

VITROHM

Customer Service + Factory

VITROHM PORTUGUESA
Unipessoal, Lda.
Estrada Nacional 249-4 Trajouce
P-2785-653 S. Domingos de Rana, Portugal
P : +351 21 445 77 - 00
F : +351 21 445 77 - 55

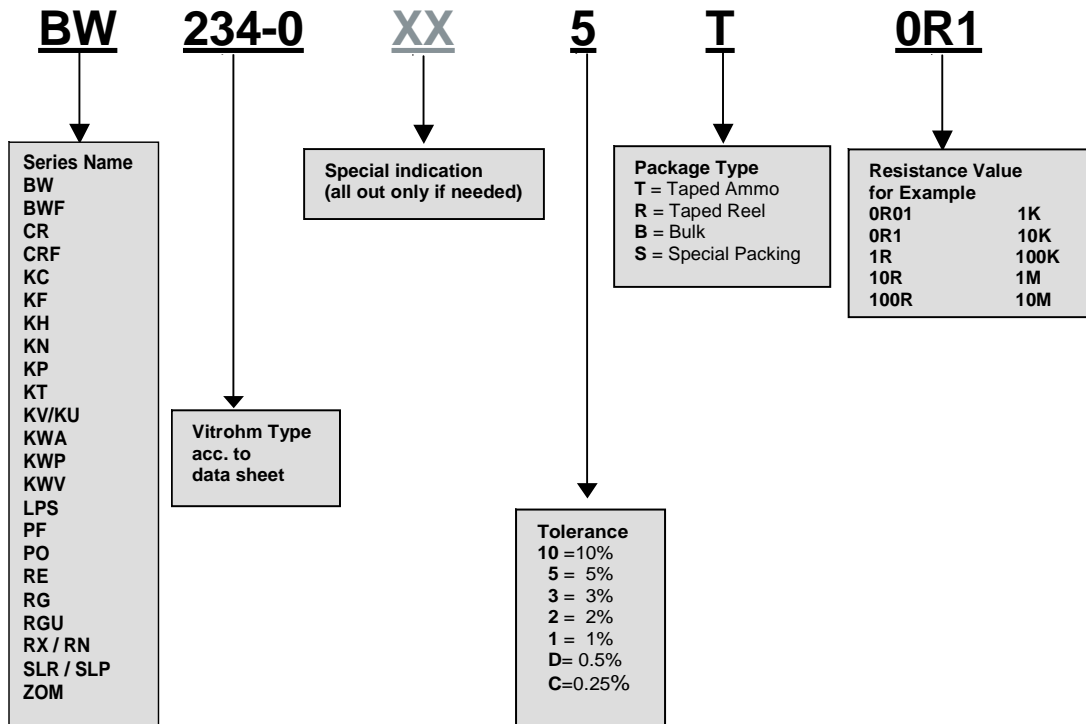
Sales + Marketing

VITROHM Holding GmbH
Ramskamp 70
D-25337 Elmshorn, Germany
P : +49 4121 870 - 103
F : +49 4121 870 - 289

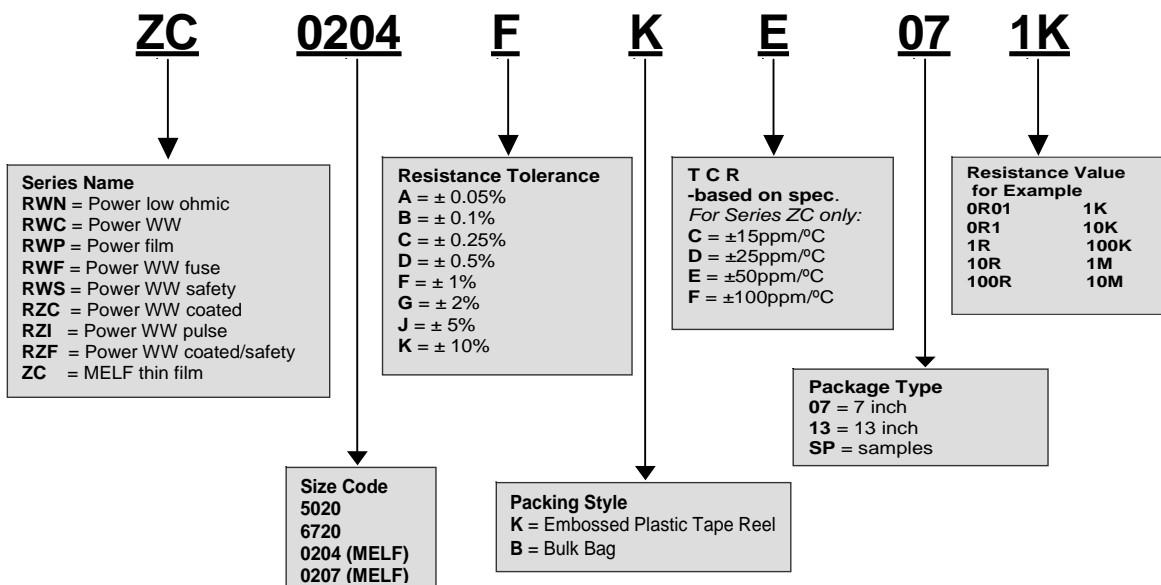
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E-Mail: vitrohm.support@yageo.com

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Wirewound & Film Resistor



SMD Resistors



Type

Internal Vitrohm-reference for a certain component, normally identical with the ordering-number.
IEC 115-1 clause 2.2.2

Series

Collection of types with similar constructional features and comparable technical data.

Style

Industrialized, often internationally standardized, designation with respect to the dimensions of a component, e.g. length/width, diameter/length.
IEC 115-1 clause 2.2.3

Dimensions

The accurate mechanical size of a certain type or tabular for a series. If without tolerances, refer to DIN 7168 (coarse).

Rated Power P_{70}

Electrical power defined by current and voltage a resistor can bear continuously. Commonly the value is given for 70°C ambient temperature.
IEC 115-1 clause 2.2.13

Resistance range

Data, showing the minimum and maximum resistance value possible for a given type or series.

Series E of preferred values

Internationally standardized staggering for resistance values within one decade, different E-series vary on the total number of values per decade. The preferred values result (approximated) from

$$E \approx \sqrt{10}^n \quad (n = 1, 2, 3 \dots E)$$

IEC 115-1 clause 2.3.2 and IEC 63

Tolerances

Here admissible deviation from nominal resistance value at the moment of receiving. Possible resistance changes due to electrical, climatic or mechanical stress are not included in the nominal tolerance.

Temperature coefficient

A value, determined by materials and styles, indicating the dependency of a resistance value from temperature. Resistance changes caused by temperature coefficient are reversible.
IEC 115-1 clause 2.2.20.2 and 4.8.4.2

Voltage coefficient

A value mainly determined by materials, indicating the dependency between resistance value and applied voltage. The voltage coefficient is negative, resulting resistance changes are reversible.
IEC 115-1 clauses 2.2.25 and 4.11

Maximum continuous working voltage

Limit for the voltage applied to a resistor. May not be exceeded, even if other limitations, e.g. rated power, are not reached. If instead of a voltage value the general equation is given, the limiting voltage is only determined by the rated power.
IEC 115-1 clause 2.2.16

Thermal resistance

A value influenced by materials and dimensions indicating the selfheating of a resistor by electrical power.

Insulation voltage

Test voltage applied for one minute between components terminals and sheathing (e.g. surface). The given value does not define continuous isolation.
IEC 115-1 clause 2.2.17

Insulation resistance

Electrical resistance between components terminals and sheathing. Given for a certain measuring voltage, e.g. 100 V or 500 V.
IEC 115-1 clauses 2.2.19 and 4.6

Climatic category

Defined in IEC 68-1, this statement establishes the lowest and highest test temperature (category temperature) as well as the duration of humidity-testing. Consequently climatic category substitutes according to the CECC- and IEC-approval-systems the former applicability classes of DIN 40040, which were almost impossible to verify by testing.

Temperature range

Limits for ambient temperature. Components may be used within the stated limits.
IEC 115-1 clause 2.2.9

Derating

Reduction of electrical power at increased ambient temperature, to avoid excess of maximum surface temperature by selfheating.
IEC 115-1 clause 2.2.24

Failure rate

Number of statistically possible defects, depending on time and quantity of components. If not stated differently, the given value refers to total-failure under nominal conditions.

Load life

Relative irreversible resistance change after a certain testing time. Normally related to rated power 70°C ambient temperature and 1000 hours testing.
IEC 115-1 clause 4.25

Damp heat, steady state

Relative irreversible resistance change after a defined climatic stress.
IEC 115-1 clause 4.24

Climatic sequence

Relative irreversible resistance change after a defined sequence of climatic stresses.
IEC 115-1 clause 4.23

Terminal strength

Relative irreversible resistance change after a defined sequence of mechanical stresses to the terminals. Test procedures according to CECC or IEC are standardized in the applicable detailed specification.

Terminal tensile strength

Limit for the tensile force applied to the terminals.

Resistance to soldering heat

Relative irreversible resistance change due to soldering. Test procedures according to CECC or IEC are standardized in the applicable detailed specification.
IEC 115-1 clause 4.18

Current noise

A voltage, having a statistical distribution of frequencies, depending on the DC-current through the resistor. Current-noise-voltage is additional to thermal noise, which depends on materials and styles.
IEC 115-1 clause 4.12

Non-linearity

A value for possible non-linearity between current through and voltage applied to an ohmic resistor.

Standards

Here enumeration of norms and standard specifications, nationally or internationally known for a given series of components. If applicable also the CECC-detailed-specification to which the given series has been approved to.

Packaging units

Quantity packed in a standard packaging unit, method of packing, in cases possibilities of selection.

Ordering-example

Necessary order processing-details for required components.

Preferred values acc. to DIN/IEC

E 6	E 12	E 24
1.0	1.0	1.0
		1.1
		1.2
1.5	1.5	1.3
		1.5
		1.6
		1.8
2.2	2.2	1.8
		2.0
		2.2
		2.4
		2.7
		3.0

E 6	E 12	E 24
3.3	3.3	3.3
		3.6
		3.9
4.7	4.7	4.3
		4.7
		5.1
		5.6
6.8	6.8	5.6
		6.2
		6.8
		7.5
		8.2
		9.1

E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192	E 48	E 96	E 192
100	100	100	162	162	162	261	261	261	422	422	422	681	681	681
		101			164			264			427			690
		102			165			267			432			698
105	105	105	169	169	169	274	274	274	442	442	442	715	715	715
		106			172			277			448			723
		107			174			280			453			732
110	110	110	178	178	178	287	287	287	464	464	464	750	750	750
		111			180			291			470			759
		113			182			294			475			768
115	115	115	187	187	187	301	301	301	487	487	487	787	787	787
		117			189			305			493			796
		118			191			309			499			806
121	121	121	196	196	196	316	316	316	511	511	511	825	825	825
		123			198			320			517			835
		124			200			324			523			845
127	127	127	205	205	205	332	332	332	536	536	536	866	866	866
		129			208			336			542			876
		130			210			340			549			887
133	133	133	215	215	215	348	348	348	562	562	562	909	909	909
		135			218			352			569			920
		137			221			357			576			931
140	140	140	226	226	226	365	365	365	590	590	590	953	953	953
		142			229			370			597			965
		143			232			374			604			976
147	147	147	237	237	237	383	383	383	619	619	619	988	988	988
		149			240			388			626			
		150			243			392			634			
154	154	154	249	249	249	402	402	402	649	649	649			649
		156			252			407			657			
		158			255			412			665			
		160			258			417			673			

Designation of resistance values according to IEC 62 and MIL:

resist. value	IEC 62	MIL 39008
0,1 Ohm	0R1 (R10)	-
1,0 Ohm	1R (1R0)	1R0
10 Ohm	10R	100
100 Ohm	100R (K10)	101
1000 Ohm	1 K (1K0)	102
10 KOhm	10K	103
0,1 MOhm	100K (M10)	104
1,0 MOhm	1M (1M0)	105
10,0 MOhm	10M	106

4-band colour code
colour coding of
resistance values and tolerances

5-band colour code
colour coding of
resistance values and tolerances

colour	1st band= 1st digit	2nd band= 2nd digit	3rd band= multi- plier	4th band= tole- rance
<i>without</i>	-	-	-	±20%
<i>silver</i>	-	-	x 0,01 Ω	±10%
<i>gold</i>	-	-	x 0,1 Ω	± 5%
<i>black</i>	-	0	x 1,0 Ω	-
<i>brown</i>	1	1	x 10 Ω	± 1%
<i>red</i>	2	2	x 100 Ω	± 2%
<i>orange</i>	3	3	x 1 kΩ	-
<i>yellow</i>	4	4	x 10 kΩ	-
<i>green</i>	5	5	x 100 kΩ	-
<i>blue</i>	6	6	x 1 MΩ	-
<i>violet</i>	7	7	x 1 MΩ	-
<i>grey</i>	8	8	-	-
<i>white</i>	9	9	-	-

1st band= 1st digit	2nd band= 2nd digit	3rd band= 3rd digit	4th band= multi- plier	5th band tole- rance
-	-	-	-	-
-	-	-	x 0,01 Ω	± 5%
-	-	-	x 0,1 Ω	± 5%
-	0	0	x 1,0 Ω	-
1	1	1	x 10 Ω	± 1%
2	2	2	x 100 Ω	± 2%
3	3	3	x 1 kΩ	-
4	4	4	x 10 kΩ	-
5	5	5	x 100 kΩ	±0,5%
6	6	6	x 1 MΩ	-
7	7	7	x 1 MΩ	-
8	8	8	-	-
9	9	9	-	-

:

Tolerances according to MIL:

Tolerance	MIL
10 %	K
5 %	J
2 %	G
1 %	F
0,5 %	D
0,25 %	C
0,1 %	B

Designation and coding of temperature coeff.:

100	$\frac{10^{-6}}{K}$	T0	brown
50	"	T2	red
25	"	T9	yellow
15	"	T10	orange
10	"	T13	blue
5	"	T16	violet
2	"	T18	-

Resistors in the DC-circuit:

R = resistance value [Ω] I = current [A]
 U = voltage [V] P = power [W]

$$R = \frac{U}{I} \quad I = \frac{U}{R} \quad U = I \cdot R$$

$$P = I^2 \cdot R \quad P = \frac{U^2}{R} \quad P = U \cdot I$$

Resistors in series

$$R_{ges.} = R_1 + R_2 + \dots + R_n$$

Resistors in parallel

$$\frac{1}{R_{ges.}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$$

2 resistors in parallel

$$R_{ges.} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

Voltage divider R_1 in series with R_2

$$U_{ges.} = U_1 + U_2$$

$$\frac{U_1}{U_2} = \frac{R_1}{R_2}$$

Current splitting R_1 in parallel with R_2

$$I_{ges.} = I_1 + I_2$$

$$\frac{I_1}{I_2} = \frac{R_2}{R_1}$$

Temperature coefficient for wirewound resistors:

Series K Table 1: Temperature coefficient of resistive wires used for series KC, KH, KV, KT, KF
(Power wirewound resistors of Vitrohm with high pressure crimped contact)

P_{70}	Typ/Type	TK/TC 400 \pm 50	TK/TC 0 $^{+40}_{-80}$	TK/TC 0 \pm 10
1W	200	0R056 - 0R2	0R22 - 300R	330R - 9K1
2W	202	0R075 - 0R43	0R47 - 620R	680R - 20K
3W	204	0R33 - 0R68	0R75 - 1K	1K1 - 30K
4W	206	0R056 - 0R2	0R22 - 300R	330R - 9K1
5W	208	0R075 - 0R3	0R33 - 470R	510R - 15K
7W	210	0R11 - 0R68	0R75 - 1K	1K1 - 30K
	212	0R075 - 0R3	0R33 - 470R	510R - 15K
9W	214	0R11 - 0R68	0R75 - 1K	1K1 - 30K
11W	216	0R15 - 1R	1R1 - 1K3	1K5 - 47K
17W	218	0R27 - 1R6	1R8 - 2K4	2K7 - 82K

TC in ppm = 10^{-6} K^{-1}

Series KP Table 2: Temperature coefficient of resistive wires used for series KP

P_{70}	Type	TC 400 \pm 50	TC 0 $^{+40}_{-80}$	TC 0 \pm 20
2 W	290	0R1 - 0R27	0R3 - 510R	560R - 7K5
4 W	292	0R15 - 0R56	0R62 - 620R	680R - 11K
5 W	294	0R27 - 0R62	0R68 - 1K1	1K2 - 20K
6,5W	296	0R39 - 1R3	1R5 - 1K6	1K8 - 27K
8 W	298	0R47 - 1R6	1R8 - 2K	2K2 - 36K

Series BW / BWF Table 3: Temperature coefficient of resistive wires used for series BW/BWF

234-0	0R1 ... 0R15	TK \pm 600	237-0	0R1	TK \pm 1000
	0R16 ... 0R62	TK \pm 300		0R11 ... 0R18	TK \pm 600
	0R68 ... 1K2	TK \pm 150		0R2 ... 0R68	TK \pm 300
235-0	0R1 ... 0R16	TK \pm 1000	236-0	0R75 ... 1K	TK \pm 150
	0R18 ... 0R68	TK \pm 800		0R1	TK \pm 1800
	0R75 ... 2K4	TK \pm 400		0R11 ... 0R16	TK \pm 1000
				0R18 ... 0R68	TK \pm 800
				0R75 ... 1K	TK \pm 400

Due to mechanical contacts resistive changes of $\pm 1,5 \%$ are possible. This may influence results of TC-measurements.

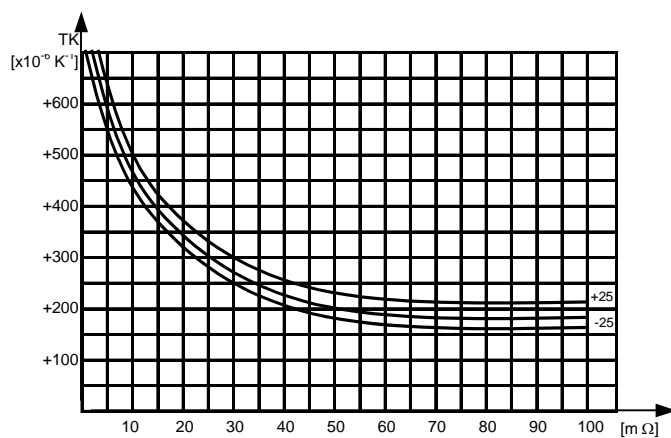


Diagram: Temperature coefficient of metal-band resistors series KN (350-354)

Pulse capability of resistors:

General information on pulse capability very often need additional explanations and do not always comply with a given application.

Please contact factory or sales office for your special requirements. For dealing with your application we need the following information:

- Pulse shape and repetition rate
- max. peak power
- Pulseduration or time constant
- max. peak voltage
- Resistance value

If already selected:

- Type or series or technology
- or preferred style

Quality:

The Quality Assurance System of Vitrohm Group meets all requirements of CECC 00114 part 1, Harmonized System of Quality Assessment for Electronic Components (System of Quality Assessment for General Requirements) and meets also the requirements of DIN-ISO 9001:2000.

By this statement the General Management obliges all employees to fulfil their duties in accordance with the Quality Handbook, to assure the quality of all Vitrohm Products to meet the requirements of CECC and other standards.

All technical data given in this catalogue are based on statistical methods using equipments of modern techniques. The data are based on mass production. Therefore, testresults of singular specimens might differ from the average range of series.

All details in printed form are legally binding only after written confirmation conforming to §§ 463 and 480 II BGB.

We reserve the right to change products and specifications due to technical development.

