

Chile - Santiago
Phone: +56-2-739-1230
Fax: +56-2-739-1227

Columbia - Bogota
Phone: +57-1-231-9398
Fax: +57-1-240-3769

Mexico - Mexico City
Phone: +52-5-729-0400
Fax: +52-5-361-8545

United States - Harrisburg, PA
Phone: +1-717-564-0100
Fax: +1-717-986-7575

Venezuela - Caracas
Phone: +58-2-986-7774
Fax: +58-2-986-9739

For Latin/South American Countries not shown
Phone: +54-11-4733-2015

Asia/Pacific

Australia - Sydney
Phone: +61-2-9840-8200
Fax: +61-2-9899-5649

India - Bangalore
Phone: +91-80-841-0200
Fax: +91-80-840-0210

Indonesia - Jakarta
Phone: +6221-526-7852
Fax: +6221-526-7856

Japan -Tokyo
Phone: +81-44-844-8111
Fax: +81-44-812-3207

Korea - Seoul
Phone: +82-2-3274-0535
Fax: +82-2-3274-0524/0531

Malaysia - Selangor
Phone: +60-3-7053055
Fax: +60-3-7053066

New Zealand - Auckland
Phone: +64-9-634-4580
Fax: +64-9-634-4586

Philippines - Makati City
Phone: +632-867-8641
Fax: +632-867-8661

People's Republic of China
Hong Kong
Phone: +852-2735-1628
Fax: +852-2735-0243

Shanghai
Phone: +86-21-6485-0602
Fax: +86-21-6485-0728

Shunde
Phone: +86-765-775-1368
Fax: +86-765-775-2823

Singapore - Singapore
Phone: +65-482-0311
Fax: +65-482-1012

Taiwan - Taipei
Phone: +886-2-2325-0391
Fax: +886-2-2325-0398

Thailand - Bangkok
Phone: +66-2-955-0500
Fax: +66-2-955-0505

Vietnam - Ho Chi Minh City
Phone: +84-8-8232-546/7
Fax: +84-8-8221-443

Europe/Middle East/Africa

Austria - Vienna
Inside:
Phone: +(0222) 277-97-0
Fax: +(0222) 277-97-333
Outside:
Phone: +43-1-277-97-0
Fax: +43-1-277-97-333

Belgium - Kessel-Lo
Phone: +32-16-352-300
Fax: +32-16-352-352

Bulgaria - Sofia
Phone: +359-2-971-2152
Fax: +359-2-971-2153

Croatia - Zagreb
Phone: +385-1-67-04-46
Fax: +385-1-69-16-04

Czech Republic - Kurim
Phone: +420-5-41-162-111
Fax: +420-5-41-162-223

Denmark - Viby
Phone: +45-86-295-055
Fax: +45-86-295-133

Egypt - Cairo
Phone: +20-2-417-76-47
Fax: +20-2-419-23-34

Estonia - Haabneeme
Phone: +372-6205-900
Fax +372-6205-980

Finland - Helsinki
Phone: +358-9-512-34210
Fax: +385-9-512-34250

France - Cergy - Pontoise
Phone: +33-1-3420-8888
Fax: +33-1-3420-8600

France
AMP Export - Pontoise
Phone: +33-1-3420-8383
Fax: +33-1-3420-8609 or
+33-1-3420-8662

France
SIMEL - Gevrey-Chambertin
Phone: +33-3-8058-3200
Fax: +33-3-8058-3200

Germany - Bensheim
Phone: +49-6251-133-0
Fax: +49-6251-133-600

Germany
HTS - Neunkirchen
Phone: +49-2247-305-0
Fax: +49-2247-305-122

Great Britain - London
Phone: +44-208-954-2356
Fax: +44-208-954-6234

Greece - Athens
Phone: +30-1-9370-396/397
Fax: +30-1-9370-655

Hungary - Budapest
Phone: +36-1-289-1000
Fax: +36-1-289-1010

Ireland - Dublin
Phone: +353-1-820-3000
Fax: +353-1-820-9790

Israel - Tel Aviv
Phone: +972-3-649-1482
Fax: +972-3-648-4041

Italy - Torino
Phone: +39-011-401-2111
Fax: +39-011-403-1116

Lithuania - Vilnius
Phone: +370-2-231-402
Fax: +370-2-231-403

Holland - 's-Hertogenbosch
Phone: +31-73-6246-246
Fax: +31-73-6212-365

Norway - Nesbru
Phone: +47-66-77-8899
Fax: +47-66-77-8855

Poland - Warsaw
Phone: +48-22-5490-888
Fax: +48-22-5490-880

Portugal - Lisbon
Phone: +351-21-384-58-90
Fax: +351-21-387-71-72

Romania - Bucharest
Phone: +40-1-311-3479/3596
Fax: +40-1-312-0574

Russia - Moscow
Phone: +7-095-926-55-06...09
Fax: +7-095-926-55-05

Slovakia - Banska Bystrica
Phone: +421-88-415-20-11/12
Fax: +421-88-415-20-13

Slovenia - Ljubtjana
Phone: +386-61-161-3270
Fax: +386-61-161-3240

South Africa - Midrand
Phone: +27-11-314-10-89
Fax: +27-11-314-19-10

Spain - Barcelona
Phone: +34-93-291-0330
Fax: +34-93-201-7879

Sweden - Upplands Vasby
Phone: +46-8-50-72-50-00
Fax: +46-8-50-72-50-01

Switzerland - Steinach
Phone: +41-71-447-0447
Fax: +41-71-447-0444

Turkey - Istanbul
Phone: +90-212-281-8181...3
Fax: +90-212-281-8184

Ukraine - Kiev
Phone: +38-044-238-6595
Fax: +38-044-238-6596

Russia - St. Petersburg
Phone: +7-812-325-32-83
Fax: +7-812-325-32-88

http://www.tycoelectronics.com

Revise April 2002 - Catalogue No. 1309349

Tyco Electronics UK Ltd,
Faraday Road, Dorcan, Swindon, Wiltshire. SN3 5HH
Tel: 01425 623406 Fax: 01425 629968
E-mail: moira.ward@tycoelectronics.com