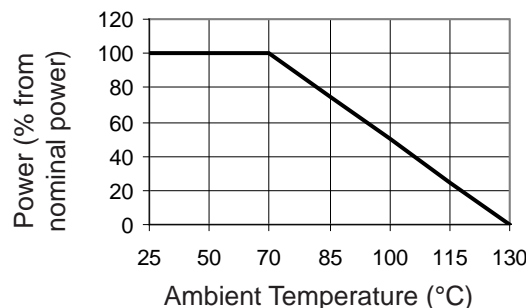


- Resistances from 0.0005Ohm to 100Ohms
- Power Rating to 15Watt
- Resistance Tolerances to $\pm 0.25\%$
- Customized Resistance Values

SPECIFICATIONS

Type	FHR 4-4026H
Resistance Range	0.0005 to 10.0 Ohms
Power rating (70°C)	15 W
Tolerances from 0.0005 Ohms from 0.01 Ohms from 0.02 Ohms	1% 0.5% / 1% 0.25% / 0.5% / 1%
Thermal Resistance	4.0 K/W
max. Current	100 A
Thermal EMF	< 0.1 μ V/K
Operating Temperature Range	-40 to 130°C
Resistor Material	CuNiMn-Foil
Substrate	anodized aluminium
Housing	Al-heatsink
Connector Material	powersocket RM2.54 / 16 pin other contacts upon request
Terminals	4

Derating

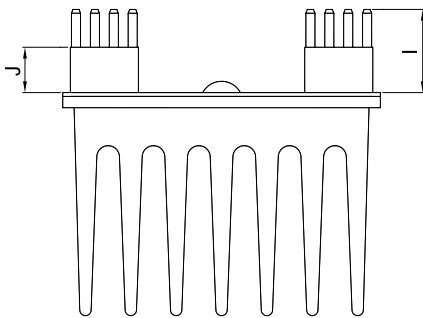
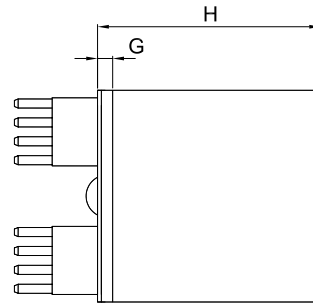
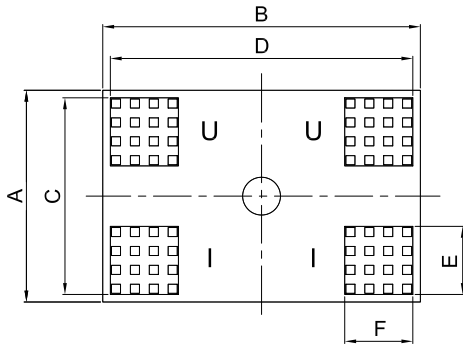


Ordering Information

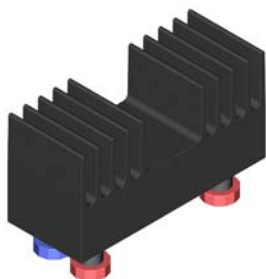
Part Number - Resistance - Tolerance
FHR 4-4026H 0.001 Ohms 1%

SPECIFICATIONS (continued)

Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	28.00	0.2	1.10	0.008
B	42.00	0.3	1.65	0.012
C	26.00	0.2	1.02	0.008
D	40.00	0.3	1.57	0.012
E	9.00	0.2	0.35	0.008
F	9.00	0.2	0.35	0.008
G	2.00	0.1	0.08	0.004
H	29.50	0.2	1.16	0.008
I	11.50	0.2	0.45	0.008
J	6.50	0.2	0.26	0.008



- Resistance Values 0.0001Ohm up to 10kOhms
- Calibration Resistor
- Resistance Tolerances to 0.02%
- Excellent Long-term Stability
- DKD-Calibration as Option