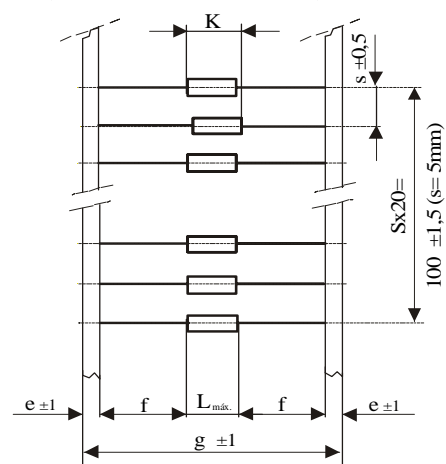
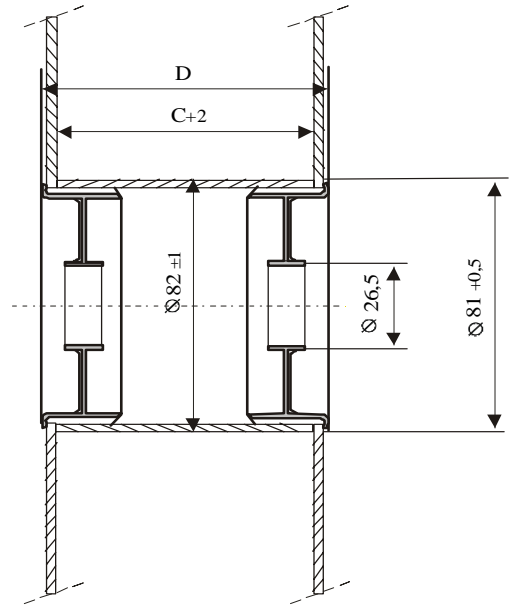
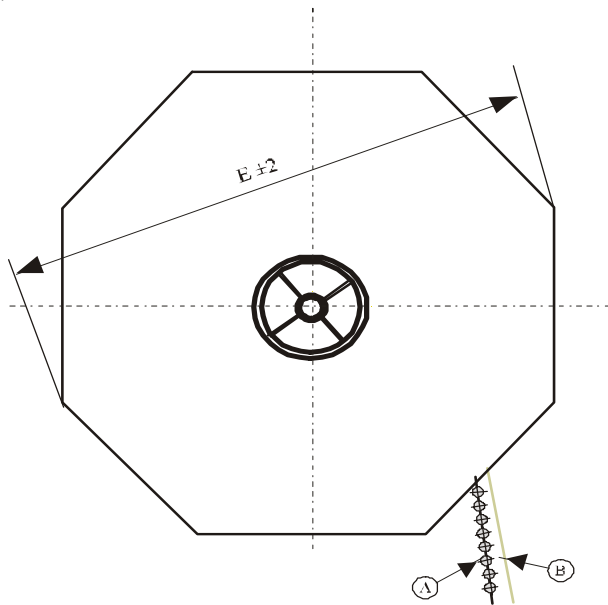


Taping Specification

Taping Specification for axial components

Series	Type	Style	L _{max}	Taping			Pieces Reel	E	Pieces Ammo
				e	s	g			
KC	200-0	0416	18,0	6	5	95	2000	356	1000*
	202-0	0424	26,0	6	5	95	2000	356	1000*
	204-0	0432	33,0	6	5	95	2000	356	1000*
KH	206-8	7x7x20	21,0	6	10	95	1000	356	-----
	208-8	7x7x25	26,0	6	10	95	1000	356	-----
	210-8	7x7x38	39,0	6	10	95	1000	356	-----
	212-8	10x10x26	26,0	6	10	95	500	356	-----
	214-8	10x10x38	39,0	6	10	95	500	356	-----
BW / F	234-0	0411	10,1	6	5	85	4000	356	1000*
	235-0	0614	14,5	6	10	85	1000	356	1000*
	236-0	0614	14,5	6	10	85	1000	356	1000*
	237-0	0411	10,1	6	5	85	4000	356	1000*
CR / F	251-0/4	0309	9,5	6	5	65	5000	356	1000*
	253-0/4	0414	14,5	6	10	85	2000	356	1000*
	254-0/4	0612	13,5	6	10	85	1000	356	1000*
	255-0	0915	15,0	6	10	85	1000	356	500*
	256-0/4	0617	18,0	6	10	85	1000	356	1000*
	257-0/4	0918	19,0	6	10	85	1000	356	500*
	258-0	0922	23,0	6	10	85	1000	356	500*
	259-0	0927	27,0	6	10	85	1000	356	500*
KN	350-8	7x7x18	19,0	6	10	85	1000	356	-----
RG	515-0	0207	6,6	6	5	65	5000	356	1000*
	520-0	0309	8,2	6	5	65	5000	356	1000*
PO	590-0	0617	16,5	9	10	95	1000	270	1000*
	591-0	0922	20,0	9	10	95	500	270	500*
	593-0	0414	12,0	6	5	85	2500	270	1000*
	595-0	0207	6,3	6	5	65	5000	315	2000*
PF	PF0207	0207	6,3	6	5	65	-----	-----	5000*
	PF0410	0410	9,0	6	5	65	-----	-----	1000*
	PF0516	0516	15,5	6	10	85	-----	-----	1000*
RX / RN	0207 W5	0207	6,2	6	5	65	-----	-----	5000*
	0410 1W	0410	10,0	6	5	65	-----	-----	2000*
	0515 1W	0515	15,0	6	5	65	-----	-----	1000*
	0512 3W	0512	12,0	6	5	65	-----	-----	1000*
	0613 3W	0613	13,0	6	10	65	-----	-----	1000*
	0516 3W	0516	15,5	6	10	65	-----	-----	1000*
	0616 3W5	0616	16,0	6	10	65	-----	-----	1000*
	0716 3W	0716	16,0	6	10	65	-----	-----	500*
0716 4W	0716	16,0	6	10	65	-----	-----	500*	
ZOM	ZOM0207	0207	6,6	6	5	65	5000	356	2000*

*Standard



- A taped resistors
- B intermediate paper
- C inner reel width $g+5$
- D outer reel width $g+10$
- E maximum reel diameter

$L_{\text{máx.}}$ Body length

k $L_{\text{máx.}} + 1,4$ (k concentric between the tapes)

f ≥ 20 mm

g taped width

s step size

e taped width

standard taping acc. to IEC 60286-1

SMD Power Resistors

Specifications



Type		RWN 5020	RWC 5020
Styles			5020
Dimensions	mm	non inductive, no winding	wirewound on ceramic
Power rating $\vartheta_0 = 200^{\circ}\text{C}$	W		P_{25} 2,2 P_{40} 2,0 P_{70} 1,6
Single pulse	I_{max} $E_{\text{i, max}}$ $T_{\text{imp, max}}$	A 50 mWs 625 ms 5	
periodic pulse load	i_{max} $E_{\text{i, per, max}}$ $t_{\text{imp, max}}$ t_{pause}	A 30 (R002 ... R018) 40 (R022 ... R05) mWs 225 ms 5 ms 100	
Tolerance	%	1, 5 (F, J)	1, 5 (F, J)
Resistance range	Ω	0R002 ... 0R05	0R01 ... 220R
Temperature coefficient	ppm K ⁻¹	see diagram	see next page
E-Series		0R002, 0R003, 0R005, \geq 0R01: E 12	E 12
		diverging values on request	
max. cont. work. voltage	V_{RMS}		$\sqrt{P \cdot R}$
Thermal resistance	K/W		100 ¹⁾
Insulation voltage (1 min.)	V_{RMS}		1000
Insulation resistance			> 1000M Ω
Climatic category			55/175/56
Temperature range	$^{\circ}\text{C}$		-55 ... 200
Endurance (P_{70} , 70 $^{\circ}\text{C}$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$		$\leq 1,0$
Damp heat, steady state	$\left[\frac{\Delta R}{R}\right] \%$		$\leq 0,25$
Resistance to soldering heat	$\left[\frac{\Delta R}{R}\right] \%$		$\leq 0,25$
Short time overload (5 * P_{70} /5sec)	$\left[\frac{\Delta R}{R}\right] \%$		$\leq 1\%$
Temperature shock			$\leq 0,25$
Board-bending-test			no interruption
Solderability		suitable for wave and reflow soldering in acc. with CECC 00802	

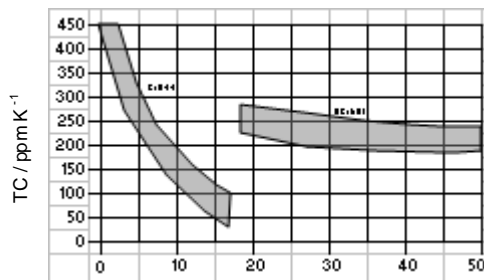
¹⁾ Thermal data according to DIN 44050 with solder pads as on next page.

Temperature coefficient:

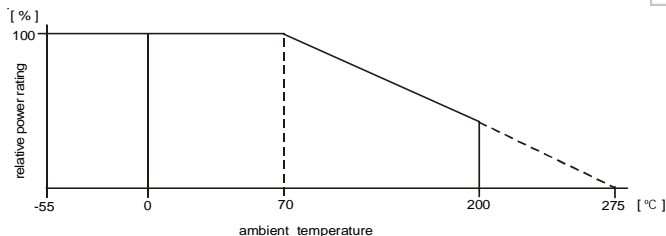
Range (RWC 5020)

≥ 0R01	0R024	400 ± 50 ppm/K
≥ 0R027	0R091	≈ + 180 ppm/K
≥ 0R1	15R	0 ± 20 ppm/K
≥ 16R	220R	0 ± 10 ppm/K

TC - Diagram (RWN 5020)



Derating:

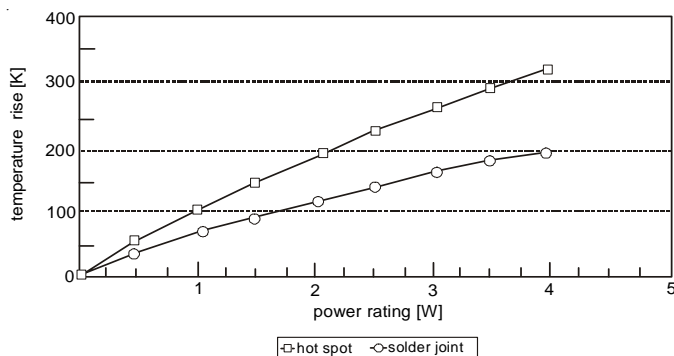


Resistance Value in mOhm

Temperature Range -55 +200°C

Temperature rise:

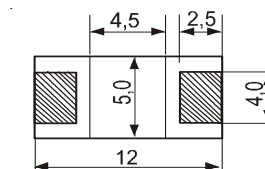
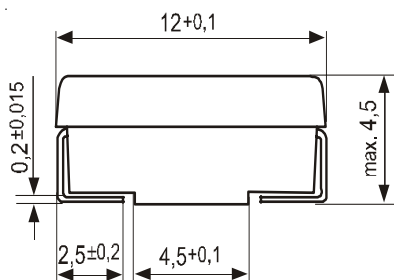
Temperature rise: RWx5020



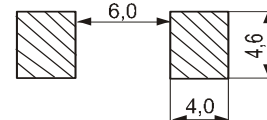
Part mounted on FR 4, pads as recommended, copper layer 35 µm

recommended solder pads:

Dimensions:



Bottom view



Solder pads

Marking:

Resistor: printed in clear: Type - Value - Tolerance

Packaging

additional Batch-No. - Production date

Packaging:

blisertape 24 mm antistatic / 1500 pcs. on reel 330 mm Ø

Ordering example:

RWC 5020 F K - 13 1R
 Type tolerance blister tape reel TC reel diameter R-value

SMD Power Metal film resistors

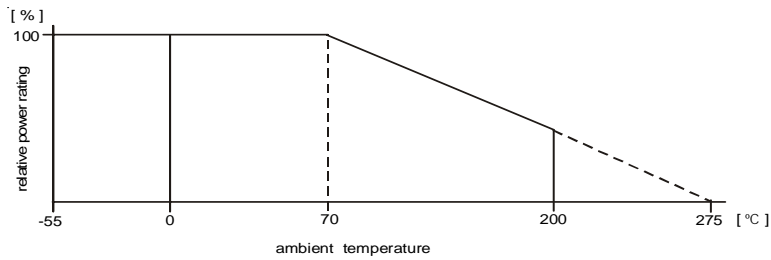


Specifications

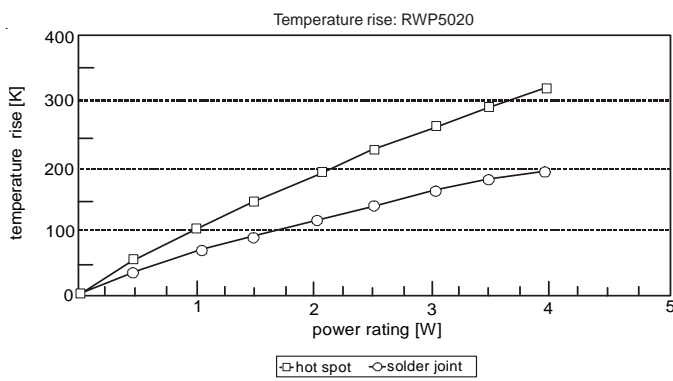
Type	RWP 5020	
Style		5020
Power rating $\vartheta_0 = 200^\circ\text{C}$	W	P_{25} 2,2 P_{40} 2,0 P_{70} 1,6 higher power depends on mounting technology
Tolerance	%	1 (F) 5 (J)
Resistance range	Ω	10R ... 1M 1R0 ... 1M
Temperature coefficient	ppm K ⁻¹	± 50 ± 200
E-Series		E 96 E 12 preferred
max. cont. work. voltage	V_{RMS}	500
Thermal resistance	K/W	90 ¹⁾
Insulation voltage (1 min.)	V_{RMS}	1000
Insulation resistance		> 1000M Ω (dry)
Climatic category		55/175/56
Temperature range	$^\circ\text{C}$	-55 ... 200
Endurance (P_{70} , 70 $^\circ\text{C}$, 1000h, intermed.)	$\left[\frac{\Delta R}{R}\right]$ %	$\leq 1,5$
Damp heat, steady state	$\left[\frac{\Delta R}{R}\right]$ %	$\leq 1,5$
Resistance to soldering heat	$\left[\frac{\Delta R}{R}\right]$ %	$\leq 0,25$
Short time overload (5 * P_{70} /2sec)	$\left[\frac{\Delta R}{R}\right]$ %	$\leq 1\%$
Temperature shock		$\leq 0,25$
Board-bending-test		no interruption
Solderability		suitable for wave and reflow soldering in acc. with CECC 00802

¹⁾ Thermal data according to DIN 44050 with solder pads as on next page.

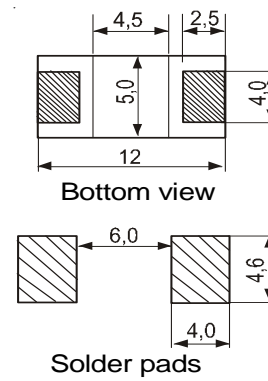
Derating:



Temperature rise:

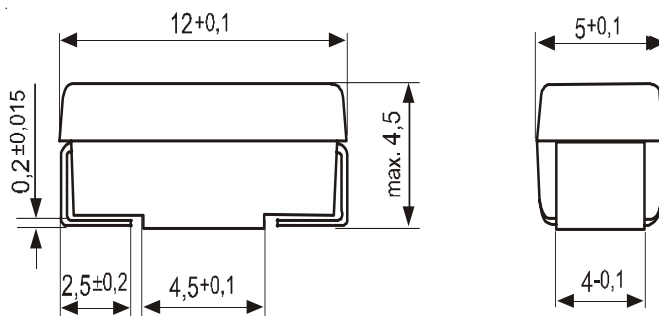


recommended solder pads:



Part mounted on FR 4, pads as recommended, copper layer 35 μm

Dimensions in mm:



Marking: Resistor: Printed in clear: Type - Value - Tolerance
 Package additional Batch-Nr. - Production date

Packaging: Blistertape 24 mm antistatic / 1.500 pcs on reel 330 mm Ø

Ordering example: RWP 5020 F K - 13 10K
 Type Tolerance blister tape reel TC reel diameter R-value

SMD Power Resistors

flame retardant, fusible and safety versions



Specifications

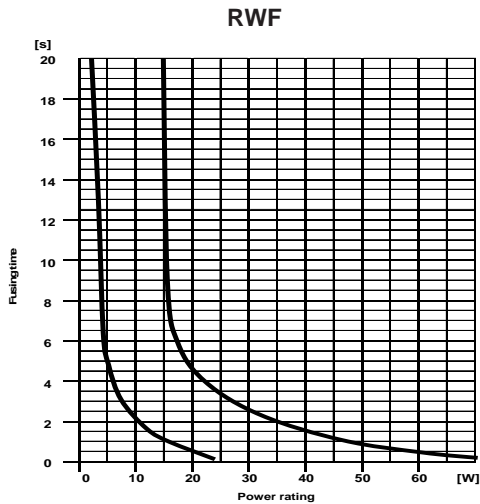
Type		RWF 5020 Fusible	RWS 5020 Safety
Styles		wirewound on core	5020 wirewound on ceramic
Power rating	W		P ₂₅ 2,2 P ₄₀ 2,0 P ₇₀ 1,6
Resistance range	Ω	0R1 ... 1K	1R ²⁾ ... 100R
E-Series		Diverging values on request	
Tolerance	%	5, 10 (J, K)	5 (J)
Temperature coefficient	10 ⁻⁶ * K ⁻¹	± 1000	120 ⁺⁵⁰
max. cont. work. voltage	V _{eff/RMS}		$\sqrt{P_{70} \cdot R}$
Thermal resistance	K/W		100 ¹⁾
Climatic category			55 / 175 / 56
Temperature range	°C		-55 ... 200
Endurance (P ₇₀ , 70°C, 1000h)	$\left[\frac{\Delta R}{R}\right]$ %		3 avg
Damp heat, steady state	$\left[\frac{\Delta R}{R}\right]$ %		< 2
Insulation voltage	V _{eff/RMS}		1000
Insulation resistance			> 1000MΩ (dry)
Resistance to soldering heat	$\left[\frac{\Delta R}{R}\right]$ %		≤ 0,25
Short time overload (5 * P ₇₀ /5sec)	$\left[\frac{\Delta R}{R}\right]$ %		≤ 1%
Temperature shock			≤ 0,25
Solderability			CECC 00802 A (dip test)
Board-bending-test			no interruption

¹⁾ Thermal data according to DIN 44050 with solder pads as on next page.

²⁾ Resistance values < 10R are flame retardant.

The interruption mechanism is not clearly defined and has to be tested in the final application!

Fusing Characteristics



RWS

The special construction of resistance values >10R results in an immediate interruption when mains voltage (220/240V_{RMS}) is applied. No flames, no explosion.

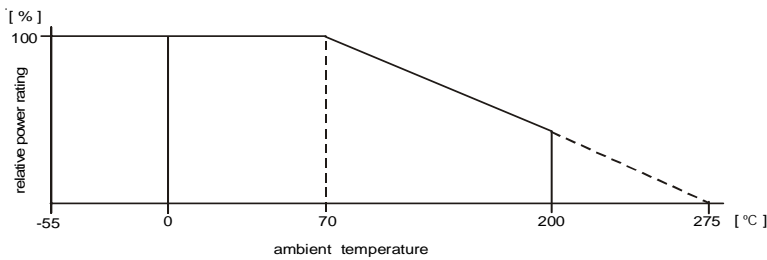
After fusing the resistance values is >100kOhm.

For other voltages test suitability in the application!

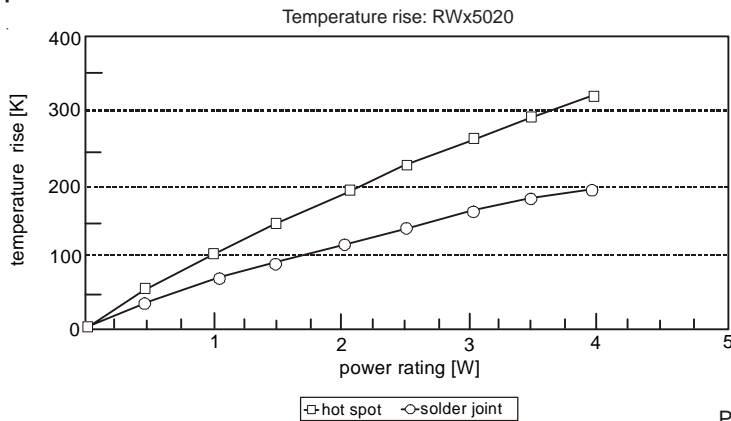
Resistance values <10R are flame retardant.

The interruption mechanism is not clearly defined and has to be tested in the final application!

Derating:

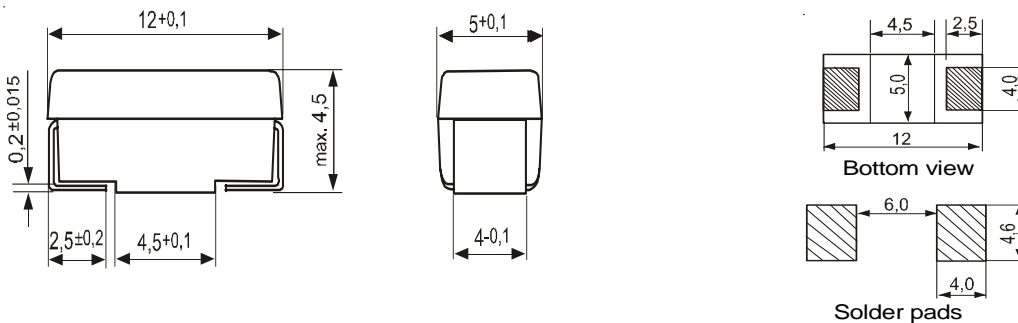


Temperature rise:



Part mounted on FR 4, pads as recommended, copper layer 35 μm recommended solder pads:

Dimensions in mm:



Marking: Resistor: Printed in clear: Type - Value - Tolerance
 Package additional Batch-Nr. - Production date

Packaging: Blister tape 24 mm antistatic / 1.500 pcs on reel 330 mm Ø

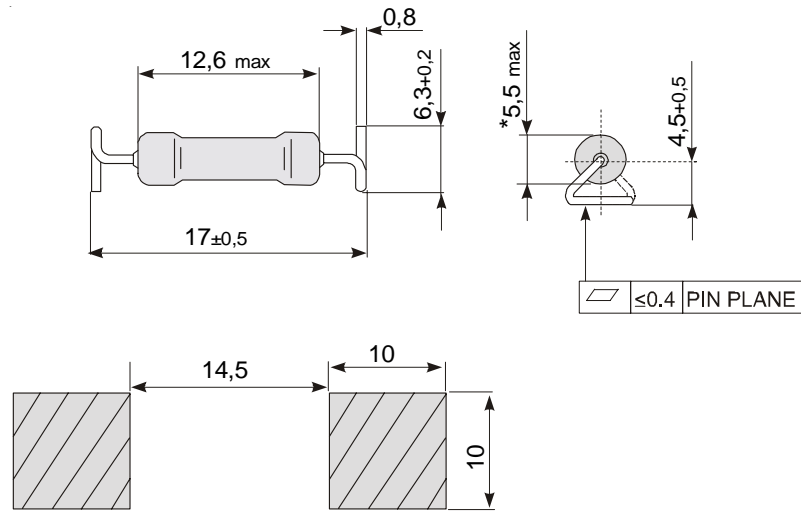
Ordering example: RWF5020 J K - 13 10R
 Type Tolerance blister tape reel TC reel diameter R-value

SMD Precision Power Wirewound Resistors
ceramic core, coated

Specifications

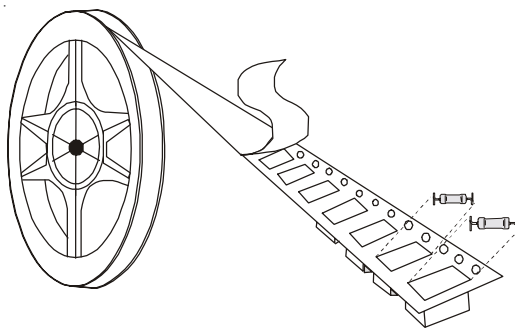
Type		RZC6720 STANDARD VERSION	RZI6720 PULSE VERSION
Power rating P_{25}	W		2,2
Resistance range	Ω		0R1 ... 750R
Tolerances	%		± 5 , ± 2 , ± 1
Temperature coefficient	$10^{-6} \cdot K^{-1}$	0 ± 20	100 \pm 50
max. cont. work. voltage	V_{RMS}		$\sqrt{P_{70} \cdot R}$
Insulation voltage (1min.)	V_{RMS}		max 75V
Insulation resistance	Ω		not insulated
Derating linear	$^{\circ}C$		25 ... 200 (0W)
Climatic category			55/200/56
Temperature range	$^{\circ}C$		- 55 ... 200
Thermal resistance	KW^{-1}		112
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$		appr. 100 depends on value
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 3,0$ average
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 1,0$
Climatic sequence (IEX 115-1/23)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 1,0$
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,2$
Terminal tensile strength	N		50
Resistance to soldering heat (260 $^{\circ}C$, 3,5s)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,2$ typ.
Solderability	s	2,5 Flowtime; solderglobule test, IEC 60068-2-20-T	
Marking		Printed in clear	

Dimensions in mm



*R ≤1R 5,5⁺¹

Packaging: Blistertape 24 mm antistatic / 450 pcs on reel 330 mm Ø



Ordering example: RZC6720 J K - 13 10R
 Type Tolerance blister tape reel TC reel diameter R-value

SMD Power Wirewound Resistors

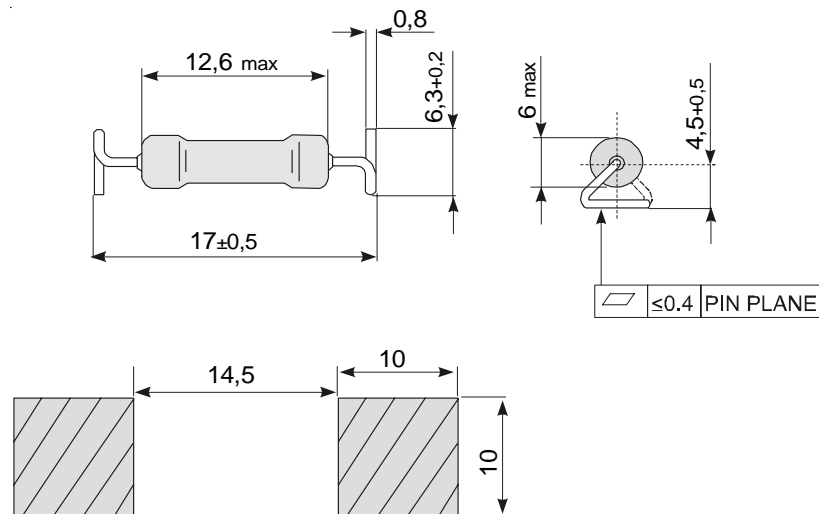
Flame retardant, safety version



Specifications

Type		RZF6720 SAFETY VERSION
Power rating P_{25}	W	2,2
Resistance range	Ω	see next page
Tolerances	%	± 5
Temperature coefficient	$10^{-6} \cdot K^{-1}$	120 ± 50
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$
Insulation voltage (1min.)	V_{RMS}	max 75V
Insulation resistance	Ω	not insulated
Derating linear	$^{\circ}C$	25 ... 200 (0W)
Climatic category		55/200/56
Temperature range	$^{\circ}C$	- 55 ... 200
Thermal resistance	KW^{-1}	112
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100 depends on value
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 5,0$ average
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 5,0$
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$
Terminal tensile strength	N	50
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.
Solderability	s	2,5 Flowtime; solderglobule test, IEC 60068-2-20-T
Marking		Printed in clear

Dimensions in mm



Type	Resistance range	
	min	max
RZF6720	* 1R0	330R

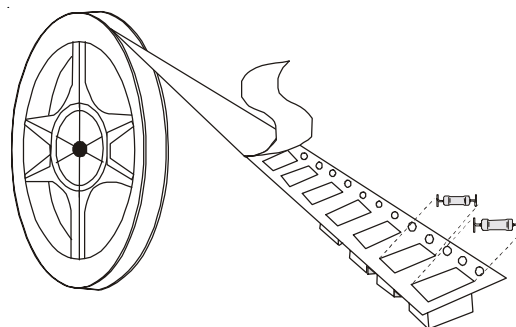
Note: The special construction of resistance values >10R results in an immediate interruption (<1s, 200ms typical) when mains voltage (220V/240V_{RMS}) is applied. No flames, no explosion. After fusing, the resistance value is >100KOhm.

For other voltages test suitability in the application!

* Resistance values < 10R are flame retardant.

The interruption mechanism is not clearly defined and has to be tested in the final application!

Packaging: Blister tape 24 mm antistatic / 450 pcs on reel 330 mm Ø



Ordering example: RZF6720 J K - 13 10R
 Type Tolerance blister tape reel TC reel diameter R-value

General:

VITROHM offers a range of low-ohm resistors for current sensing applications, resistance ranges typically from 1 milliohm to 100 milliohms.

These devices are of non-wound construction and made from flat resistive alloy wire.

The resistor's specification depends on the material and the chosen dimensions, namely specific-resistance, thermal conductivity and temperature coefficient are of importance.

1. Standard, leaded types, KN-family Types KN 350 ... KN 354

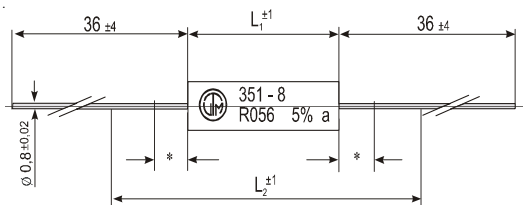
The „KN-resistors“ are available in standardized sizes with choices of open-frame and ceramic cased types. Copper leads are welded to the resistive element for board assembly.

Attention should be given to the following:

- resistance value

The value is specified over a given „measuring length“. Between the two measuring points lies the element plus some copper-wire for contact purposes.

If the actual used total length of the resistor in the application differs from this specified length, the influence of the copper wire of 0.4 mΩ per centimeter must be considered.

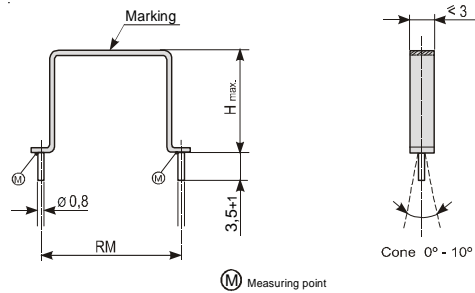


- temperature coefficient

Typically the temperature coefficient of the resistive element ranges around 150 ppm/°C (ask factory for details). However, the copper wire is part of the effective resistance and influences the TC between the contacts.

The lower the resistance value, the more influence of the copper leads, the higher the TC!

If the TC is of concern in a given application, a vertical style of the KN-family should be used (type 35X-009). In this case the influence of the copper wire is almost eliminated.



- power and current rating

The „KN-resistors“ are standard products with a fixed given power rating (P_{70}). Nevertheless, current rating can be of concern, especially if overload or pulse conditions can occur.

The current limit is defined by the current density, and 100 A per mm² are considered absolute maximum in power electronics. With a 0,8 mm diameter copper wire, the current limit is 50 A.

With respect to reliability, the welding junction between copper and resistive alloy should not carry more than 20 A continuously.

The 50 A limit may not be exceeded even under pulse conditions.

2. Semi-customized types, LPS-family Types LPS 355 ... LPS 359

VITROHM provides tools to produce U-shaped low-ohm resistors for direct board mounting.

The solder-tags (1 or 2 per side) are of given dimensions, the size of the final unit is designed in accordance with the applicational requirements.

If the demand for a shunt-resistor justifies a customized solution, the LPS-family offers a variety of possibilities.

The dimensions of the part are ruled by the requested power rating, as the generated heat need to be dissipated by an appropriate surface area.

To remain within reasonable size-limits, LPS-resistors are made up to 8 W rated power.

Normally, the user defines the resistance value (1 mΩ to 60 mΩ) the requested power and size limitations, if any. According to this, VITROHM designs the part.

Utmost care must be given during assembly and board soldering, otherwise resistance value will be above specification and overheating at solder joint may occur.

Again, attention must be given to some facts:

- solder tags

The parts can be manufactured with 2 or 4 soldertags. 4 are used either for Kelvin-connections or for high current applications. Depending from the material's thickness, one solder contact can carry up to 70A, so a 4-contact part can carry 140A (ask factory).

- solderability

Solder tags are made from resistive alloy to avoid falsification of temperature coefficient.

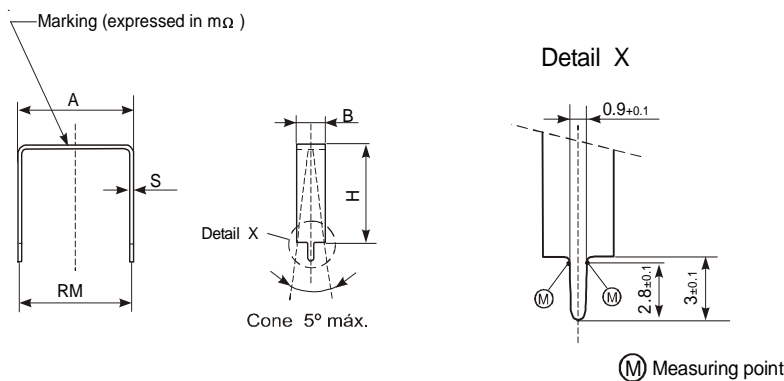
Solderability is enhanced by special chemical cleaning of the surface after production and is preserved by special packing in nitrogen atmosphere.

Nevertheless, in cases, soldering parameters (temperature, time) must be adjusted for good results, as the LPS-resistor acts like a heat-sink during soldering.

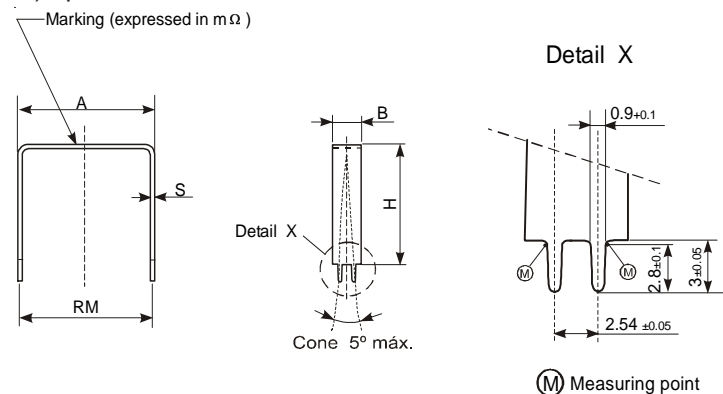
However, the solder-tag represents a significant resistance if not embedded totally in solder!

Depending on value and power rating, 6 different solder tags are available:

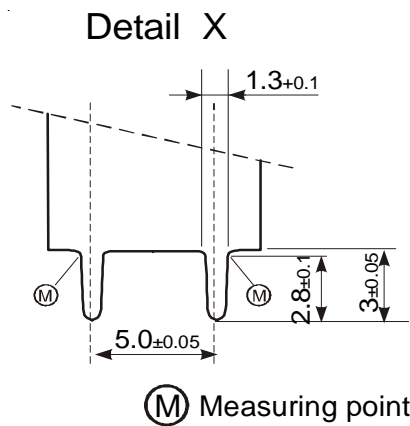
1) Standard pins: LPS 359-0XX



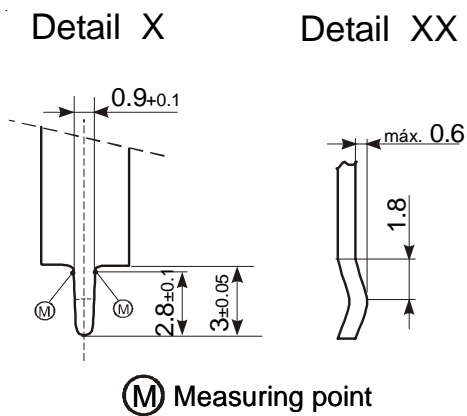
2) Special for low ohms: LPS 359-1XX



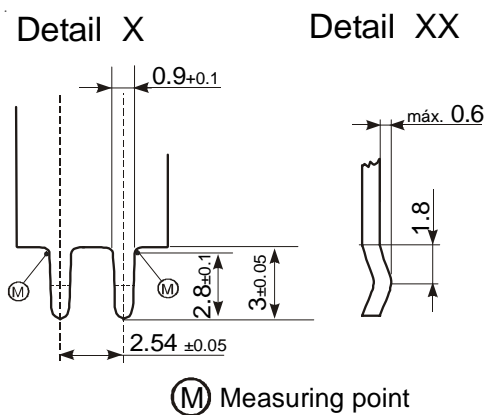
3) Special for very low ohm and high power: LPS 359-2XX



4) Same as LPS 359-0xx, but with a snap in: LPS359-3XX



5) Same as LPS 359-1XX, but with a snap in: LPS 359-4XX

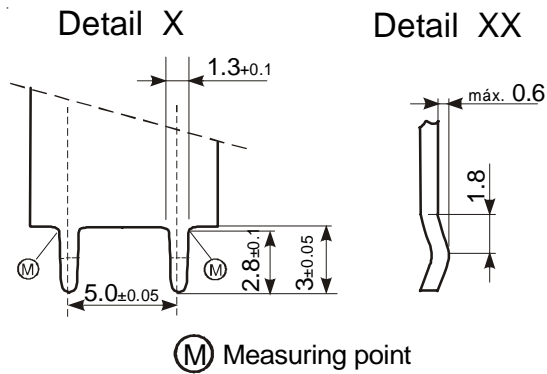


Special varieties on request.

RM: Available from 5 to 25 mm, preferably in 5 mm-steps.

H, B and S depend on material, resistance value and required rating.

6) Same as LPS 359-2XX, but with snap in: LPS359-5XX



3. Low-Power, moulded type, RWN family:

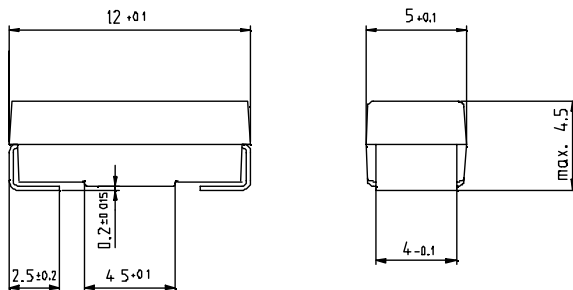
If power rating is not the main concern, i.e. current ranges below 5A, a current sensing device in a standard resistor package may be suitable.

VITROHM offers a SMD-version (RWN).

It is designed for automatic PCB-assembly in blister-tape (RWN).

The power rating for this type is limited by the max. temperature of the moulding material. Overheating may cause carbonizing of the plastic, short circuit may occur.

This limits also the pulse handling capacity. 40A can be carried by the internal contacts, but energy must not exceed 625 mWs.



VITROHM has the products and the knowledge.

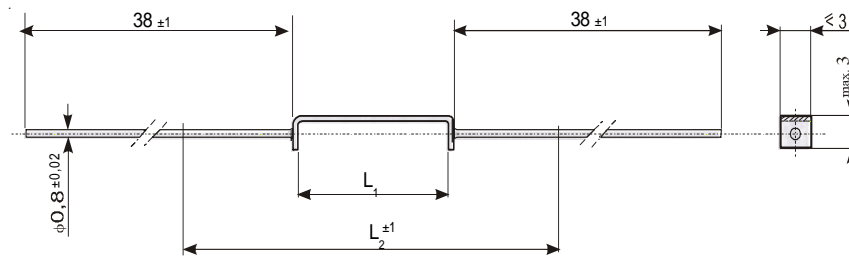
If you need help in designing - in the right product or need more information, please contact your sales-contact for assistance.



Specifications

Type		KN350-0	KN351-0	KN352-0
Styles		3313	3321	3332
Power rating P_{70}	W	1	2	3
Resistance range	Ω	0R003...0R051	0R004...0R068	0R005...0R1
E-Series			E 24 > 0R01	
Tolerances	%		$\pm 1, \pm 2, \pm 3, \pm 5$	
Temperature coefficient	$10^{-6} \cdot K^{-1}$		+ 200 ... + 1200 depends on value	
max. cont. work. voltage	V_{RMS}		$\sqrt{P_{70} \cdot R}$ for all styles	
Insulation voltage (1min.)	V_{RMS}		non insulated	
Insulation resistance	Ω		non insulated	
Derating	$^{\circ}C$		linear 70 ... 300 (0W)	
Climatic category			55/200/56	
Temperature range	$^{\circ}C$		- 55 ... 300	
Thermal resistance	KW^{-1}	200	100	70
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$		appr. 10, depends on value	
Endurance (P_{70} , @70 $^{\circ}C$, 1000h interm.)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 3,0$	
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,5$	
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,5$	
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,5$	
Terminal tensile strength	N		min. 25	
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,2$ typ.	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T		
Marking		value imprinted		

Dimensions in mm:



Type	L_1	$L_2 \pm 1$
KN350-0	12 ... 14,5	40
KN351-0	17,5 ... 21,5	45
KN352-0	29 ... 34	60

Measuring length L_2 : Resistance value is measured over the centered length L_2 on terminals free of oxide and contaminations. Differing conditions require adequate corrections ($R_{\text{terminal}} = 0,4 \text{ m}\Omega/\text{cm}$)

Packaging:

Type	Packaging	Pieces	Pack.Code
KN350-0	bulk	500	B
KN351-0	bulk	500	B
KN352-0	bulk	500	B

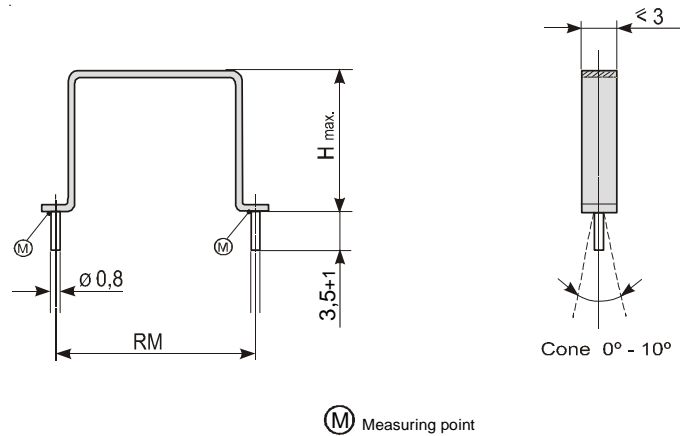
Ordering example: KN351-0 3 B 0R033
 Type Tolerance Pack.-Code R-Value



Specifications

Type		KN350-009	KN351-009 KN351-010	KN352-009 KN352-010 KN352-011
Power rating P_{70}	W	0,5	1,0	1,5
Resistance range	Ω	0R003...0R051	0R003...0R082	0R005...0R1
E-Series			E 24 \geq 0R01	
Tolerances	%		$\pm 1, \pm 2, \pm 3, \pm 5$	
Temperature coefficient	$10^{-6} * K^{-1}$		+ 200 ... + 1200	
max. cont. work. voltage	V_{RMS}		$\sqrt{P_{70} \cdot R}$ for all styles	
Insulation voltage (1min.)	V_{RMS}		non insulated	
Insulation resistance	Ω		non insulated	
Derating, linear	$^{\circ}C$		70 ... 300 (0W)	
Climatic category			55/200/56	
Temperature range	$^{\circ}C$		- 55 ... 300	
Thermal resistance	KW^{-1}	200	100	70
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$		ca. 10, depends on value	
Endurance (P_{70} , 70 $^{\circ}C$, 1000h interm.)	$\left[\frac{AR}{R}\right]\%$		$\pm 3,0$	
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right]\%$		$\pm 0,5$	
Climatic sequence	$\left[\frac{AR}{R}\right]\%$		$\pm 0,5$	
Terminal strength	$\left[\frac{AR}{R}\right]\%$		$\pm 0,5$	
Terminal tensile strength	N		min. 25	
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{AR}{R}\right]\%$		$\pm 0,2$ typ.	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T		
Marking		value imprinted		

Dimensions in mm:



Type	RM	Hmax.
KN350-009 KN351-009 KN352-009	10	6,5 10,5 17,0
KN351-010 KN352-010	15	8 14,5
KN352-011	20	12

Construction: The resistive elements consist of a flat metal-band. Spot welded Cu-terminals ensure high stability of contacts. Thus, this construction results in a non inductive resistor of both high stability and overload capacity.