SPECIFICATIONS

Type	CAL 4-40100		
	Resistance Value (Ohms)	Tolerance	max. Current
	0.0001	0.1 %	60 A
	0.0002	0.1 %	60 A
	0.001	0.05 %	30 A
	0.002	0.05 %	30 A
	0.005	0.05 %	20 A
	0.01	0.03 %	15 A
	0.02	0.03 %	10 A
	0.05	0.03 %	5 A
	0.1	0.02 %	5 A
	0.2	0.02 %	3 A
	0.5	0.02 %	2 A
	1.0	0.02 %	1.5 A
	2.0	0.02 %	1 A
	5.0	0.02 %	0.7 A
	10	0.02 %	0.5 A
	20	0.02 %	0.3 A
	50	0.02 %	0.2 A
	100	0.02 %	0.15 A
	200	0.02 %	0.1 A
	500	0.02 %	0.07 A
	1000	0.02 %	0.04 A
	2000	0.02 %	0.02 A
	5000	0.02 %	0.012 A
	10000	0.02 %	0.01 A
Long term stability	0.02% typ. (23°C for 2000h) 0.05% max. (70°C for 2000h)		
Temperature Coefficient	<10 ppm/K (20...60)°C		
Operating Temperature Range	-20...70°C		
Resistor Material	CuNiMn		
Dimensions (WxHxD)	100 x 70 x 40 mm 3.94 x 2.76 x 1.58 inches		
Weight	approx. 230g		

All Calibration Resistors are shipped with a factory certificate / including type / serial number / resistance value and correction factor of measurement. (2×10^{-4} / see DKD-3).

Option DKD

Calibration of a Calibration Resistor at a DKD Calibration Laboratory (supervised by the PTB / Physikalisch Technische Bundesanstalt in Braunschweig) with DKD Calibration Certificate.

Ordering Information

Part Number - Resistance - Tolerance

CAL 4-40100 0.0002 Ohms 0.1%



- Customized Resistance Values
- Power Rating to 5Watt
- Resistance Tolerances to $\pm 0.2\%$
- TCR to $\pm 15\text{ppm/K}$
- Excellent Pulse Handling Capabilities (350J)

SPECIFICATIONS

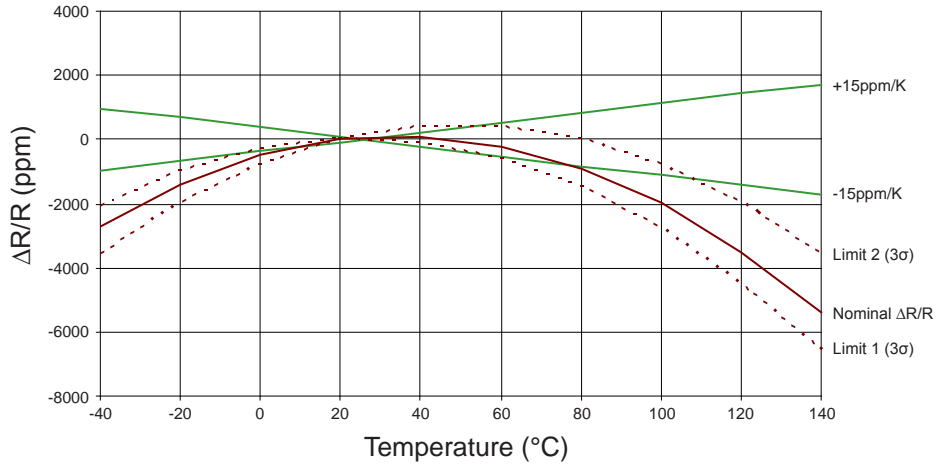
Type	FHR 4-2036D/D
Resistance Range	0.035 Ohms Other values upon request
Power rating (70°C)	5 W
Max. Pulse Energy	350J / 500ms
Tolerances	0.2% Other tolerances upon request
Thermal Resistance	12 K/W
Stability	0.5%
Temperature Coefficient	$\pm 15\text{ppm/K}$ (20 to 60°C)
Insulation Resistance	500 VDC
max. Current	12 A
Thermal EMF	$< 0.1\mu\text{V/K}$
Operating Temperature Range	-40 to 130°C
Resistor Material	CuNiMn-Foil
Substrate	Al
Connector Material	Cu / tinned
Terminals	2