Packaging:

Type	Packaging	Pieces	Pack.Code
KN350-009	bulk	1000	B
KN351-009 KN351-010	bulk	1000	B
KN352-009 KN352-010 KN352-011	bulk	500	B

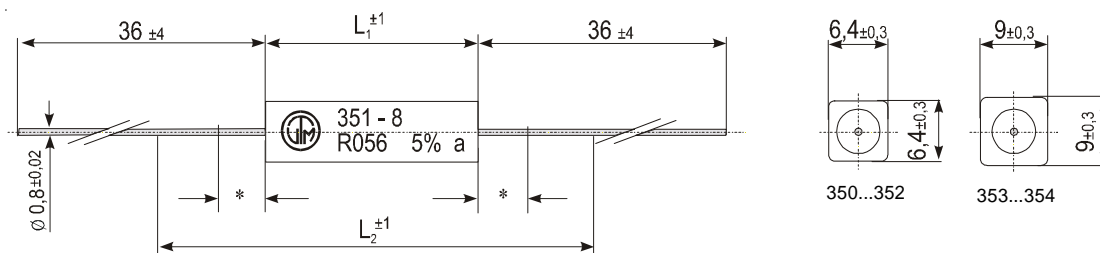
Ordering example: KN350-009 5 B 0R015
 Type Tolerance Pack.-Code R-Value



Specifications

Type		KN350-8	KN351-8	KN352-8	KN353-8	KN354-8
Styles		7718	7725	7738	9925	9938
Power rating P_{70}	W	4	5	7	7	9
Resistance range	Ω	0R003 ... 0R051	0R004 ... 0R068	0R005 ... 0R1	0R004 ... 0R068	0R005 ... 0R1
E-Series		E24>0R01	E24>0R01	E24>0R01	E24>0R01	E24>0R01
Tolerances	%	$\pm 1, \pm 2, \pm 3, \pm 5$				
Temperature coefficient	$10^{-6} \cdot K^{-1}$	+ 200 ... + 1200 depends on value				
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles				
Insulation voltage (1min.)	V_{RMS}	2000				
Insulation resistance	Ω	$> 10^4 M$				
Derating	$^{\circ}C$	linear 70 ... 250 (0W)				
Climatic category		55/200/56				
Temperature range	$^{\circ}C$	- 55 ... 250				
Thermal resistance	KW^{-1}	65	50	38	35	30
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 10, depends on value				
Endurance (P_{70} , @70 $^{\circ}C$, 1000h interm.)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average				
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,5$				
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,5$				
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,5$				
Terminal tensile strength	N	min. 25				
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.				
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T				
Marking		printed in clear				

Dimensions in mm:



6mm. reduced solderability in this area

	KN350-8	KN351-8	KN352-8	KN353-8	KN354-8
L_1	18	25	38	25	38
L_2	40	45	60	45	60

Measuring length L_2 : Resistance value is measured over the centered length L_2 on terminals free of oxide and contaminations. Differing conditions require adequate corrections ($R_{terminal} = 0,4 \text{ m}\Omega/\text{cm}$)

Packaging:

Type	Packaging	Pieces	Pack.Code
KN350-8	bulk taped	200 1000	B R
KN351-8	bulk	200	B
KN352-8	bulk	200	B
KN353-8	bulk	200	B
KN354-8	bulk	100	B

Ordering example: KN350-8 5 B 0R015
 Type Tolerance Pack.-Code R-Value

Ceramic Metal Plate Resistors
Low value , low inductance

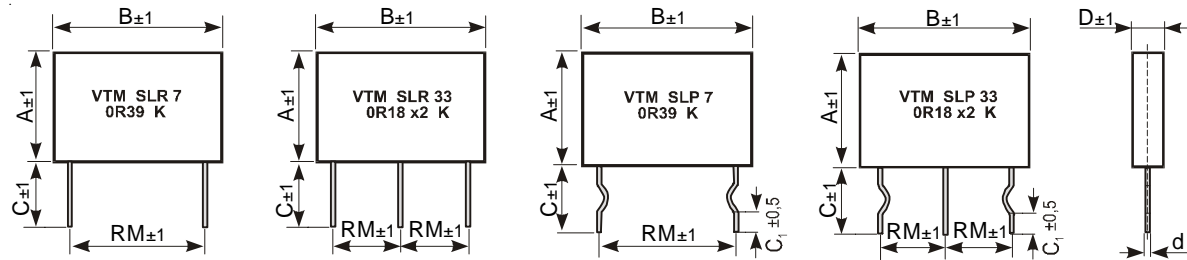


Specifications

Type		SLR2 SLP2	SLR3 SLP3	SLR5 SLP5	SLR5B SLP5B	SLR7 SLP7	SLR7B SLP7B	SLR10 SLP10	SLR10A SLP10A	SLR33 SLP33	SLR33B SLP33B	SLR55 SLP55
Power rating P ₇₀	W	see next page										
Resistance range	Ω	see next page										
Tolerances	%	10% (K) standard 5% (J) on request										
Temperature coefficient	10 ⁻⁶ *K ⁻¹	± 250										
max. cont. work. voltage	V _{RMS}	$\sqrt{P_{70} \cdot R}$										
Insulation voltage	V _{RMS}	> 700 V										
Insulation resistance	Ω	≥ 1G										
Derating linear	°C	70 ... 150										
Climatic category		25 / 155 / 21										
Temperature range	°C	- 25 ~ 155										
Short time overload	$\left[\frac{\Delta R}{R}\right] \%$	± (1% R+0.05Ω)										
Load Life P _{70°C} (70°C 1000h, 1.5h "ON", 0.5h "OFF")	$\left[\frac{\Delta R}{R}\right] \%$	± (5% R+0.1Ω)										
Damp heat, steady state (40°C, 95% r.h., 21d)	$\left[\frac{\Delta R}{R}\right] \%$	± (5% R+0.1Ω)										
Terminal tensile strength	$\left[\frac{\Delta R}{R}\right] \%$	± (1% R+0.05Ω)										
Resistance to soldering heat (350°C, 3.5s)		± (1% R+0.05Ω) .										
Solderability IEC 60068-2-20 260 °C , Solder bath	s	2 ± 0.5										
Marking		printed in clear										

Ordering example: SLR2 10 B 0R1
 Type Tolerance Pack.-Code R-Value

Dimensions in mm:



Type	Rated power $P_{70^{\circ}\text{C}}$	Resistance range		Dimensions (mm)								Packaging	
		Min.	Max.	A	B	C (SLR)	C (SLP)	C_1 (SLP)	D	d	RM	Pieces / Box	
												SLR	SLP
SLR2 / SLP2	2	0R01	1R	8	13	12	10	4	5	0.6	9	300	300
SLR3 / SLP3	3	0R05	1R	13	13	12	10	4	5	0.6	8	230	230
SLR5 / SLP5	5	0R01	3R3	18	14	12	10	4	5	0.6	10	180	180
SLR5B / SLP5B	5	0R05	3R3	10	26	12	10	4	5	0.8	20	160	160
SLR7 / SLP7	7	0R05	3R3	18	26	12	10	4	5	0.8	20	100	100
SLR7B / SLP7B	7	0R05	3R3	13	26	12	10	4	5	0.8	20	130	130
SLR10 / SLP10	10	0R05	3R3	20	26	12	10	4	5	0.8	20	100	100
SLR10A / SLP10A	10	0R05	3R3	19	26	12	10	4	5.5	0.8	20	100	100
SLR33 / SLP33	3+3	0R1+0R1	0R5+0R5	18	26	12	10	4	5	0.8	10	100	100
SLR33B / SLP33B	3+3	0R1+0R1	0R5+0R5	13	26	12	10	4	5	0.8	10	130	130
SLR55 / SLP55	5+5	0R1+0R1	1R8+1R8	20	26	12	10	4	5	0.8	10	100	100

Low Ohmic Power Standard Resistors current sensor



Specifications

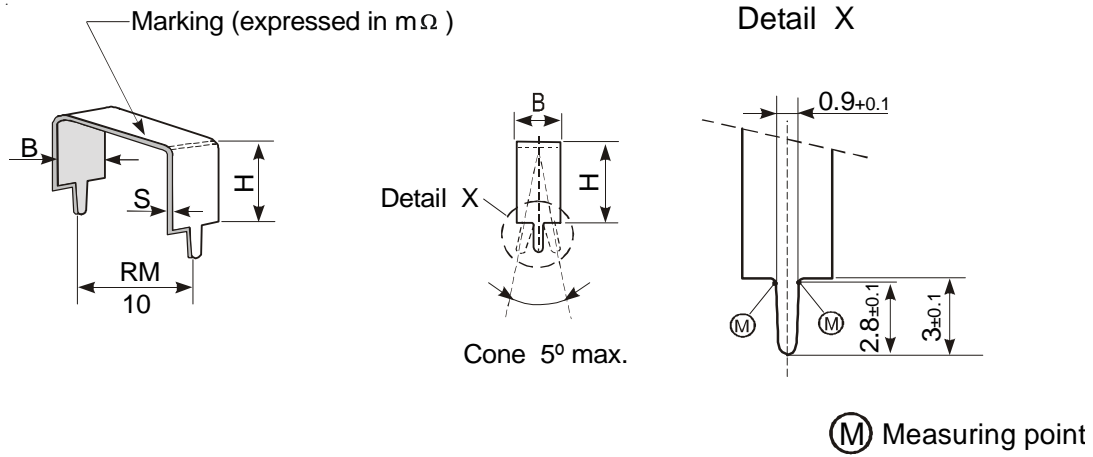
Type		*LPS 355-0, LPS 356-0, LPS 357-1 special varieties LPS 359 - xxx
Style		Existing styles upon request
Power rating P_{70}	W	Depends on styles
Resistance range	Ω	R0005 ... R068
Tolerances	%	± 5 others upon request
Temperature coefficient	$10^{-6} \cdot K^{-1}$	<-80 ... +40 / for CuNi44 others upon request
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$
Insulation voltage (1min.)	V_{RMS}	not insulated
Insulation resistance	Ω	not insulated
Derating linear	$^{\circ}C$	70 ... 235 (0W)
Climatic category		55/350/56
Temperature range	$^{\circ}C$	- 55 ... 350
Thermal resistance	KW^{-1}	$280^{\circ} C / P_{70}$
Failure Rate (Total ϑ_o , max, 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	< 0,1
Endurance (P_{70} , 1000h)	$\left[\frac{AR}{R}\right] \%$	< 0,3
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right] \%$	$\pm 0,5$
Climatic sequence	$\left[\frac{AR}{R}\right] \%$	$\pm 0,5$
Terminal strength	$\left[\frac{AR}{R}\right] \%$	n. a.
Terminal tensile strength	N	n. a.
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{AR}{R}\right] \%$	$\pm 0,2$ typ.
Solderability	s	Suitable for wave-soldering (see also page 25)
Marking		Value imprinted

Construction: These components are made directly from alloys. Standard are CuNi44 and CuNi23 Mn, others upon request.

* For special varieties pls. see „Design Notes for Current-Sense Resistors“ page 24 to 27 or contact VITROHM sales.

Dimensions in mm:

Type LPS 355-0



R-Value	Material	Dimension B S	H ± 2 [mm]	P [W]
0R005	CuNi44	5 x 0,7	12,5	2,2
0R0068		4 x 0,8	16,5	2,1
0R01		4 x 0,5	15	2,0
0R015		4 x 0,3	13	1,8
0R022		4 x 0,2	13	1,8
0R033		3 x 0,2	15	1,5
0R047		2 x 0,2	14	1,0
0R051		2 x 0,2	15,5	1,0
0R068		2 x 0,2	22,5	1,4

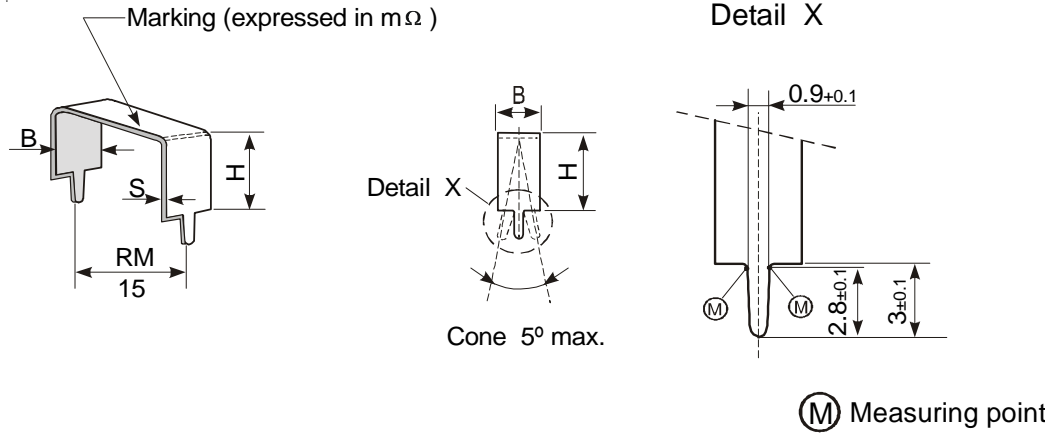
Packaging: bulk, depends on size and type
 B = bulk packing 1.000 pieces / box

Ordering example: LPS 355-0 5 B 0R01
 Type Tolerance Pack.-Code R-Value

Dimensions in mm:



Type LPS 356-0



R-Value	Material	Dimension		H ± 2 [mm]	P [W]
		B	S		
0R005	CuNi44	5	0,7	10	2,2
0R0068		4	0,8	14	2,1
0R01		4	0,5	12,5	2,0
0R015		4	0,3	10,5	1,8
0R022		4	0,2	10,5	1,8
0R033		3	0,2	12,5	1,5
0R047		2	0,2	11,5	1,0
0R051		2	0,2	13	1,0
0R068		2	0,2	20	1,4

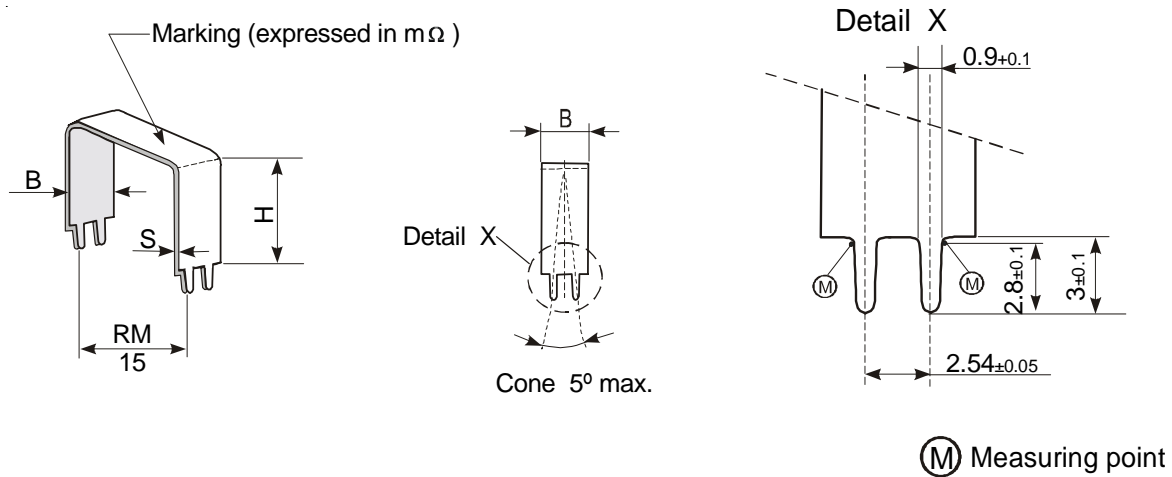
Packaging: bulk, depends on size and type
 B = bulk packing 1000 pieces / box

Ordering example: LPS 356-0 5 B 0R01
 Type Tolerance Pack.-Code R-Value

Dimensions in mm:



Type LPS 357-1



R-Value	Material	Dimension		H ± 2 [mm]	P [W]
		B	S		
0R001	CuNi23 Mn	10	0,8	10	3,7
0R0022		10	0,8	22	7,0
0R0033	CuNi44	10	0,5	12	4,6
0R005		5	0,8	13	2,6
0R0068		5	0,7	20	3,4
0R01		9	0,2	14	4,5
0R015		7	0,2	15,5	4,0
0R022		4	0,2	11,5	1,9
0R033	4	0,2	21	2,8	

Packaging: bulk, depends on size and type
 B = bulk packing 500 pieces / box

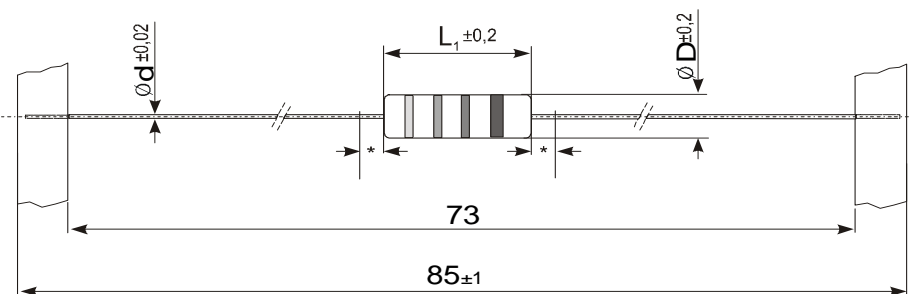
Ordering example: LPS 357-1 5 B 0R01
 Type Tolerance Pack.-Code R-Value



Specifications

Type		BW234-0	BW235-0
Style		0411	0614
Power rating P_{70}	W	0,75 ($P_{50} = 1,0$)	1,5 ($P_{25} = 2,0$)
Resistance range	Ω	0R1 ... 1K2	0R1 ... 2K4
E-Series		E 24, E 12	
Tolerances	%	$\pm 5, \pm 10$	
Temperature coefficient	$10^{-6} \cdot K^{-1}$	see table next page	
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$	
Insulation voltage (1min.)	V_{RMS}	700	1000
Insulation resistance	Ω	$> 10^4 M$	
Derating linear	$^{\circ}C$	70 ... 175 (0W)	
Climatic category		55/175/56	
Temperature range	$^{\circ}C$	- 55 ... 175	
Thermal resistance	KW^{-1}	140	80
Failure rate (Total, ϑ_0 max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100, depends on value	
Endurance (P_{70} , 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 5,0$ average	
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$	
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$	
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	± 1	
Terminal tensile strength	N	40	
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T	
Marking		DIN-IEC-colour code, 4 bands	

Dimensions in mm:



* 3mm, reduced solderability in this area.

Temperature coefficient

Typ	resistance Value	TC * $10^{-6}K^{-1}$
BW234-0	0R1 ... 0R15	± 600
	0R16 ... 0R62	± 300
	0R68 ... 1K2	± 150
BW235-0	0R1 ... 0R16	± 1000
	0R18 ... 0R68	± 800
	0R75 ... 2K4	± 400

Type	$L \pm 0,2$	$\varnothing D \pm 0,2$	$\varnothing d \pm 0,02$	Tape step
BW234-0	9,9	3,6	0,8	5
BW235-0	14,3	5,7	1,0*	10

*Special lead diameter 0,8 mm available, type BW 235-006

Packaging:

Type	Packaging	Pieces	Pack.Code
BW234-0	taped/Ammopack	1000	T
BW235-0	taped/Ammopack	1000	T

Ordering example: BW 234-0 5 T 1K
 Type Tolerance Pack.-Code R-Value

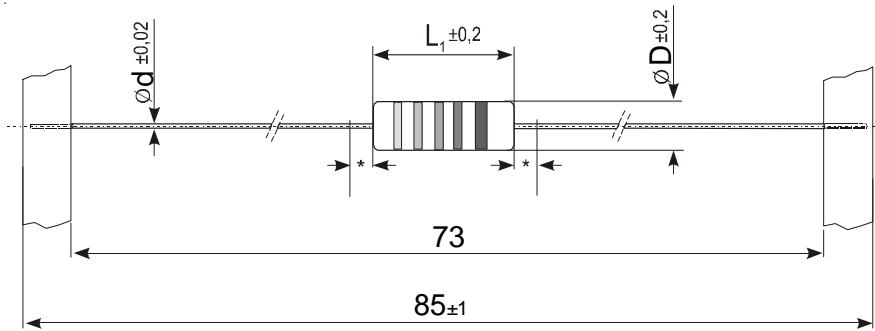
Insulated Wirewound Resistors, moulded
flame retardant, failsafe



Specifications

Type		BWF237-0	BWF236-0
Style		0411	0614
Power rating P_{70}	W	0,75 ($P_{50} = 1,0$)	1,5 ($P_{25} = 2,0$)
Resistance range	Ω	0R1 ... 1K	0R1 ... 1K
E-Series		E 24, E 12	
Tolerances	%	$\pm 5, \pm 10$	
Temperature coefficient	$10^{-6} * K^{-1}$	- 400 ... + 1000, see table next page	
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$	
Insulation voltage (1min.)	V_{RMS}	700	1000
Insulation resistance	Ω	> $10^4 M$	
Derating linear	$^{\circ}C$	70 ... 175 (0W)	
Climatic category		55/175/56	
Temperature range	$^{\circ}C$	- 55 ... 175	
Thermal resistance	KW^{-1}	140	80
Failure rate (Total, ϑ_0 max., 60% conf. lev.)	$10^{-9} * h^{-1}$	appr. 100, depends on value	
Endurance (P_{70} , 1000h)	$\left[\frac{AR}{R}\right] \%$	$\pm 5,0$ average	$\pm 10,0$ average
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right] \%$	$\pm 2,0$	
Climatic sequence	$\left[\frac{AR}{R}\right] \%$	$\pm 2,0$	
Terminal strength	$\left[\frac{AR}{R}\right] \%$	± 1	
Terminal tensile strength	N	40	
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{AR}{R}\right] \%$	$\pm 0,2$ typ.	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T	
Marking		DIN-IEC-colour code, 5 bands (5th band (blue) for failsafe version)	

Dimensions in mm:



* 3mm, reduced solderability in this area.