Ordering Information

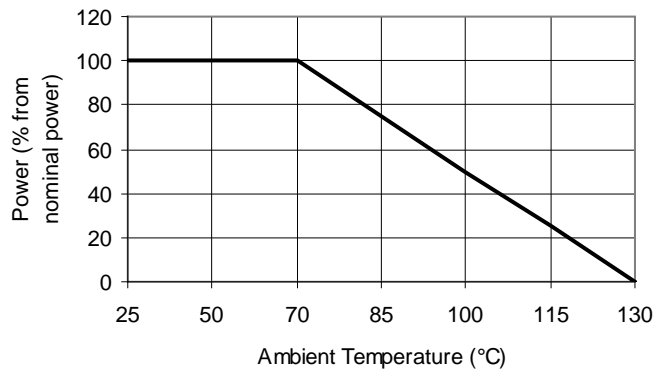
Part Number - Resistance - Tolerance
 FHR 4-2036D/D 0.035 Ohms 0.02%

SPECIFICATIONS (continued)

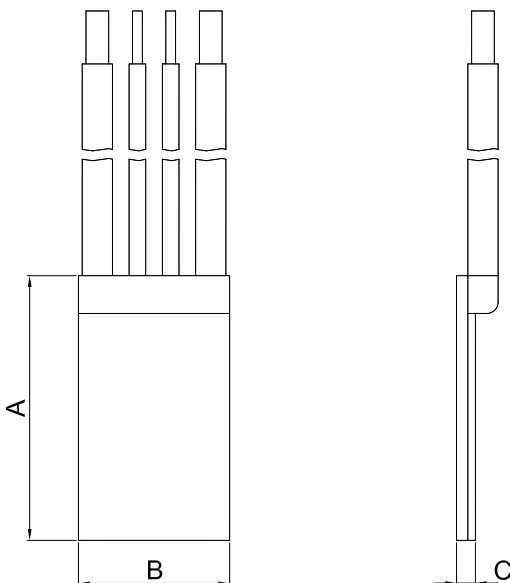
Temperature Coefficient



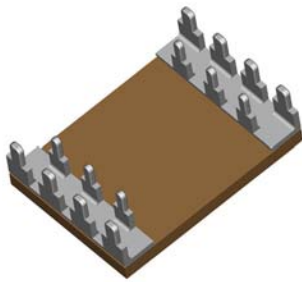
Derating



Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	35.00	0.3	1.38	0.012
B	20.00	0.2	0.79	0.008
C	2.50	0.2	0.10	0.008



- Resistances from 0.001 Ohm to 0.01 Ohms
- Power Rating to 10 Watt
- Resistance Tolerances to $\pm 1\%$
- TCR to $\pm 30\text{ppm/K}$
- Load Stability to 0.5%
- Customized Resistance Values

SPECIFICATIONS

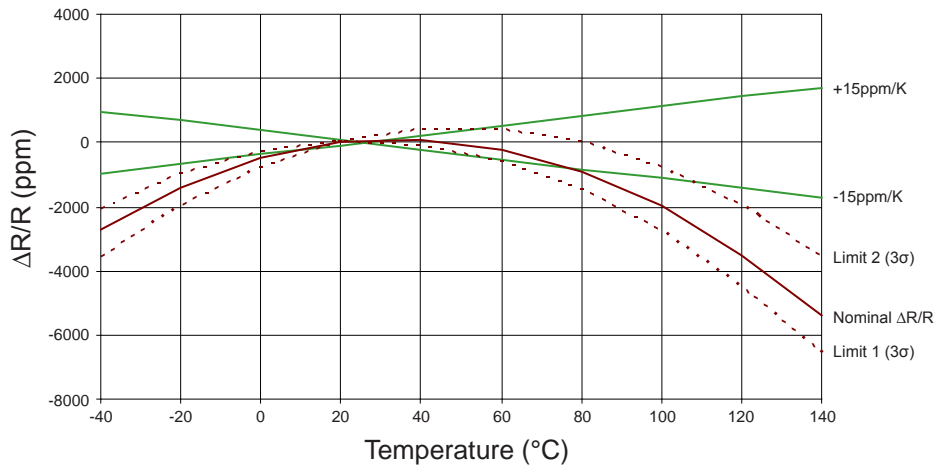
Type	FHR 4-2820H
Resistance Range	0.001 to 0.01 Ohms Other values upon request
Power rating free air 70°C with heatsink	3 W 10 W
Tolerances	1% / 5% Other tolerances upon request
Thermal Resistance	8.0 K/W
Stability	0.5%
Temperature Coefficient	$\pm 30\text{ppm/K}$ (20 to 60°C)
Insulation Resistance	50 VDC
max. Current	100 A
Thermal EMF	$< 0.1\mu\text{V/K}$
Operating Temperature Range	-40 to 130°C
Resistor Material	CuNiMn-Foil
Substrate	anodized aluminium
Connector Material	Cu / tinned
Terminals	4

Ordering Information

Part Number - Resistance - Tolerance
FHR 4-2820H 0.01 Ohms 1%

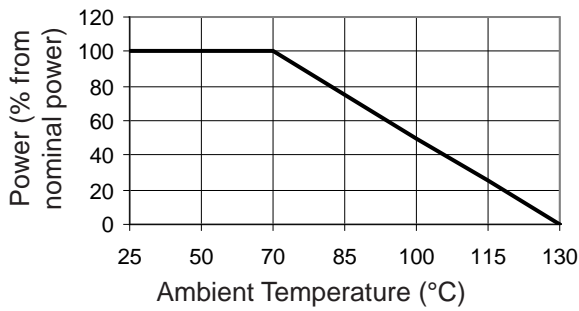
SPECIFICATIONS (continued)

Temperature Coefficient

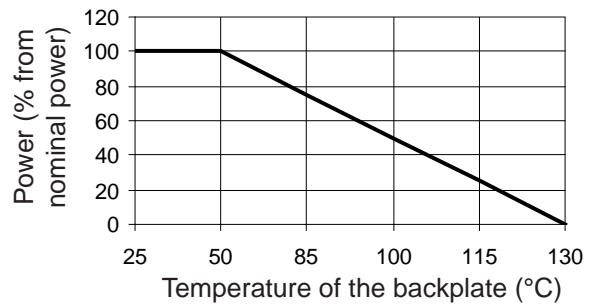


Derating

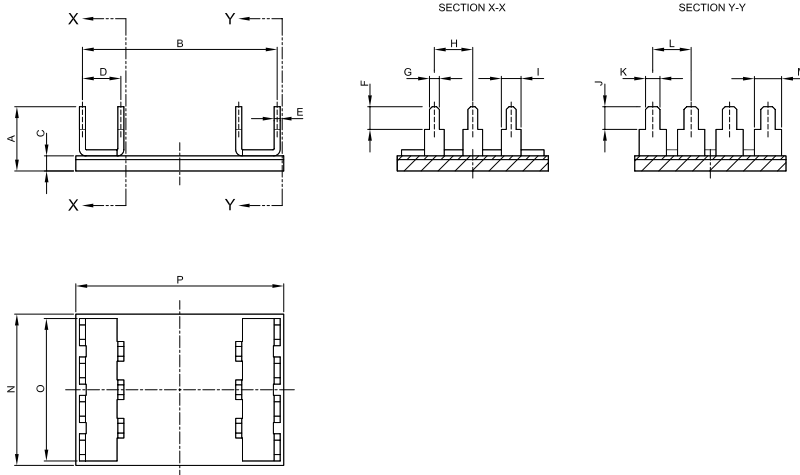
without heatsink



with heatsink



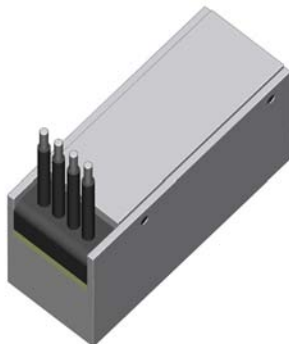
Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	8.50	0.2	0.33	0.008
B	25.75	0.2	1.01	0.008
C	2.00	0.2	0.08	0.008
D	5.08	0.1	0.20	0.004
E	0.80	0.1	0.03	0.004
F	3.00	0.1	0.12	0.004
G	1.30	0.1	0.05	0.004
H	5.08	0.1	0.20	0.004
I	2.60	0.1	0.10	0.004
J	3.00	0.1	0.12	0.004
K	1.90	0.1	0.07	0.004
L	5.08	0.1	0.20	0.004
M	3.60	0.1	0.14	0.004
N	20.00	0.2	0.79	0.008
O	18.84	0.2	0.74	0.008
P	27.50	0.2	1.08	0.008

UHR 4-5020D

Special Resistors



- Resistances from 10Ohm to 40Ohms
- Power Rating to 8Watt
- Resistance Tolerances to $\pm 0.1\%$
- TCR to $\pm 5\text{ppm/K}$
- Load Stability to 0.1%