Temperature coefficient

Typ	resistance Value	TC * 10 ⁻⁶ K ⁻¹
BWF237-0	0R1	± 1000
	0R11 ... 0R18	± 600
	0R2 ... 0R68	± 300
	0R75 ... 1K	± 150
BWF236-0	0R1	± 1800
	0R11 ... 0R16	± 1000
	0R18 ... 0R68	± 800
	0R75 ... 1K	± 400

Type	L ± 0,2	ØD ± 0,2	Ød ± 0,02	Tape step
BWF237-0	9,9	3,6	0,8	5
BWF236-0	14,3	5,7	1,0*	10

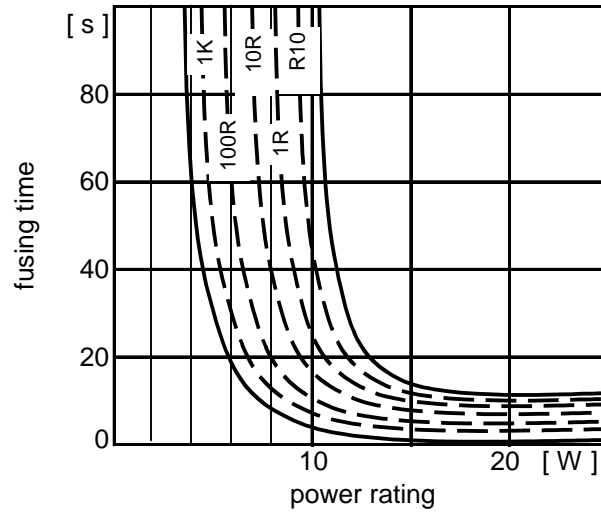
*Special lead diameter 0,8 mm available, type BWF 236-006

Packaging:

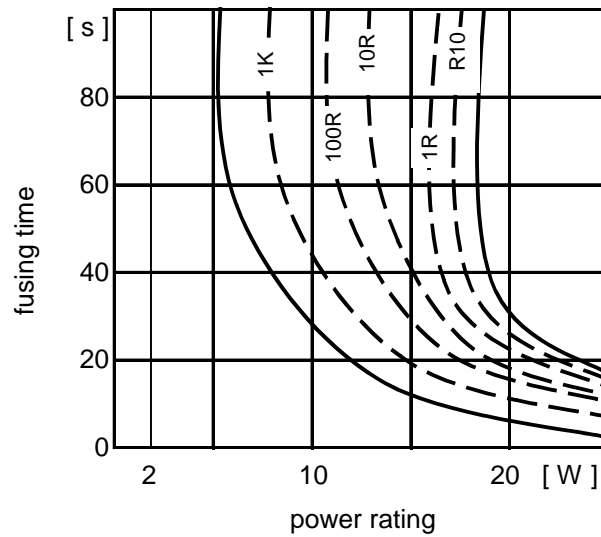
Type	Packaging	Pieces	Pack.Code
BWF236-0	taped/Ammopack	1000	T
BWF237-0	taped/Ammopack	1000	T

Ordering example: BWF 237-0 5 T 1K
 Type Tolerance Pack.-Code R-Value

Type BWF 237-0

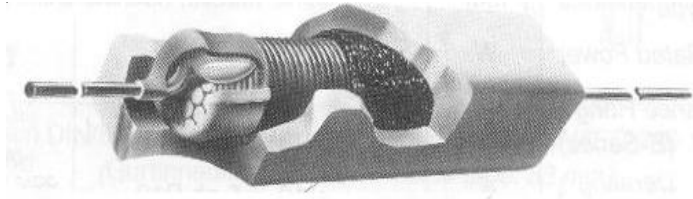


Type BWF 236-0



Wirewound Resistors

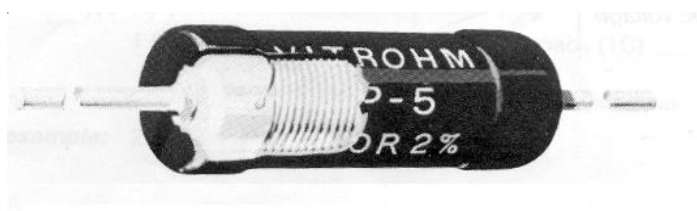
Resistors of Series K, wound on fibre glass core, have a special internal direct contact to virtually eliminate resistance changes caused by varying, often high temperatures.



Series BW and BWF, wound on fibre glass core and capped in an special process, suit all requirements for automatic insertion due to moulded case. The accurate fusing characteristic of Series BWF reliably protects circuits from overload.



Resistors of Series CR are wound on ceramic carriers, all-welded contacts. Coated, the resistors comply with all requirements for precision and high ratings.



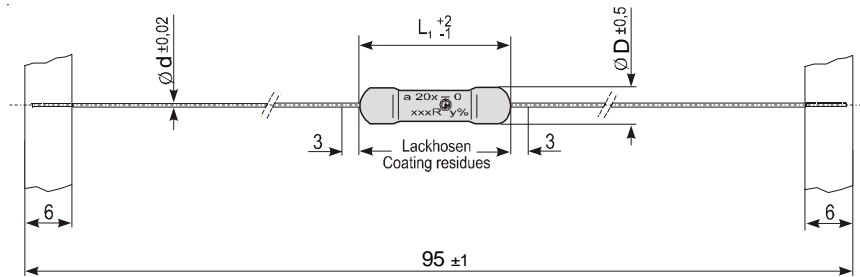
Power Wirewound Resistors axial, coated, fibre glass core



Specifications

Type		KC 200-0	KC202-0	KC204-0
Style		0416	0424	0432
Power rating P_{70}	W	1,0	2,0	3,0
Resistance range	Ω	0R056 ...9K1	0R075 ...20K	0R33 ... 30K
E-Series		E 24 (5%), E 12 (10%)		
Tolerances	%	± 10 ; $R \geq 0R1 \pm 5\%$		
Temperature coefficient	$10^{-6} \cdot K^{-1}$	- 80 ... + 500		
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$		
Insulation voltage (1min.)	V_{RMS}	max. 75		
Insulation resistance	Ω	not insulated		
Derating linear	$^{\circ}C$	70 ... 350 (0W)		
Climatic category		55/200/56		
Temperature range	$^{\circ}C$	- 55 ... 350		
Thermal resistance	KW^{-1}	200	125	125
Failure rate (Total, ϑ_0 max., 60% conf. lev.)		appr. 100, depends on value		
Endurance (P_{70} , 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average		
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$		
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$		
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 1,0$		
Terminal tensile strength	N	50		
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.		
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T		
Marking		printed in clear		

Dimensions in mm:



Typ	L1	ØD	Ød
KC200-0	16	4,5 ± 0,5	0,8 ± 0,02
KC202-0	24	4,5 ± 0,5	0,8 ± 0,02
KC204-0	32	4,5 ± 0,5	0,8 ± 0,02

Packaging:

Type	Packaging	Pieces	Pack.Code
KC200-0	taped/Ammopack	1000	T
KC202-0	taped/Ammopack	1000	T
KC204-0	taped/ammopack	1000	T

Ordering example: KC 200-0 5 T 1R
 Type Tolerance Pack.-Code R-Value

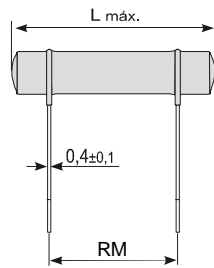
Power Wirewound Resistors
radial, fibre glass core, coated



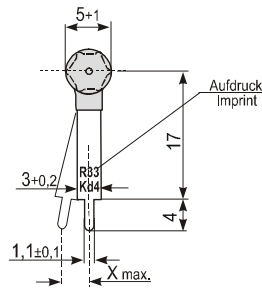
Specifications

Type		KP290	KP292	KP294	KP296	KP298
Styles		0518	0523	0533	0543	0553
Power rating P_{70}	W	2,0	4,0	5,0	6,5	8,0
Resistance range	Ω	0R1 ... 7K5	0R15 ... 11K	0R27 ... 20K	0R39 ... 27K	0R47 ... 36K
E-Series		E 24/E 12	E 24/E 12	E 24/E 12	E 24/E 12	E 24/E 12
Tolerances	%	± 10 $\pm 5 \geq 0R2$	± 10 $\pm 5 \geq 0R3$	± 10 $\pm 5 \geq 0R47$	± 10 $\pm 5 \geq 0R68$	± 10 $\pm 5 \geq 0R91$
Temperature coefficient	$10^{-6} * K^{-1}$		- 80 ... + 500			
max. cont. work. voltage	V_{RMS}		$\sqrt{P_{70} \cdot R}$ for all styles			
Insulation voltage (1min.)	V_{RMS}		max 75			
Insulation resistance	Ω		not insulated			
Derating linear	$^{\circ}C$		70 ... 350 (0W)			
Climatic category			55/200/56			
Temperature range	$^{\circ}C$		- 55 ... 350			
Thermal resistance	KW^{-1}	110	70	60	50	40
Failure rate (Total, ϑ_0 , max., 60% conf. lev.)	$10^{-9} * h^{-1}$		appr. 100, depends on value			
Endurance (P_{70} , 70 $^{\circ}C$, 1000)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 3,0$ average			
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 2,0$			
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 2,0$			
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 1,0$			
Terminal tensile strength	N		40			
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 0,2$ typ.			
Solderability	s	solderable according to IEC 60068-2-20 Ta				
Marking		on termination; value 3 digits, Tolerance, Production date code				

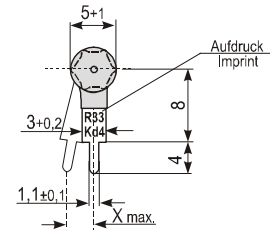
Dimensions in mm:



Type 290-0... 298-0



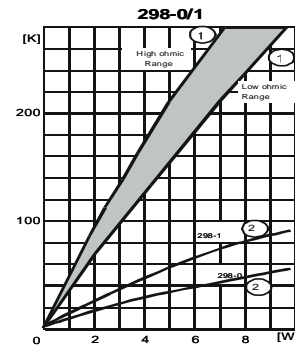
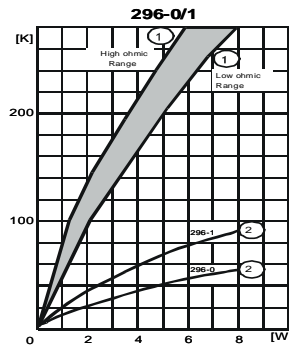
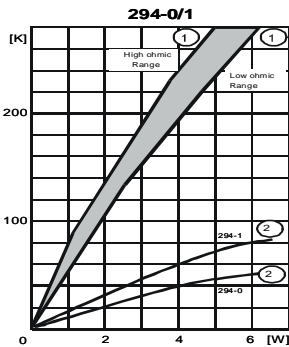
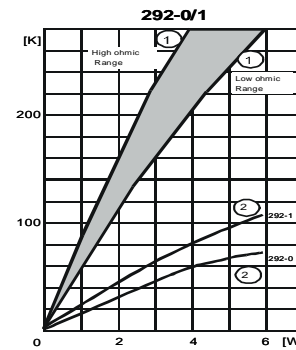
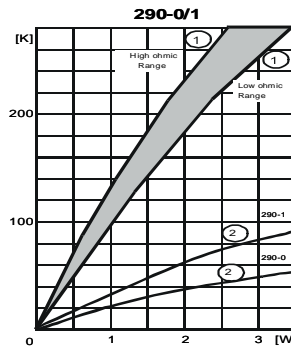
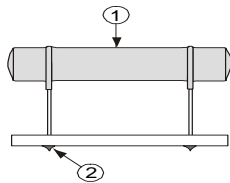
Type 290-1... 298-1



Type	L	RM
KP290-0/1	18,2	10
KP292-0/1	23,3	15
KP294-0/1	33,4	25
KP296-0/1	43,5	35
KP298-0/1	53,7	45

Type	RM Tolerance	Xmax.
KP29x-0	+1,0	3,0
KP29x-1	+0,8	1,7

Temperature rise:
(solder joints)



Packaging:

Type	Packaging	Pieces	Pack.-Code
KP290-0	bulk	500	B
KP290-1		1000	
KP292-0	bulk	500	B
KP292-1		1000	
KP294-0	bulk	250	B
KP294-1		500	
KP296-0	bulk	250	B
KP296-1		500	
KP298-0	bulk	250	B
KP298-1		250	

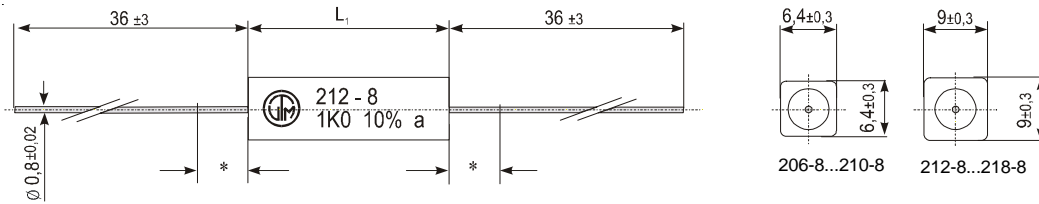
Ordering example: KP294-1 5 B 1K3
 Type Tolerance Pack.-Code R-Value



Specifications

Type		KH206-8	KH208-8	KH210-8	KH212-8	KH214-8	KH216-8	KH218-8
Power rating P_{70}	W	4	5	7	7	9	11	17
Resistance range	Ω	see page 2						
E-Series		E 24 (5%), E 12 (10%)						
Tolerances	%	$\pm 5, \pm 10$						
Temperature coefficient	$10^{-6} \cdot K^{-1}$	depends on value see table 3						
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles						
Insulation voltage (1min.)	V_{RMS}	2000						
Insulation resistance	Ω	$> 10^4$						
Derating linear	$^{\circ}C$	linear 70 ... 350 (0W)						
Climatic category		55/200/21						
Temperature range	$^{\circ}C$	- 55 ... 350						
Thermal resistance	KW^{-1}	65	50	40	40	30	25	15
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100, depends on value						
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average						
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 1,0$						
Terminal tensile strength	N	50						
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.						
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T						
Standards		CECC 40202-001 and -005 applicable DIN 45921 T 202						
Marking		Printed in clear						

Dimensions in mm:



* 6mm, reduced solderability in this area

Type	Resistance range			L_1
	10%	Min 5%	Max	
KH206-8	0R056	0R1	9K1	$20 \pm 1,0$
KH208-8	0R075	0R15	15K	$25 \pm 1,0$
KH210-8	0R11	0R33	33K	$38 \pm 1,0$
KH212-8	0R075	0R15	15K	$25 \pm 1,0$
KH214-8	0R11	0R33	33K	$38 \pm 1,0$
KH216-8	0R15	0R51	47K	$50 \pm 1,5$
KH218-8	0R27	0R91	82K	$75 \pm 2,0$

Temperature coefficient:

Type	TC +400 ± 50 ppm K ⁻¹	TC 0 ± 40 ppm K ⁻¹	TC 0 ± 10 ppm K ⁻¹
KH206	0R056 ... 0R2	0R22 ... 300R	330R ... 9K1
KH208	0R075 ... 0R3	0R33 ... 470R	510R ... 15K
KH210	0R11 ... 0R68	0R75 ... 910R	1K0 ... 33K
KH212	0R075 ... 0R3	0R33 ... 470R	510R ... 15K
KH214	0R11 ... 0R68	0R75 ... 910R	1K0 ... 33K
KH216	0R15 ... 1R	1R1 ... 1K3	1K5 ... 47K
KH218	0R27 ... 1R6	1R8 ... 2K4	2K7 ... 82K

Packaging:

Type	Packaging	Pieces	Pack.-Code
KH206-8	bulk taped	200	B
		1000	R
KH208-8	bulk taped	200	B
		1000	R
KH210-8	bulk taped	200	B
		1000	R
KH212-8	bulk taped	200	B
		500	R
KH214-8	bulk taped	100	B
		500	R
KH216-8	bulk	100	B
KH218-8	bulk	100	B

Ordering example:

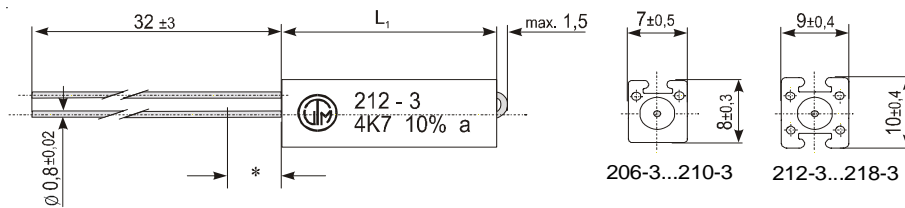
KH206-8 5 B 9R1
Type Tolerance Pack.-Code R-Value



Specifications

Type		KV206-3	KV208-3	KV210-3	KV212-3	KV214-3	KV216-3	KV218-3
Power rating P_{70}	W	4	5	7	7	9	11	17
Resistance range	Ω	see page 2						
E-Series		E 24 (5%), E 12 (10%)						
Tolerances	%	$\pm 5, \pm 10$						
Temperature coefficient	$10^{-6} \cdot K^{-1}$	depends on value see table 3						
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles						
Insulation voltage (1min.)	V_{RMS}	2000						
Insulation resistance	Ω	$> 10^4$						
Derating linear	$^{\circ}C$	linear 70 ... 350 (0W)						
Climatic category		55/200/21						
Temperature range	$^{\circ}C$	- 55 ... 350						
Thermal resistance	KW^{-1}	65	50	40	40	30	25	15
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100, depends on value						
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average						
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 1,0$						
Terminal tensile strength	N	50						
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.						
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T						
Standards		CECC 40202-001 and -005 applicable DIN 45921 T 202						
Marking		Printed in clear						

Dimensions in mm:



* 6mm, reduced solderability in this area

Type	Resistance range			L ₁
	10%	Min 5%	Max	
KV206-3	0R056	0R1	9K1	20 ±1,0
KV208-3	0R075	0R15	15K	25 ±1,0
KV210-3	0R11	0R33	33K	38 ±1,0
KV212-3	0R075	0R15	15K	25 ±1,0
KV214-3	0R11	0R33	33K	38 ±1,0
KV216-3	0R15	0R51	47K	50 ±1,5
KV218-3	0R27	0R91	82K	75 ±2,0

Temperature coefficient:

Type	TC +400 ±50 ppm K ⁻¹	TC 0 ±40 ppm K ⁻¹	TC 0 ±10 ppm K ⁻¹
KV206	0R056 ... 0R2	0R22 ... 300R	330R ... 9K1
KV208	0R075 ... 0R3	0R33 ... 470R	510R ... 15K
KV210	0R11 ... 0R68	0R75 ... 910R	1K0 ... 33K
KV212	0R075 ... 0R3	0R33 ... 470R	510R ... 15K
KV214	0R11 ... 0R68	0R75 ... 910R	1K0 ... 33K
KV216	0R15 ... 1R	1R1 ... 1K3	1K5 ... 47K
KV218	0R27 ... 1R6	1R8 ... 2K4	2K7 ... 82K

Packaging:

Type	Packaging	Pieces	Pack.-Code
KV206-3	bulk	200	B
KV208-3	bulk	200	B
KV210-3	bulk	200	B
KV212-3	bulk	200	B
KV214-3	bulk	200	B
KV216-3	bulk	200	B
KV218-3	bulk	100	B

Ordering example:

KV206-3 5 B 1K3
 Type Tolerance Pack.-Code R-Value

Power Wirewound Resistors,
vertical, circuit breaker, fibre glass core, ceramic case

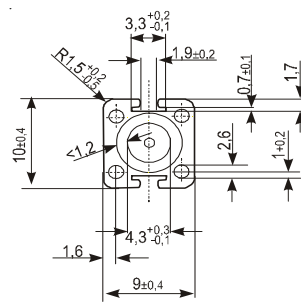
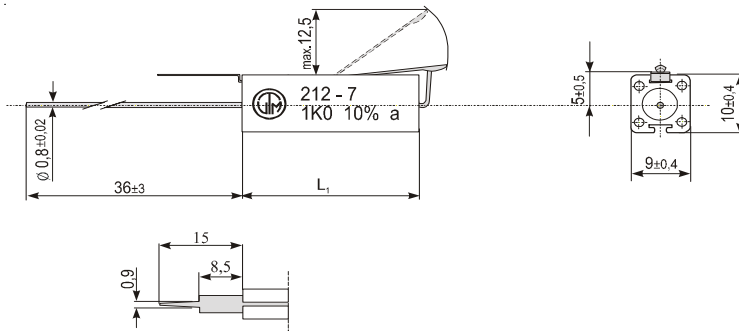


Specifications

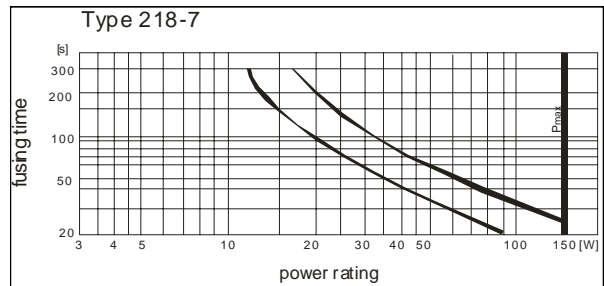
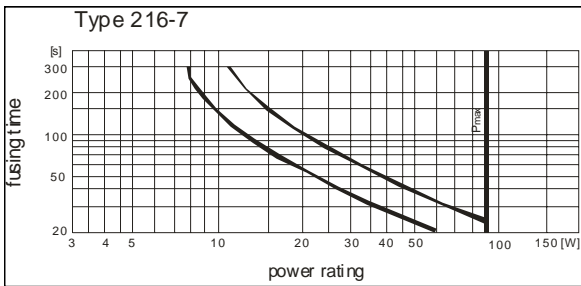
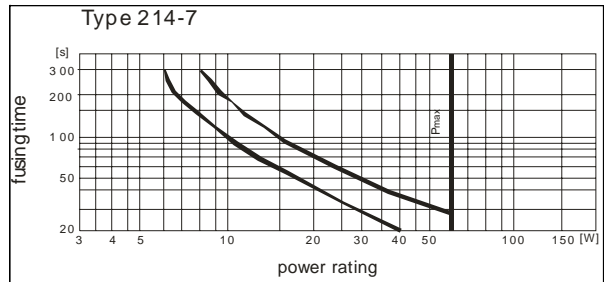
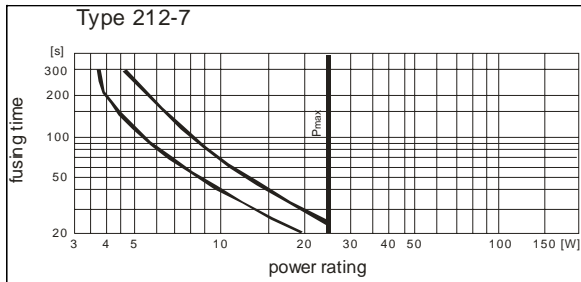
Type		KT212-7	KT214-7	KT216-7	KT218-7
Power rating P_{70}	W	2	2,5	3,5	4,5
Resistance range	Ω	see below			
E-Series		E 24 (5%), E 12 (10%)			
Tolerances	%	$\pm 5, \pm 10$			
Temperature coefficient	$10^{-6} \cdot K^{-1}$	- 80 ... + 500			
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$			
Insulation voltage (1min.)	V_{RMS}	2000			
Insulation resistance	Ω	$> 10^4 M$			
Derating linear	$^{\circ}C$	see diagram next page			
Climatic category		55/150/56			
Temperature range	$^{\circ}C$	- 55 ... 150			
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100, depends on value			
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{AR}{R}\right] \%$	$\pm 3,0$ average			
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right] \%$	$\pm 2,0$			
Climatic sequence	$\left[\frac{AR}{R}\right] \%$	$\pm 2,0$			
Terminal strength	$\left[\frac{AR}{R}\right] \%$	$\pm 1,0$			
Terminal tensile strength	N	50			
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{AR}{R}\right] \%$	$\pm 0,2$ typ.			
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T			
Marking		Printed in clear			