SPECIFICATIONS

Type	UHR 4-5020D
Resistance Range	1.0 to 40 Ohms Other values upon request
Power rating (70°C)	8 W
Pulse Energy	1 kJ / 1s
Thermal Resistance Rthj-c	10 K/W
Tolerances	0.1% Other tolerances upon request
Stability	0.1%
Temperature Coefficient	$\pm 5\text{ppm/K}$ (-55 to 155°C)
Insulation Resistance	3 kVDC
max. Current	3 A
Thermal EMF	$< 0.1\mu\text{V/K}$
Operating Temperature Range	-55 to 155°C
Resistor Material	NiCr-Foil
Substrate	AlN
Housing	Al
Connector Material	Cu tinned
Terminals	4

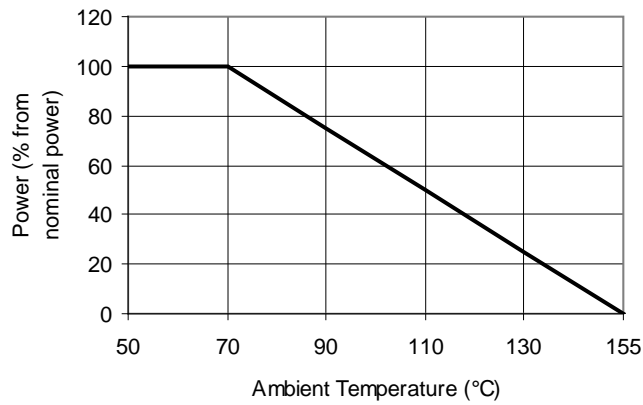
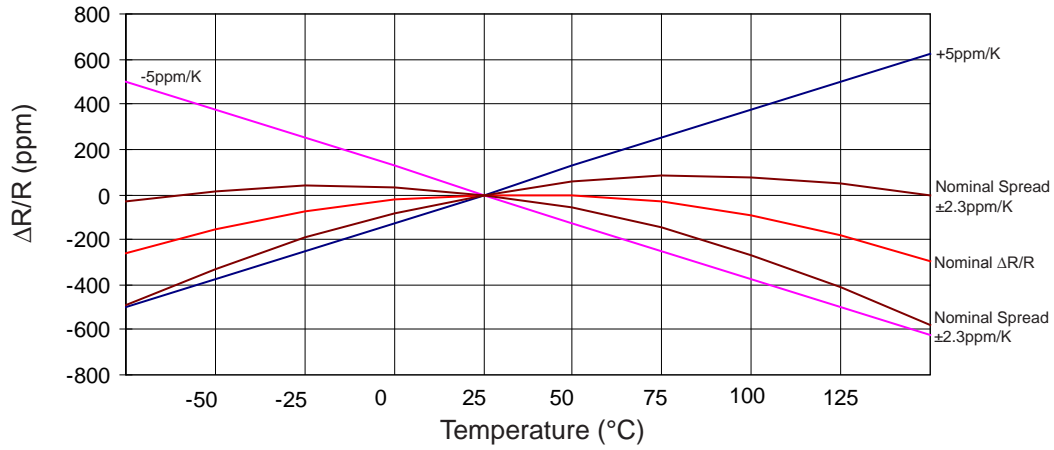
Ordering Information

Part Number - Resistance - Tolerance

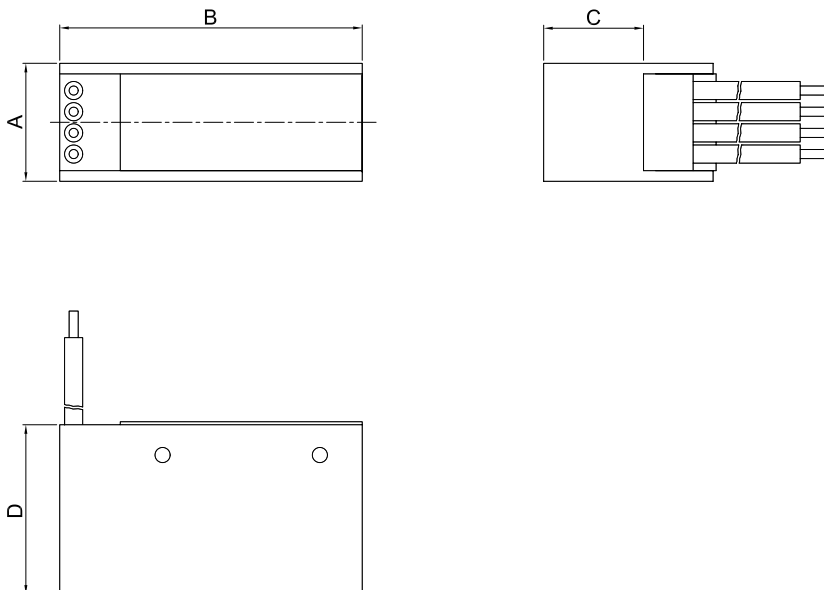
UHR 4-5020D 10Ohms 0.1%

SPECIFICATIONS (continued)

Temperature Coefficient



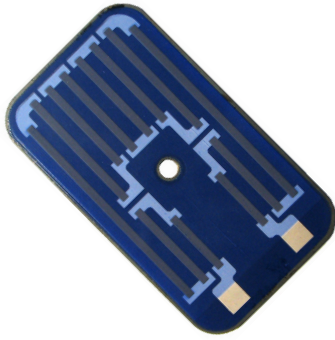
Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	19.50	0.2	0.77	0.008
B	50.00	0.3	1.97	0.012
C	16.50	0.2	0.65	0.008
D	28.00	0.2	1.10	0.008

TFBR Series

Low Profile Power Resistors



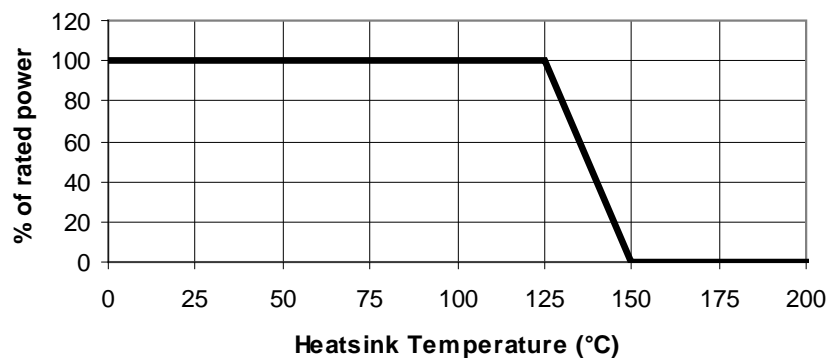
- Resistances from 0.5 to 270 Ohms
- Power Rating to 16000 Watt
- Low inductance

SPECIFICATIONS

Type	TFBR2	TFBR5
Power Rating (W)	100	300
Max. single pulse power (W) (1ms pulse non-repetitive)	8000	16000
Resistance Range (Ω)	0.5 to 270	
Max ΔR at rated pulse load	$\pm 20\%$	
Max. pulse power (W)	2000	5000
Stability after 50000 cycles	$< \pm 5\%$	
Max. resistor temperature ($^{\circ}\text{C}$)	365	
Min. dielectric withstand voltage	250 VDC	
Inductance (typ.)	$< 3\mu\text{H}$	$< 5\mu\text{H}$
Dimensions LxW	60.96 x 40.64 mm [3.78 x 1.6 inches]	122 x 70 mm [4.80 x 2.75 inches]

For tests the resistor was mounted on a heatsink with a thermal resistance of 0.5 K/W air cooled at 15 m/s.

Derating



Ordering Information

Part Number - Resistance
Example: TFBR 100 Ohms

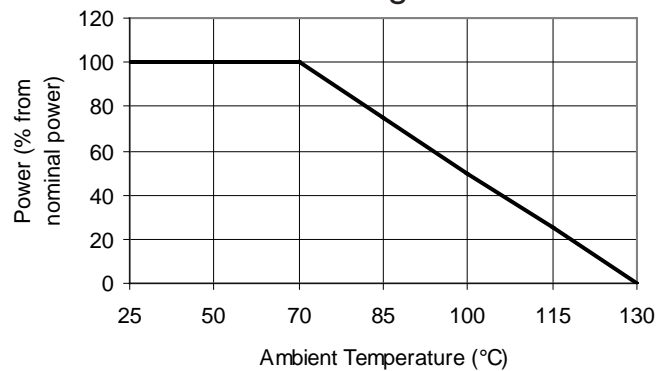


- Resistances from 50 Ohm to 600 kOhms
- Power Rating to 0.25 Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 5 \text{ ppm/K}$
- Load Stability to 0.1%
- Hermetically Sealed