Type	Resistance range		Max	L_1
	10%	5%		
KT212-7	0R075	0R15	15K	25 $\pm 1,0$
KT214-7	0R11	0R33	33K	38 $\pm 1,0$
KT216-7	0R15	0R51	47K	50 $\pm 1,0$
KT218-7	0R27	0R91	82K	75 $\pm 1,0$

Dimensions in mm



Fusing times vs. load:



Packaging:

Type	Packaging	Pieces	Pack.-Code
KT212-7	bulk	200	B
KT214-7	bulk	200	B
KT216-7	bulk	200	B
KT218-7	bulk	100	B

Ordering example:

KT212-7 5 B 1K5
 Type Tolerance Pack.-Code R-Value

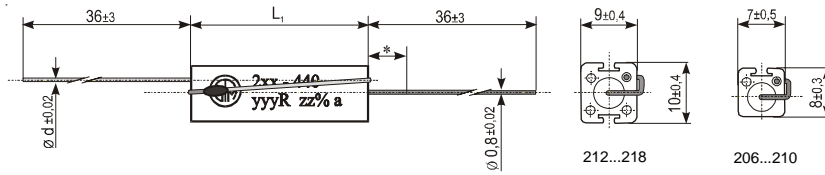
Power Wirewound Resistors
axial, circuit breaker, ceramic case, fibre glass core



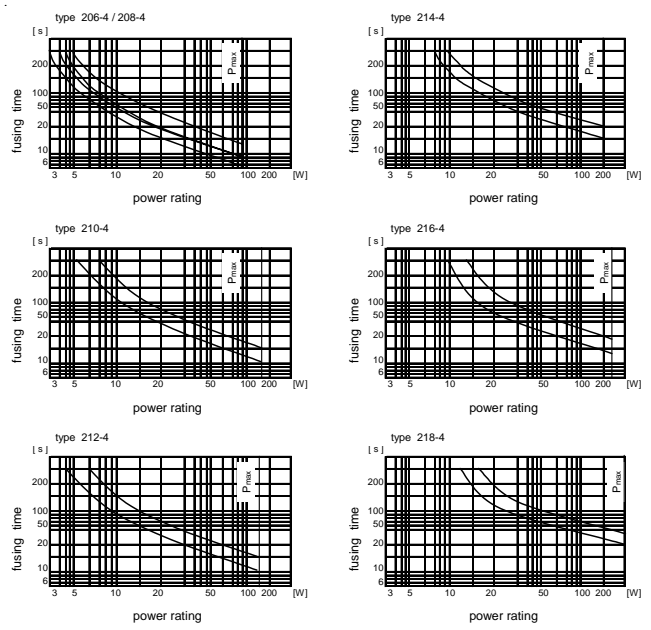
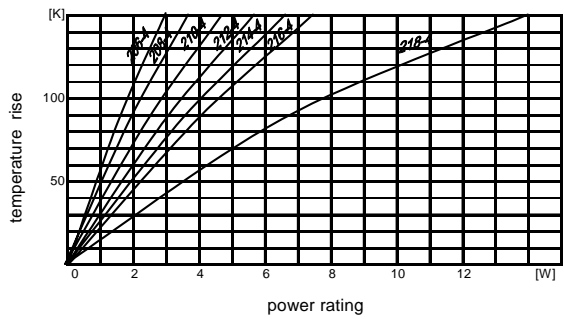
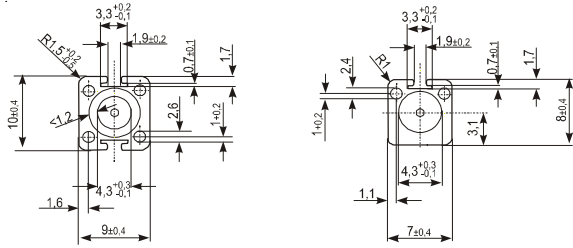
Specifications

Type			KF206-4	KF208-4	KF210-4	KF212-4	KF214-4	KF216-4	KF218-4
Power rating	P_{25} P_{70}	W	2,5 1,2	3,0 1,5	4,5 2,5	3,5 2,0	5,0 3,0	7,0 4,0	11 6,0
Resistance range		Ω	see page 2						
E-Series			E 24 (5%), E 12 (10%)						
Tolerances		%	$\pm 5, \pm 10$						
Temperature coefficient		$10^{-6} \cdot K^{-1}$	- 80 ... + 500						
max. cont. work. voltage		V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles						
Insulation voltage (1min.)		V_{RMS}	2000						
Insulation resistance		Ω	$> 10^4 M$						
Derating linear		$^{\circ}C$	see Table Temperature rise of solder joints						
Climatic category			55/150/56						
Temperature range		$^{\circ}C$	- 55 ... 150						
Failure rate (Total, ϑ_o , max., 60% conf. lev.)		$10^{-9} \cdot h^{-1}$	appr. 100, depends on value						
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)		$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average						
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)		$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Climatic sequence		$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$						
Terminal strength		$\left[\frac{\Delta R}{R}\right] \%$	$\pm 1,0$						
Terminal tensile strength		N	50						
Resistance to soldering heat (260 $^{\circ}C$, 10s)		$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$ typ.						
Solderability		s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T						
Marking			Printed in clear						

Dimensions in mm:



* 6mm, reduced solderability in this area



Type	Resistance range		L ₁	Ød
	Min	Max		
KF206-4	0R1	9K1	20 ±1,0	0,6
KF208-4	0R15	15K	25 ±1,0	0,6
KF210-4	0R33	33K	38 ±1,0	0,8
KF212-4	0R15	15K	25 ±1,0	0,6
KF214-4	0R33	33K	38 ±1,0	0,8
KF216-4	0R51	47K	50 ±1,5	0,8
KF218-4	0R91	82K	75 ±2,0	0,8

Packaging:

Type	Packaging	Pieces	Pack.-Code
KF206-4	bulk	100	B
KF208-4	bulk	100	B
KF210-4	bulk	100	B
KF212-4	bulk	100	B
KF214-4	bulk	100	B
KF216-4	bulk	100	B
KF218-4	bulk	100	B

Ordering example:

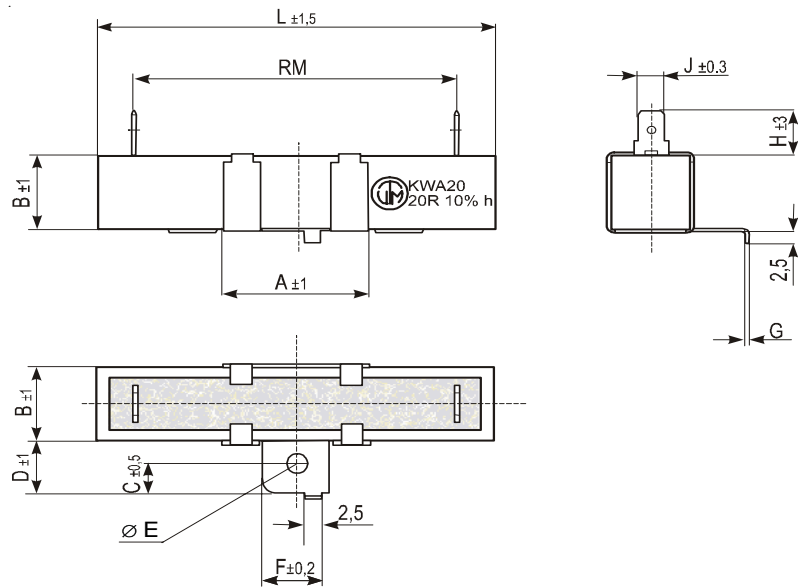
KF212-4 5 B 1K
 Type Tolerance Pack.-Code R-Value



Specifications

Type		KWA 15	KWA 20	KWA 30	KWA 40
Style		1348	1364	1975	1990
Power rating P_{70}	W	15	20	30	40
Resistance range	Ω	0R51...5K6	0R51...10K	0R62...10K	0R62...10K
E-Series			E 24		
Tolerances	%		± 5		
Temperature coefficient	$10^{-6} * K^{-1}$		± 250		
max. cont. work. voltage	V_{RMS}		$\sqrt{P_{70} \cdot R}$		
Insulation voltage (1min.)	V_{RMS}		2000		
Insulation resistance	Ω		> 10M		
Derating linear	$^{\circ}C$		linear 70 ... 350 $^{\circ}C$ (0W)		
Climatic category			55/200/21		
Temperature range	$^{\circ}C$		- 55 ... 350		
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$		ca. 100 depends on value		
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 5,0$		
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 5,0$		
Resistance to soldering heat (360 $^{\circ}C$, 3,5s)	$\left[\frac{\Delta R}{R}\right] \%$		$\pm 1,0$		
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T			
Marking		Printed in clear			

Dimensions in mm



Type	L ±1,5	RM	B ±1	A ±1	C ±0,5	D ±1	E	F ±0,2	G	H ±3	J ±0,3
KWA15	48,0	34,0	13	25	6	12,5	4	12	0,6	9 *	4,8 *
KWA20	63,5	48,0	13	25	6	12,5	4	12	0,6	9 *	4,8 *
KWA30	75,0	56,0	19	40	8	18,0	4,2	18	0,8	12	6,4
KWA40	90,0	71,0	19	40	8	18,0	4,2	18	0,8	12	6,4

* Special AMP contacts 6,4 x 12 mm available types KWA15001 and KWA20001

Type	Packaging	Pieces	Pack.-Code
KWA15	bulk	70	B
KWA20	bulk	60	B
KWA30	bulk	14	B
KWA40	bulk	14	B

Ordering example: KWA40 5 B 3K6
 Type Tolerance Pack.-Code R-Value

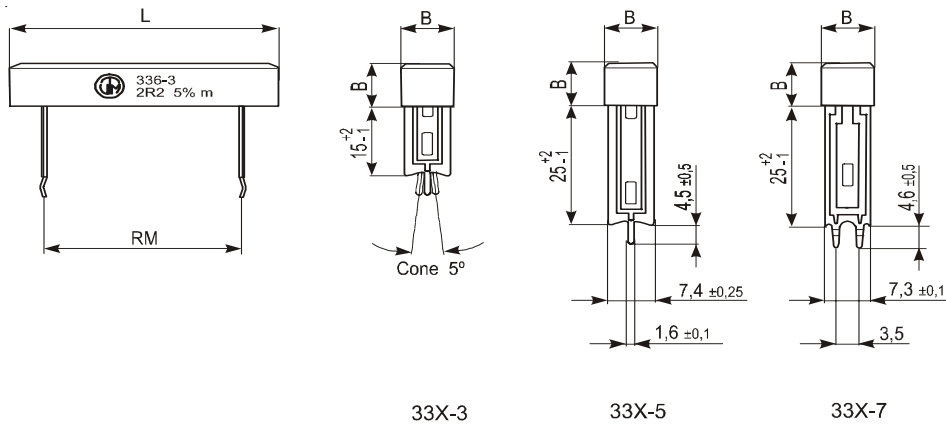
Power Wirewound Resistors, ceramic case, radial



Specifications

Type		KWP 330-3/5/7	KWP 331-3/5/7	KWP 332-3/5/7	KWP 333-3/5-7	KWP 335-3/5/7	KWP 336-3/5/7	KWP 337-3/5/7	KWP 338-3/5/7
Power rating P_{25} P_{70}	W	3,0 2,0	4,0 2,2	5,0 2,5	7,0 3,0	9,0 4,5	10,0 4,5	15,0 5,5	20,0 8,0
Resistance range	Ω	0R2... 2K4	0R22... 3K	0R3... 3K6	0R43... 4K7	0R56... 5K6	0R68... 6K8	0R62... 7K5	0R91... 10K
E-Series		E 24 (5%). E 12 (10%)							
Tolerances	%	± 5 , ± 10							
Temperature coefficient	$10^{-6} \cdot K^{-1}$	- 80 ... + 500 depends on value							
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles							
Insulation voltage (1min.)	V_{RMS}	2000							
Insulation resistance	Ω	$> 10^4 M$							
Derating linear	$^{\circ}C$	linear 70 ... 275 (0W)							
Climatic category		55/200/56							
Temperature range	$^{\circ}C$	- 55 ... 275							
Thermal resistance	KW^{-1}	37	35	35	35	35	30	20	14
Failure rate (Total, ϑ_{σ} , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	ca. 100 depends on value							
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 3,0$ average							
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$							
Resistance to soldering heat (360 $^{\circ}C$, 3,5s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,5$							
Solderability	s	2,5 s Flowtime; solderglobule test IEC 60068-2-20-T							
Marking		Printed in clear							

Dimensions in mm



Type	L	B	RM
KWP330-3/5/7	23	10	10
KWP331-3/5/7	25	10	12,5
KWP332-3/5/7	28	10	15
KWP333-3/5/7	35	10	22,5
KWP335-3/5/7	43	10	30
KWP336-3/5/7	48	10	35
KWP337-3/5/7	50	13	32,5
KWP338-3/5/7	65	13	47,5

Packaging:

Type	Packaging	Pieces	Pack.-Code
KWP330-3/5/7	bulk	144	B
KWP331-3/5/7	bulk	100	B
KWP332-3	bulk	112	B
KWP332-5/7	bulk	128	B
KWP333-3	bulk	120	B
KWP333-5/7	bulk	100	B
KWP335-3	bulk	150	B
KWP335-5/7	bulk	105	B
KWP336-3	bulk	150	B
KWP336-5	bulk	120	B
KWP336-7	bulk	100	B
KWP337-3	bulk	128	B
KWP337-5/7	bulk	50	B
KWP338-3	bulk	100	B
KWP338-5/7	bulk	48	B

Ordering example:

KWP333-3
Type

5
Tolerance

B
Pack.-Code

0R43
R-Value

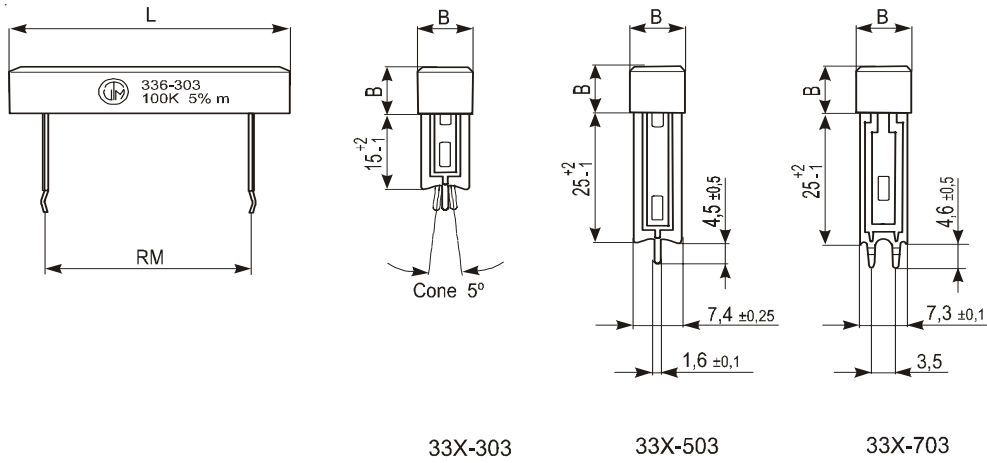
Power Resistors, Metox Element ceramic case, radial



Specifications

Type		KWP 330-303 330-503 330-703	KWP 331-303 331-503 331-703	KWP 332-303 332-503 332-703	KWP 333-303 333-503 333-703	KWP 334-303 334-503 334-703	KWP 336-303 336-503 336-703
Power rating P_{25} P_{70}	W	3,0 2,0	4,0 2,2	5,0 2,5	7,0 3,0	9,0 4,5	10,0 4,5
Resistance range	Ω	390R... 100K	680R... 100K	680R... 100K	1K... 100K	1K... 100K	1K... 100K
E-Series	%	E 24 (5%)					
Temperature coefficient	$10^{-6} * K^{-1}$	± 250 ppm					
max. cont. work. voltage	V_{RMS}	350			500		
Insulation voltage (1min.)	V_{RMS}	2000					
Insulation resistance	Ω	$> 10^4 M$					
Derating linear	$^{\circ}C$	linear 70 ... 235 (0W)					
Climatic category		55/155/21					
Temperature range	$^{\circ}C$	- 55 ... 235					
Thermal resistance	KW^{-1}	37	35	35	35	35	30
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$	1					
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{\Delta R}{R}\right] \%$	± 5 average					
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	± 5					
Resistance to soldering heat (360 $^{\circ}C$, 3,5s)	$\left[\frac{\Delta R}{R}\right] \%$	± 1					
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T					
Marking		Printed in clear					

Dimensions in mm



Type	L	B	RM
KWP330-303/503/703	23	10	10
KWP331-303/503/703	25	10	12,5
KWP332-303/503/703	28	10	15
KWP333-303/503/703	35	10	22,5
KWP334-303/503/703	43	10	32,5
KWP336-303/503/703	48	10	35

Packaging:

Type	Packaging	Pieces	Pack.-Code
KWP330-303/503/703	bulk	144	B
KWP331-303/503/703	bulk	100	B
KWP332-303	bulk	112	B
KWP332-503/703	bulk	128	B
KWP333-303	bulk	120	B
KWP333-503/703	bulk	100	B
KWP334-303	bulk	150	B
KWP334-503/703	bulk	105	B
KWP336-303	bulk	150	B
KWP336-503	bulk	120	B
KWP336-703	bulk	100	B

Ordering example:

KWP336-303 5 B 100K
 Type Tolerance Pack.-Code R-Value

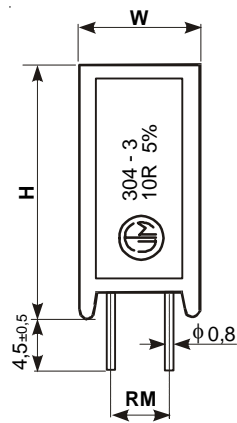
Power Wirewound Resistors ceramic case, vertical



Specifications

Type		KWV302-3	KWV304-3	KWV306-3	KWV308-3	KWV309-3	KWV310-3
Power rating P_{70}	W	2	3	5	7	10	10
Resistance range	Ω	0R1...1K	0R1...4K7	0R1...4K7	0R1...10K	0R1...4K7	0R1...16K
E-Series		E 24					
Tolerances	%	5					
Temperature coefficient	$10^{-6} \cdot K^{-1}$	- 80 ... + 500 (depends on value)					
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$ for all styles					
Insulation voltage (1min.)	V_{RMS}	2000					
Insulation resistance	Ω	$> 10^4 M$					
Derating linear	$^{\circ}C$	70 ... 275 (0W)					
Climatic category		55/200/21					
Temperature range	$^{\circ}C$	- 55 ... 275					
Thermal resistance	KW^{-1}	100	68	40	30	20	20
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100, depends on value					
Endurance (P_{70} , 70 $^{\circ}C$, 1000)	$\left[\frac{\Delta R}{R}\right] \%$	3,0					
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	2,0					
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	2,0					
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	2,0					
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	0,5					
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20T					
Marking		Printed in clear					

Dimensions in mm:



Type	H ±1	W ±1	D ±1	RM ±0,5
KWV302-3	20,5	11	7	5
KWV304-3	25	12	8	5
KWV306-3	26	13	9	5
KWV308-3	39	13	9,5	5
KWV309-3	35	16	12	7,5
KWV310-3	51	13	9,5	5

Packaging:

Type	Packaging	Pieces	Pack.-Code
KWV302-3	bulk	250	B
KWV304-3	bulk	204	B
KWV306-3	bulk	176	B
KWV308-3	bulk	108	B
KWV309-3	bulk	120	B
KWV310-3	bulk	120	B

Ordering example: KWV304-3 5 B 100R
 Type Tolerance Pack.-Code R-Value

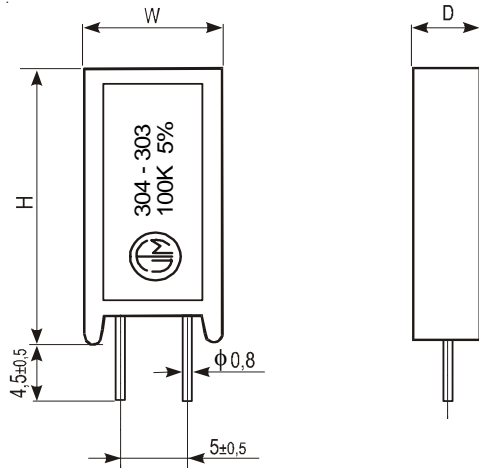
Power Resistors, Metox Element
ceramic case, vertical



Specifications

Type		KWV302-303	KWV304-303	KWV306-303	KWV308-303	KWV310-303
Power rating P_{70} W	W	2	3	5	7	10
Resistance range	Ω	390R...100K	680R...100K	680R...100K	1K ...100K	1K ...100K
E-Series		E 24	E 24	E 24	E 24	E 24
Tolerances	%	± 5	± 5	± 5	± 5	± 5
Temperature coefficient	$10^{-6} * K^{-1}$			± 250		
max. cont. work. voltage	V_{RMS}	350	350	350	500	500
Insulation voltage (1min.)	V_{RMS}			700		
Insulation resistance	Ω			> 1 GM		
Derating linear	$^{\circ}C$			70 ... 235 (0W)		
Climatic category				55/155/21		
Temperature range	$^{\circ}C$			- 55 ... 235		
Thermal resistance	KW^{-1}	100	68	40	30	20
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$			appr. 100, depends on value		
Endurance (P_{70} , 70 $^{\circ}C$, 1000)	$\left[\frac{AR}{R}\right] \%$			$\pm 5,0$		
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right] \%$			$\pm 5,0$		
Climatic sequence	$\left[\frac{AR}{R}\right] \%$			$\pm 5,0$		
Terminal strength	$\left[\frac{AR}{R}\right] \%$			$\pm 1,0$		
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{AR}{R}\right] \%$			$\pm 1,0$		
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20T				
Marking		Printed in clear				

Dimensions in mm:



Type	H ±1	W ±1	D ±1
KWV302-303	20,5	11	7
KWV304-303	25	12	8
KWV306-303	26	13	9
KWV308-303	39	13	9,5
KWV310-303	51	13	9,5

Packaging:

Type	Packaging	Pieces	Pack.-Code
KWV302-303	bulk	250	B
KWV304-303	bulk	204	B
KWV306-303	bulk	176	B
KWV308-303	bulk	108	B
KWV310-303	bulk	120	B

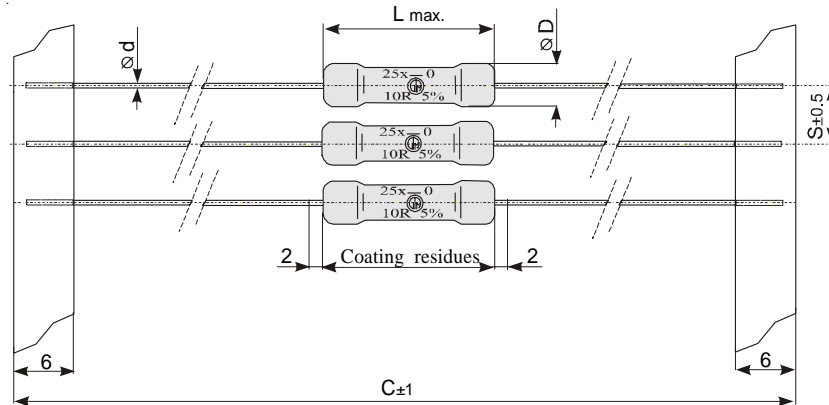
Ordering example: KWV304-303 5 B 100K
 Type Tolerance Pack.-Code R-Value

Precision Power Wirewound Resistors,
ceramic carrier, coated, axial

Specifications

Type		CR 251-0	CR 253-0	CR 254-0	CR 255-0	CR 256-0	CR 257-0	CR 258-0	CR 259-0
Power rating P_{40} $\vartheta_{o,}$ P_{70}	W	1,1 1,0	2,5 2,0	3,0 2,5	3,3 3,0	4,0 3,5	5,0 4,3	5,5 5,0	7,2 6,5
Resistance range	Ω	see next page							
Tolerances	%	Rmin. ... Rmax.: $\pm 5, \pm 2, \pm 1; R \geq 1R: \pm 0,5$							
Temperature coefficient	$10^{-6} \cdot K^{-1}$	see next page							
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$							
Insulation voltage (1min.)	V_{RMS}	max 75V							
Insulation resistance	Ω	not insulated							
Derating linear	$^{\circ}C$	70 ... 350 (0W)							
Climatic category		55/200/56							
Temperature range	$^{\circ}C$	- 55 ... 350							
Thermal resistance	KW^{-1}	280	140	112	94	80	65	56	43
Failure rate (Total, $\vartheta_{o,}$ max., 60% conf. lev.)	$10^{-9} \cdot h^{-1}$	appr. 100 depends on value							
Endurance (P_{70} , 70 $^{\circ}C$, 1000h)	$\left[\frac{AR}{R}\right]\%$	$\pm 3,0$ average							
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{AR}{R}\right]\%$	$\pm 1,0$							
Climatic sequence (IEX 115-1/23)	$\left[\frac{AR}{R}\right]\%$	$\pm 1,0$							
Terminal strength	$\left[\frac{AR}{R}\right]\%$	$\pm 0,2$							
Terminal tensile strength	N	40			50				
Resistance to soldering heat (260 $^{\circ}C$, 3,5s)	$\left[\frac{AR}{R}\right]\%$	$\pm 0,2$ typ.							
Solderability	s	2,5 Flowtime; solderglobule test, IEC 60068-2-20-T							
Marking		Printed in clear							

Dimensions in mm



Type	Temperature Coefficient (-20°C to 120°C)									
	500 +400 ppm/K		400 ± 50 ppm/K		appr. +180 ppm/K		0 ± 20 ppm/K		0 ± 10 ppm/K	
251-0	-----	-----	≥ 0R01	≤ 0R024	≥ 0R027	≤ 0R091	≥ 0R1	≤ 15R	≥ 16R	≤ 220R
253-0	≥ 0R01	≤ 0R02	≥ 0R022	≤ 0R047	≥ 0R051	≤ 0R091	≥ 0R1	≤ 47R	≥ 51R	≤ 750R
254-0	≥ 0R01	≤ 0R027	≥ 0R03	≤ 0R075	≥ 0R082	≤ 0R091	≥ 0R1	≤ 47R	≥ 51R	≤ 750R
255-0	≥ 0R015	≤ 0R024	≥ 0R027	≤ 0R062	≥ 0R068	≤ 0R091	≥ 0R1	≤ 68R	≥ 75R	≤ 1K0
256-0	≥ 0R02	≤ 0R03	≥ 0R033	≤ 0R062	≥ 0R068	≤ 0R091	≥ 0R1	≤ 130R	≥ 150R	≤ 1K5
257-0	≥ 0R027	≤ 0R047	≥ 0R051	≤ 0R082	≥ 0R091	≤ 0R13	≥ 0R15	≤ 150R	≥ 160R	≤ 2K2
258-0	≥ 0R033	≤ 0R062	≥ 0R068	≤ 0R13	≥ 0R15	≤ 0R16	≥ 0R18	≤ 160R	≥ 180R	≤ 2K7
259-0	≥ 0R047	≤ 0R075	≥ 0R082	≤ 0R15	≥ 0R16	≤ 0R24	≥ 0R27	≤ 180R	≥ 200R	≤ 3K9

Type	L max.	ØD* max	Ød
CR251-0	9,0	3,0	0,65
CR253-0	14,5	4,0	0,65
CR254-0	12,6	5,5	0,80
CR255-0	15,0	8,5	0,80
CR256-0	17,0	5,5	0,80
CR257-0	18,0	8,5	0,80
CR258-0	22,0	8,5	0,80
CR259-0	27,0	8,5	0,80

*R ≤ 1R0 Dmax. +1

Packaging:

Type	Packaging	Pieces	Pack.-Code	C	S
CR251-0	taped	1000	T	65	5
CR253-0	taped	1000	T	85	10
CR254-0	taped	1000	T	85	10
CR255-0	taped	500	T	85	10
CR256-0	taped	1000	T	85	10
CR257-0	taped	500	T	85	10
CR258-0	taped	500	T	85	10
CR259-0	taped	500	T	85	10

Ordering example: CR259-0 1 T 10R
 Type Tolerance Pack.-Code R-Value

Power Wirewound Resistors flame retardant, safety version



Specifications

Type		CRF251-4	CRF253-4	CRF254-4	CRF256-4	CRF257-4
Power rating P_{40} P_{70}	W	1,1 1,0	2,2 2,0	3,0 2,5	4,0 3,5	5,0 4,3
Resistance range	Ω	see next page (higher values upon request)				
E-Series		E 24				
Tolerances	%	± 5				
Temperature coefficient	$10^{-6} * K^{-1}$	120 ± 50				
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$				
Insulation voltage (1min.)	V_{RMS}	max 75V				
Insulation resistance	Ω	not insulated				
Derating linear	$^{\circ}C$	70 ... 350 (0W)				
Climatic category		55/350/56				
Temperature range	$^{\circ}C$	- 55 ... 350				
Thermal resistance	KW^{-1}	280	140	112	80	65
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$	appr. 10, depends on value				
Endurance (P_{70} , 70 $^{\circ}C$, 1000)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 5,0$ average				
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 5,0$				
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 2,0$				
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,2$				
Terminal tensile strength	N	40	50			
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,5$				
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20				
Marking		printed in clear				

Type	Resistance range	
	min.	max.
CRF251-4	*1R0	100R
CRF253-4	*1R0	330R
CRF254-4	*1R0	330R
CRF256-4	*1R0	330R
CRF257-4	*1R0	330R

Note: The special construction of resistance values >10R results in an immediate interruption (<1s, 200ms typical) when mains voltage (220V/240V_{RMS}) is applied. No flames, no explosion. After fusing, the resistance value is >100KOhm.

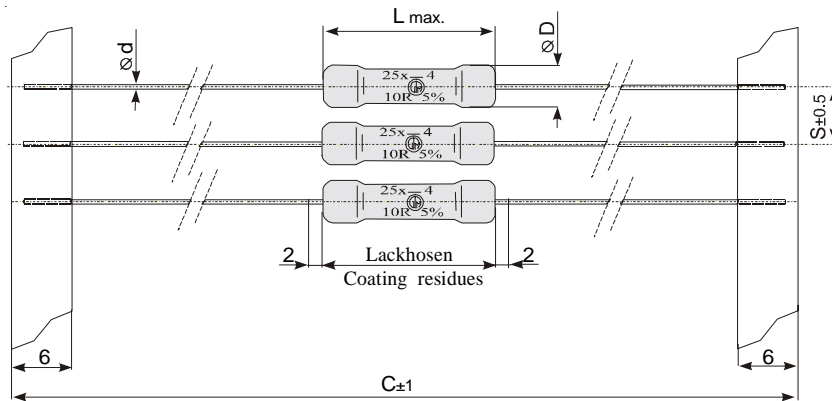
For other voltages test suitability in the application!

* Resistance values < 10R are flame retardant.

The interruption mechanism is not clearly defined and has to be tested in the final application!

Type	L	ØD	Ød
max.	max.		
CRF251-4	9,0	3,0	0,65
CRF253-4	14,5	4,0	0,65
CRF254-4	12,6	6,0	0,80
CRF256-4	17,0	6,0	0,80
CRF257-4	18,0	8,5	0,80

Dimensions in mm:



Packaging:

Type	Packaging	Pieces	Pack. Code	C	S
CRF251-4	taped/Ammopack	1000	T	65	5
CRF253-4	taped/Ammopack	1000	T	85	10
CRF254-4	taped/Ammopack	1000	T	85	10
CRF256-4	taped/Ammopack	1000	T	85	10
CRF257-4	taped/Ammopack	500	T	85	10

Ordering example: CRF254-4 5 T 15R
 Type Tolerance Pack.-Code R-Value

Power Wirewound Resistors,
flameproof, coated, axial



Specifications

Type		RX0207W5	RX04101W	RX05151W	RX05123W	RX06133W	RX05163W	RX07163W	RX06163W5	RX07164W	RX09265W	RX08205W5	RX10266W	RX10348W	RX103410W	RX104010W	RX104012W	RX104812W
Power rating P ₇₀	W	0,5	1	1	3	3	3	3	3,5	4	5	5,5	6	8	10	10	12	12
Power rating P ₄₀		0,6	1,1	1,1	3,4	3,4	3,4	3,4	4	4,5	5,7	6	7	9	11	11	13,5	13,5
Resistance range	Ω	see next page																
E-Series		E 24																
Tolerances	%	5% (± 1% on request)																
Temperature coefficient	10 ⁻⁶ *K ⁻¹	0R1 - 4R9 -400 / +1000 5R0 - 9R9 ± 700 ≥10R ± 250																
max. cont. work. voltage	V _{RMS}	$\sqrt{P_{70} \cdot R}$																
Derating Linear	°C	70 ... 275 (OW)																
Temperature range	°C	- 55 ... +275																
Failure rate (Total, ϕ ₀ , max., 60% conf. lev.)	10 ⁻⁹ *h ⁻¹	100																
Endurance (P ₇₀ , 70°C, 1000)	$\left[\frac{\Delta R}{R}\right]$ %	± 5																
Damp heat, steady state (40°C, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right]$ %	± 5																
Climatic sequence	$\left[\frac{\Delta R}{R}\right]$ %	± 5																
Terminal strength	$\left[\frac{\Delta R}{R}\right]$ %	± 1																
Surface temp. Rise	°C	< 250																
Terminal tensile strength	N	10																
Resistance to soldering heat (260°C, 10s)	$\left[\frac{\Delta R}{R}\right]$ %	± 2																
Solderability		min. 95% coverage																
Coating Color		Grey																
Marking		0207 ... 0716 Color code / 0926 ... 1048 printed in clear																

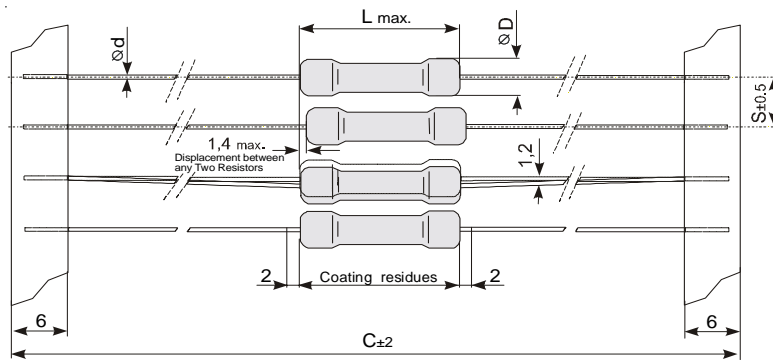
Features:

Available in non-inductive styles with Aryton Perry winding for lowest reactive components (Series RN).

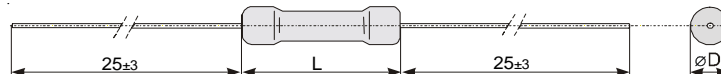
Ordering example: RX06133W 5 T 100R
 Type Tolerance Pack.-Code R-Value

Type	Resistance range 5% (J)	Dimensions		
		L max.	∅ D max.	∅ d ± 0,05
RX0207W5	0R1 ... 220R	6,2	2,5	0,7
RX04101W	0R05 ... 390R	10	3,9	0,7
RX05151W	0R1 ... 220R	15	5	0,8
RX05123W	0R1 ... 220R	12	5	0,8
RX06133W	0R05 ... 3K3	13	5,5	0,8
RX05163W	0R1 ... 220R	15,5	5,5	0,8
RX07163W	0R1 ... 2K2	16	6,5	0,8
RX06163W5	0R1 ... 220R	16	6	0,8
RX07164W	0R1 ... 2K2	16	6,5	0,8
RX09265W	0R33 ... 4K7	26	9	0,8
RX08205W5	0R33 ... 4K7	20	7,5	0,8
RX10266W	0R33 ... 4K7	26	9,5	0,8
RX10348W	0R47 ... 10K	34	10	1,0
RX103410W	0R47 ... 10K	34	10	1,0
RX104010W	0R68 ... 22K	40	10	1,0
RX104012W	0R68 ... 22K	40	10	1,0
RX104812W	1R ... 30K	48	10	1,0

RX0207...RX 0820



RX0820...RX 1048



Type	Packaging	C	S	Pieces	Pack-Code
RX0207W5	Taped	65	5	5000	T
RX04101W	Taped	65	5	2000	T
RX05151W	Taped	65	5	1000	T
RX05123W	Taped	65	5	1000	T
RX06133W	Taped	65	10	1000	T
RX05163W	Taped	65	10	1000	T
RX07163W	Taped	65	10	500	T
RX06163W5	Taped	65	10	500	T
RX07164W	Taped	65	10	500	T
RX09265W	bulk	----	----	100	B
RX08205W5	bulk	----	----	100	B
RX10266W	bulk	----	----	100	B
RX10348W	bulk	----	----	100	B
RX103410W	bulk	----	----	100	B
RX104010W	bulk	----	----	100	B
RX104012W	bulk	----	----	100	B
RX104812W	bulk	----	----	50	B

Wirewound Resistors, Aluminium Housed,
Chassis Mount

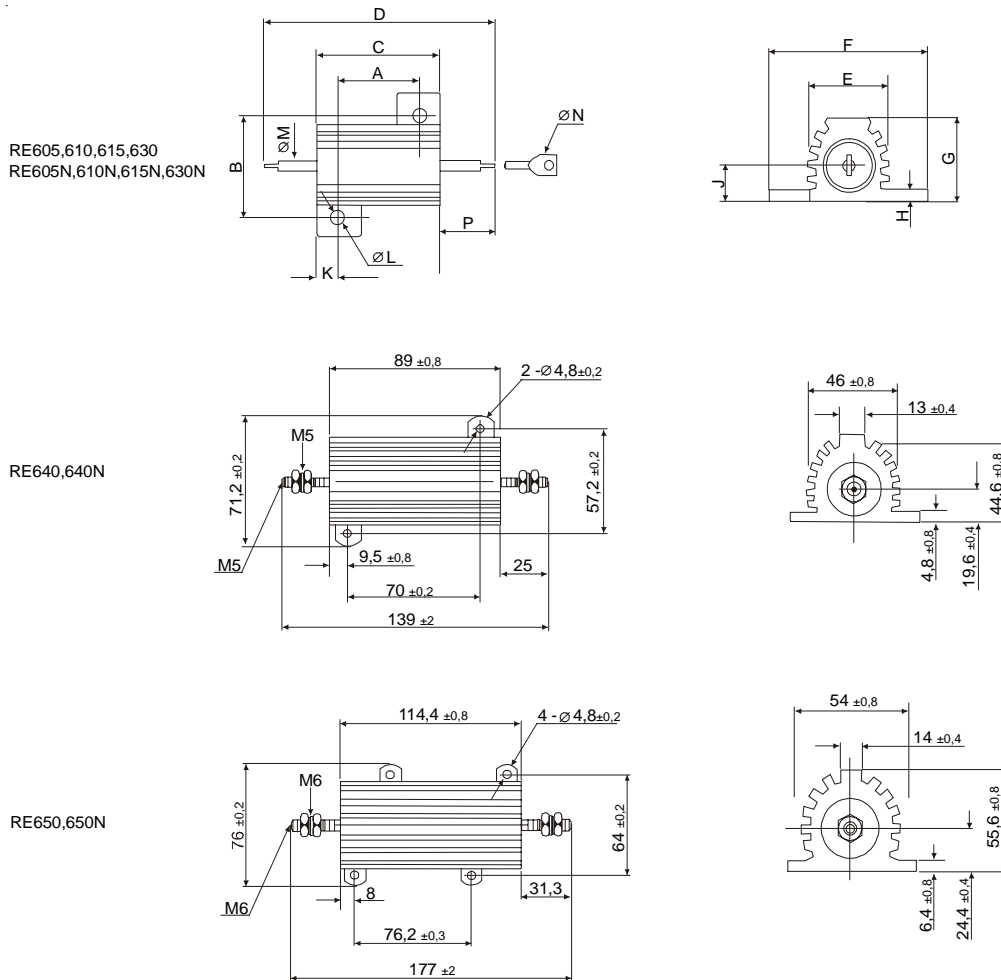


Specifications

Type		RE 605	RE 605N	RE 610	RE 610N	RE 615	RE 615N	RE 630	RE 630N	RE 640	RE 640N	RE 650	RE 650N
Power rating P_{40}	W	see next page											
Resistance range	Ω	see next page											
Tolerances	%	see next page											
Temperature coefficient	$10^{-6} * K^{-1}$	0R1-0R99 ± 100 1R0-9R9 ± 50 $\geq 10 R$ ± 20											
max. cont. work. voltage	V_{RMS}	$\sqrt{P_{70} \cdot R}$											
Insulation voltage (1min.)	V_{RMS}	1000			2000			4500					
Insulation resistance	Ω	> 10M											
Derating linear	$^{\circ}C$	70 ... 250 (0W)											
Climatic category		55/200/56											
Temperature range	$^{\circ}C$	- 55 ... 250											
Failure rate (Total, ϑ_o , max., 60% conf. lev.)	$10^{-9} * h^{-1}$	appr. 10, depends on value											
Endurance (P_{70} , 70 $^{\circ}C$, 1000)	$\left[\frac{\Delta R}{R}\right]$ %	$\pm 5,0$ average											
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right]$ %	$\pm 5,0$											
Climatic sequence	$\left[\frac{\Delta R}{R}\right]$ %	$\pm 2,0$											
Terminal strength	$\left[\frac{\Delta R}{R}\right]$ %	$\pm 0,5$											
Terminal tensile strength	N	50											
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right]$ %	$\pm 0,5$											
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20											
Marking		printed in clear											

Features:

Molded construction for enviromental protection. Complete welded construction. Meets applicable requirements of MIL-PRF-18546. Available in non-inductive styles with Aryton Perry winding for lowest reactive components (affix N). Mounts on Chassis to utilize heat-sink effect. Excellent stability in operation.