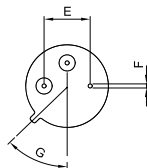
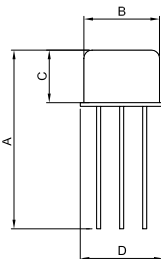
SPECIFICATIONS

Type	WPR 2-TO5
Resistance Range	50 Ohms to 600 kOhms Other values upon request
Power rating (70°C)	0.25 W
Tolerances	0.01% / 0.1% / 0.25% / 0.5% / 1% Other tolerances upon request
Stability	0.1%
Temperature Coefficient	$\pm 5 \text{ ppm/K}$ (-40 to +125°C)
Thermal EMF	$< 0.1 \mu\text{V/K}$
Operating Temperature Range	-55 to 130°C
Resistor Material	NiCr
Connector Material	Cu / gold-coat
Terminals	2

Derating



Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	19.40	1.0	0.76	0.039
B	8.15	0.2	0.32	0.008
C	5.80	0.1	0.23	0.004
D	9.13	0.2	0.36	0.008
E	5.08	0.1	0.20	0.004
F	Ø0.45	0.1	Ø0.018	0.004
G	45°	30'	45°	30'

Ordering Information

Part Number - Resistance - Tolerance WPR 2-TO5 330 Ohms 0.01%

TSC & TVC Series

Tubular Power Wirewound Resistors



- Resistances from 1 to 48kOhms
- Power Rating 5 to 225Watts
- Resistance Tolerances to $\pm 5\%$



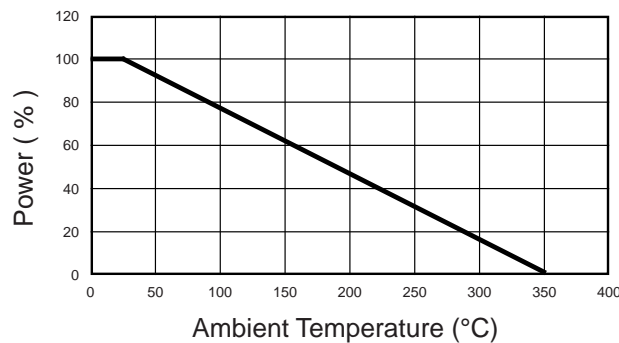
Options:

- Special Tolerances
- Ayrton-Perry / Non-Inductive Windings
- Fixed / Tapped / or Adjustable
- Quick Connect Terminals
- Mounting Brackets

SPECIFICATIONS

Specification	Value
Resistance Range	1 Ω to 48kOhms
Tolerances	$\pm 5\%$ Standard (Call Factory for Other Tolerances)
Temperature Coefficient	>20R : ± 200 ppm/K 1R to 20R : ± 260 ppm/K
Temperature Range	-55°C to +350°C
Dielectric Strength	1000 VAC
Overload	10X Rated Power / 5s

Power Derating Curve



Ordering Information

For Non-Inductive Windings / insert the letter "N" (i.e. TSCN-50)

TSC-50 and larger parts are Available with 0.250 x 0.032 Quick Connect Terminal / Add "QC" to the Part Number.

Push-in friction grip mounting brackets are Available / Add "BKTS" to Part Number

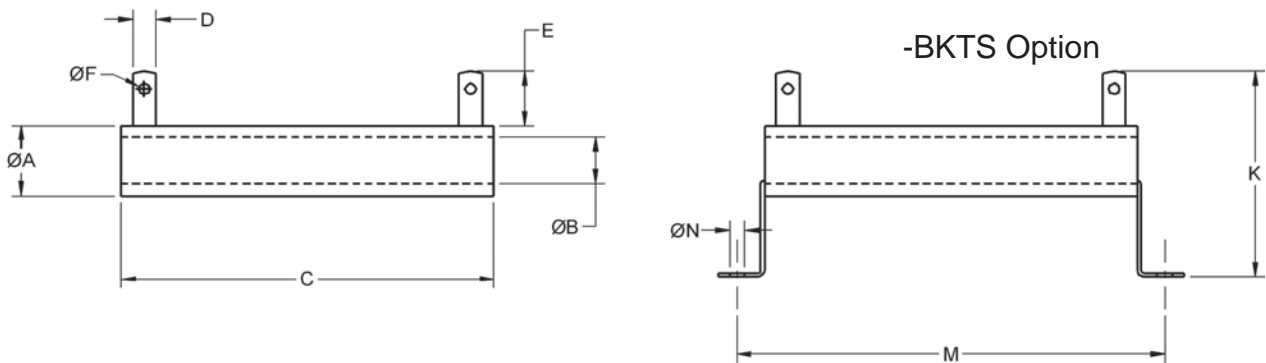
Part Number - Resistance - Tolerance - TCR (If not standard) - Quick-Connects - Brackets

Example: TSC-75 100 Ohm 5% QC BKTS

SPECIFICATIONS (continued)

Type	Wattage Rating	Resistance Range ¹	Dimensions			Terminal Size	BKTS - Mounting Dimensions		
			A ±0.062" [±1.6mm]	B ±0.031" [±0.8mm]	C ±0.062" [±1.6mm]		K ±0.062" [±1.6mm]	M ±0.062" [±1.6mm]	C ±0.020" [±0.5mm]
TSC-5	5	1 - 1k	0.312 [7.9]	0.188 [4.8]	1.00 [25.4]	T1	-	1.44 [36.6]	0.146 [3.7]
TSC-10	10	1 - 1k	0.312 [7.9]	0.188 [4.8]	1.75 [44.4]	T1	0.938 [23.8]	2.19 [55.6]	0.146 [3.7]
TSC-20	20	1 - 10k	0.250 [6.4]	0.188 [4.8]	2.00 [50.8]	T1	-	2.50 [63.5]	0.146 [3.7]
TSC-25	25	1 - 10k	0.563 [14.3]	0.312 [7.9]	2.00 [50.8]	T2	1.688 [42.9]	2.75 [69.9]	0.161 [4.1]
TSC-25A	30	1 - 10k	0.750 [19.1]	0.500 [12.7]	2.00 [50.8]	T2	2.312 [58.7]	2.88 [73.2]	0.161 [4.1]
TSC-25B	30	1 - 10k	0.625 [15.9]	0.453 [11.5]	2.00 [50.8]	T2	1.688 [42.9]	2.63 [66.8]	0.161 [4.1]
TSC-50	50	1.5 - 15k	0.563 [14.3]	0.312 [7.9]	4.00 [102]	T2	1.688 [42.9]	4.75 [121]	0.161 [4.1]
TSC-50A	60	1.5 - 15k	0.750 [19.1]	0.500 [12.7]	4.00 [102]	T2	2.312 [58.7]	4.88 [124]	0.196 [5.0]
TSC-50B	70	1.5 - 15k	0.750 [19.1]	0.547 [13.9]	4.50 [114]	T2	2.312 [58.7]	5.38 [137]	0.196 [5.0]
TSC-75	75	1.5 - 15k	0.563 [14.3]	0.312 [7.9]	6.00 [152]	T2	1.688 [42.9]	6.75 [171]	0.161 [4.1]
TSC-75A	90	2.7 - 20k	0.750 [19.1]	0.500 [12.7]	6.00 [152]	T2	2.312 [58.7]	6.88 [175]	0.196 [5.0]
TSC-100	100	2.7 - 20k	0.750 [19.1]	0.500 [12.7]	6.50 [165]	T2	2.312 [58.7]	7.38 [187]	0.196 [5.0]
TSC-130	130	2.7 - 20k	1.125 [28.6]	0.750 [19.1]	6.50 [165]	T3	2.812 [71.4]	7.38 [187]	0.196 [5.0]
TSC-160	175	3.3 - 39k	1.125 [28.6]	0.750 [19.1]	8.50 [216]	T3	2.812 [71.4]	9.38 [238]	0.196 [5.0]
TSC-200	225	3.3 - 47k	1.125 [28.6]	0.750 [19.1]	10.50 [267]	T3	2.812 [71.4]	11.38 [289]	0.196 [5.0]

¹ For non-inductive windings / divide maximum resistance by 2



Terminal Size	D ±0.010" [±6.4mm]	E ±0.032" [±0.8mm]	F ±0.005" [±0.13mm]
T1	0.188 [4.8]	0.438 [11.1]	0.104 [2.6]
T2	0.250 [6.3]	0.563 [14.3]	0.166 [4.2]
T3	0.312 [7.9]	0.625 [15.9]	0.196 [5.0]