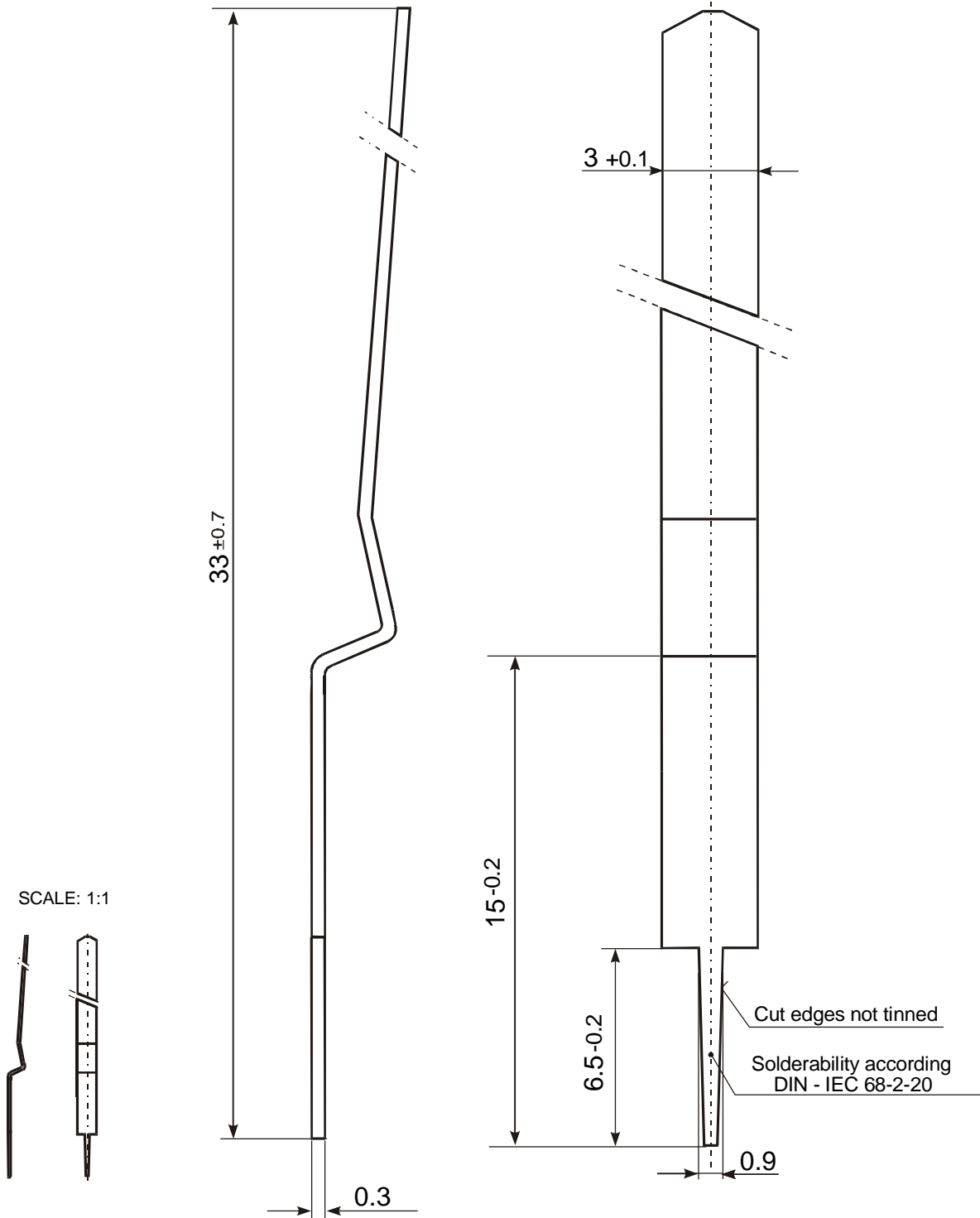


Dimensions (mm)														
Type	A	B	C	D	E	F	G	H	J	K	L	M	N	P
	±0,1	±0,1	±0,5	±1,5	±0,4	±0,1	±0,4	±0,2	±0,2	±0,2	±0,1	±0,02	±0,1	±0,1
RE605	11,2	12,5	15,2	28,6	8,5	16,4	8,1	1,7	3,8	2	2,4	1,5	1,3	6,7
RE610	14,2	15,9	19	34,9	10,7	20,3	9,9	1,9	4,2	2,4	2,4	2	2,2	7,95
RE615	18,2	19,8	27	49,2	14	27,4	13,9	1,9	5,9	4,4	3,2	2	2,2	11,1
RE630	40	21,4	50	70,6	16	29	15,5	2,2	6,6	5	3,2	2	2,2	10,3

Type	MIL-PR	Rated power (W)		Resistance range			Packing unit
	Type	Civil	Military	±0.25%	±0.5%	±1%, ±5%, ±10%	
RE605	RE60G	7.5 (5)	5	R5 ... 1K2	R1 ... 1K2	R1 ... 3K32	280
RE605N	RE60N	7.5 (5)	5	1R ... 200R	1R ... 860R	1R ... 1K65	280
RE610	RE65G	12.5 (10)	10	R5 ... 2K7	R1 ... 2K7	R1 ... 5K62	160
RE610N	RE65N	12.5 (10)	10	1R ... 1K2	1R ... 1K2	1R ... 2K8	160
RE615	RE70G	25	20	R1 ... 3K9	R1 ... 3K9	10R ... 12K1	60
RE615N	RE70N	25	20	1R ... 2K7	1R ... 2K7	1R ... 6K04	60
RE630	RE75G	50	30	R1 ... 5K6	R1 ... 5K6	10R ... 39K2	30
RE630N	RE75N	50	30	1R ... 3K9	1R ... 3K9	1R ... 19K6	30
RE640	RE77G	100	75	R1 ... 8K2	R5 ... 12K	R5 ... 29K4	10
RE640N	RE77N	100	75	1R ... 5K6	1R ... 5K6	1R ... 14K7	10
RE650	RE80G	250	120	R1 ... 27K	R1 ... 27K	R1 ... 35K7	10
RE650N	RE80N	250	120	1R ... 8K2	1R ... 8K2	1R ... 17K4	10

Note: Figures in parentheses on RE605 and RE610 indicate wattage printed on parts, new construction allows these resistors to be rated at higher wattage.

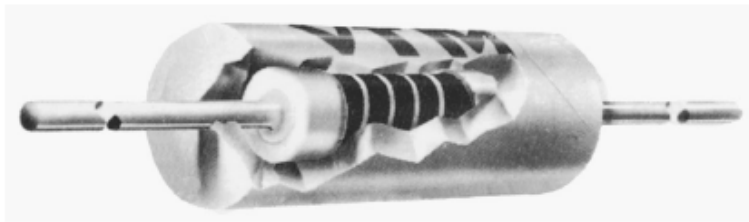
Mounting Brackets Type S18141
for Serie KH-0, KV, KU, KT and KF



packing: 5.000 pcs. bulk
Ordering example: S18141

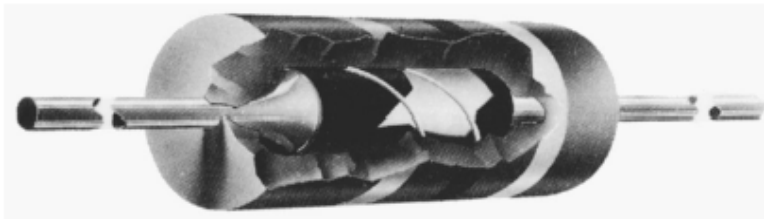
Metaloxidefilm Resistors

Metaloxidefilm-Resistors make film technology available to power applications because of their wide temperature range. Series PO and PF include different styles for best lay-out-matching.



Metalglazefilm resistors

Metalglazefilm-Resistors comply with highest reliability requirements due to thickfilm elements contacted by soldering, close tolerances and low temperature coefficients. Series RG and RGU allow the choice of axial and vertical insertion.



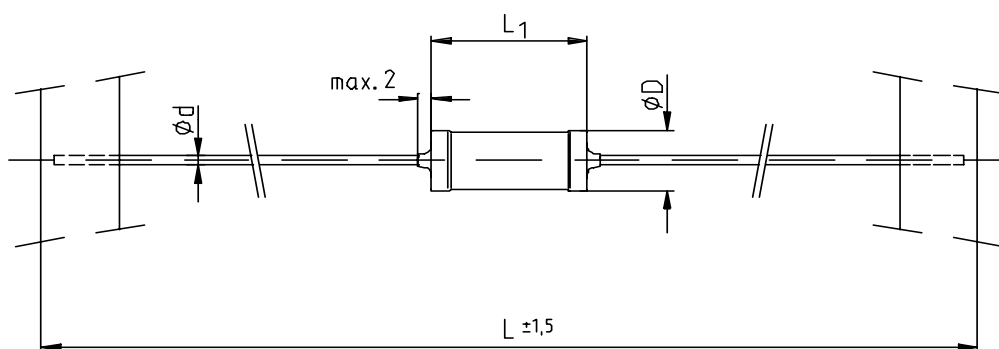
Power Metaloxide film resistor
flame retardant



Specifications

Type		PO595-0	PO593-0	PO590-0	PO591-0
Style		0207	0414	0617	0922
Power rating P ₇₀	W	1	2	3	4
Resistance range	Ω	see next page			
E-Series		see next page			
Tolerances	%	see next page			
Temperature coefficient	10 ⁻⁶ * K ⁻¹	see next page			
max. cont. work. voltage	V _{RMS}	500			750
Voltage coefficient	10 ⁻⁶ V ⁻¹	< 3			
Insulation voltage (1min.)	V _{RMS}	500			
Insulation resistance	Ω	> 10 ³ M			
Derating	°C	linear 70 ... 250 (0W)			
Climatic category		55/200/56			
Temperature range	°C	- 55 ... 250			
Thermal resistance	KW ⁻¹	<140	<130	<70	<60
Failure rate (Total, ϑ ₀ , max., 60% conf. lev.)	10 ⁻⁹ * h ⁻¹	< 10			
Endurance (P ₇₀ , @70°C, 1000h, interm.)	$\left[\frac{AR}{R}\right]$ %	± 1,5	± 1,5	± 1,5	± 1,5
Damp heat, steady state (40°C, 93% r.h., 56d)	$\left[\frac{AR}{R}\right]$ %	± 1,5			
Climatic sequence	$\left[\frac{AR}{R}\right]$ %	± 1,0			
Terminal strength	$\left[\frac{AR}{R}\right]$ %	± 0,3			
Terminal tensile strength	N	40			
Resistance to soldering heat (260°C, 10s)	$\left[\frac{AR}{R}\right]$ %	± 0,25			
Solderability	s	2,5 Flowtime; solderglobule test IEC 60068-2-20-T			
Current noise (DIN/IEC 195)	dB	R < 15K: -15 R>: 15 + 10/decade			
Nonlinearity (DIN/IEC 440)	dB	R < 15K: 110 R> 15 K: 110 -20/decade			
Marking		595/593: DIN-IEC-colour code, 4/5/6 bands 590/591: printed in clear			

Dimensions in mm:



PO595-0 Resistance range	PO593-0 Resistance range	PO590-0 Resistance range	PO591-0 Resistance range	E-series	Tolerance	TC $10^{-6}K^{-1}$
0R22 ... 10M	0R22 ... 10M	0R22 ... 560K	0R22 ... 100K	E 24	$\pm 5\%$	± 200
-	1R ... 1M	1R ... 100K	1R ... 68K	E24 / E 48	$\pm 2\%$	± 200
1R ... 1M	-	-	-	E 24 / E 96	$\pm 1\%$	± 50

Type	L_1 [mm]	$\varnothing D$ [mm]	$\varnothing d$ [mm]	$L \pm 1,5$ [mm]	Inside tape [mm]
PO595-0	6,3 -1	2,5 -0,5	0,6 $\pm 0,02$	65	52
PO593-0	12 -1,5	4,1 -0,5	0,8 $\pm 0,02$	85	73
PO590-0	16,5 -1,5	6,0 -0,5	0,8 $\pm 0,02$	95	77
PO591-0	20 -1	9,0 -0,5	0,8 $\pm 0,02$	95	77

Packaging:

Type	Packaging	Pieces	Pack.-Code
PO595-0	taped/Ammopack	2000	T
PO593-0	taped/Ammopack	1000	T
PO590-0	taped/Ammopack	1000	T
PO591-0	taped/Ammopack	500	T

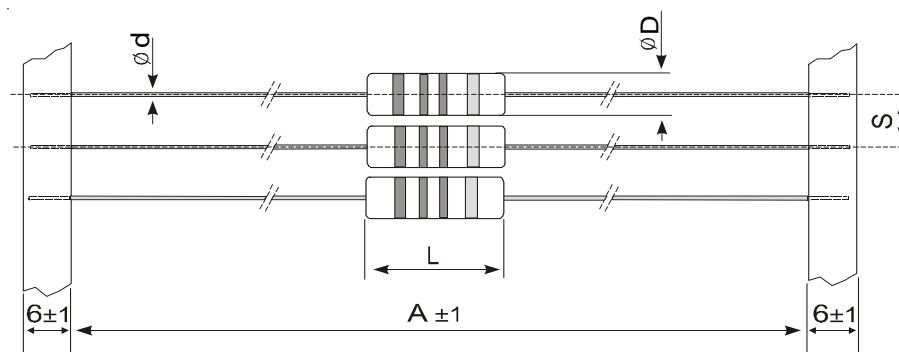
Ordering example: PO593-0 5 T 10K
 Type Tolerance Pack.-Code R-Value



Specifications

Type		PF0207	PF0410	PF0516
Style		0207	0410	0516
Power rating P ₇₀	W	1	2	3
Resistance range	Ω		1R 1M	
E-Series			E 24	
Tolerances	%		5%	
Temperature coefficient	10 ⁻⁶ * K ⁻¹		± 100	
max. cont. work. voltage	V _{RMS}	350	500	750
Insulation voltage (1min.)	V _{RMS}	500	500	750
Insulation resistance	Ω		> 10 ⁴	
Derating Linear	°C	linear 70 ... 200 / 230 / 240 (0W)		
Climatic category			55/200/56	
Temperature range	°C	- 55 ... 200	- 55 ... 230	- 55 ... 240
Thermal resistance	KW ⁻¹	130	80	55
Failure rate (Total, ϑ _o max., 60% conf. lev.)	10 ⁻⁹ h ⁻¹		< 1	
Endurance (P ₇₀ , @ 70°C, 1000h interm.)	$\left[\frac{AR}{R}\right]$ %		± 2	
Damp heat, steady state (40°C, 93% r.h., 56d)	$\left[\frac{AR}{R}\right]$ %		± 2	
Climatic sequence	$\left[\frac{AR}{R}\right]$ %		± 2	
Terminal strength	$\left[\frac{AR}{R}\right]$ %		± 0,2	
Terminal tensile strength	N		30	
Resistance to soldering heat (350°C, 3s)	$\left[\frac{AR}{R}\right]$ %		± 0,25 + R05	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T		
Marking		Colour code: 4 bands		

Dimensions in mm:



Type	L	$\varnothing D$	$\varnothing d$	A	S
PF0207	$6,3 \pm 0,5$	$2,4 \pm 0,2$	0,6	52,4	5
PF0410	$9,0 \pm 0,5$	$3,9 \pm 0,3$	0,6	52,4	5
PF0516	$15,5 \pm 1,0$	$5,0 \pm 0,5$	0,8	73,0	10

Packaging:

Type	Packaging	Packing style *	Pieces
PF0207	Ammopack	T	5000
PF0410	Ammopack	T	1000
PF0516	Ammopack	T	1000

* Taped on reel on request

Ordering example: PF0207 5 T 15R
 Type Tolerance Pack.-Code R-Value

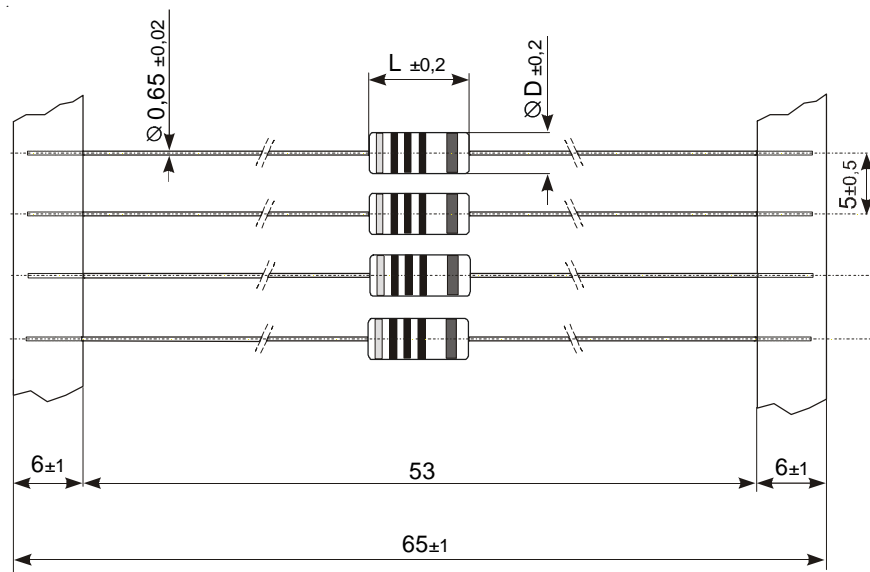
Metalglaze film resistors, axial, hi-temp.-solder contacts moulded
 unflammable acc. to IEC 695-2-2



Specifications

Type		RG515-0	RG520-0
Style		0207	0309
Power rating P ₇₀	W	0,5 (P _{max.} = 0,7)	0,7 (P _{max.} = 0,9)
Resistance range	Ω	see next page	
E-Series		see next page	
Tolerances	%	see next page	
Temperature coefficient	10 ⁻⁶ * K ⁻¹	see next page	
max. cont. work. voltage	V _{RMS}	350	
Voltage coefficient	10 ⁻⁶ * V ⁻¹	< 30	
Insulation voltage (1min.)	V _{RMS}	1000	
Insulation resistance	Ω	> 10 ⁴	
Derating	°C	linear 70 ... 155 (0W)	
Climatic category		55/155/56	
Temperature range	°C	- 65 ... 175	
Thermal resistance	KW ⁻¹	125	100
Failure rate (Total, ϑ ₀ max., 60% conf. lev.)	10 ⁻⁹ h ⁻¹	< 1	
Endurance (P ₇₀ , @ 70°C, 1000h interm.)	[$\frac{AR}{R}$] %	± 0,5	
Damp heat, steady state (40°C, 93% r.h., 56d)	[$\frac{AR}{R}$] %	± 1,0	
Climatic sequence	[$\frac{AR}{R}$] %	± 1,0	
Terminal strength	[$\frac{AR}{R}$] %	± 0,2	
Terminal tensile strength	N	40	
Resistance to soldering heat (260°C, 10s)	[$\frac{AR}{R}$] %	± 0,1	
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T	
Current noise (DIN/IEC 195)	dB	R<1K0: -20 R>1K0: ± 20/decade	
Nonlinearity (DIN/IEC 440)	dB	110 - 20/decade	
Marking		Colour code: 5 resp. 6 bands (6th. band for TC) < 1R0 4 bands	

Dimensions in mm:



Resistance range	E-series	Tolerance	Temperature coefficient $10^{-6} K^{-1}$
0R3 ... 3M3	E 24	$\pm 2\%$	100 (T0) *
0R3 ... 9R1	E 24	$\pm 1\%$	100 (T0) *
10R ... 3M32	E 96	$\pm 1\%$	50 (T2)
10R ... 1M	E 96	$\pm 0,5\%$	25 (T9)

* R <1R TC200

Type	L	$\varnothing D$
RG515-0	6,4	2,3
RG520-0	8,0	3,2

Packaging:

Type	Packaging	Pieces	Pack.Code
RG515-0	taped/Ammopack	1000	T
	taped/reel	5000	R
RG520-0	taped/Ammopack	1000	T

Ordering example: RG515-0 1 T 1K
 Type Tolerance Pack.-Code R-Value

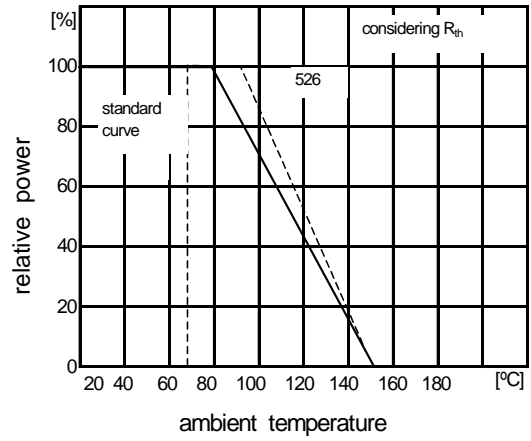
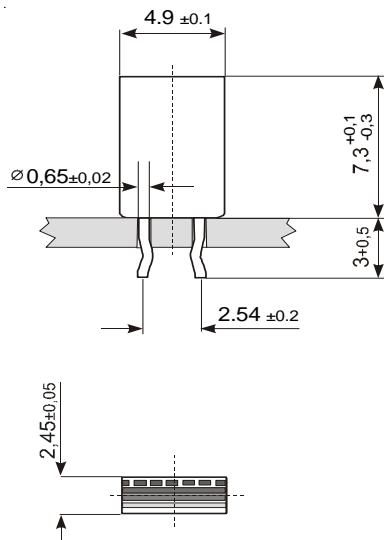
Metalglaze film resistors, moulded, vertical
unflammable acc. to IEC 695-2-2



Specifications

Type		RGU 526-0
Style		04
Power rating P_{70}	W	0,5
Resistance range	Ω	see next page
E-Series		see next page
Tolerances	%	see next page
Temperature coefficient	$10^{-6} * K^{-1}$	see next page
max. cont. work. voltage	V_{RMS}	350
Voltage coefficient	$10^{-6} * V^{-1}$	< 30
Insulation voltage (1min.)	V_{RMS}	1000
Insulation resistance	Ω	> 10^4 except top surface
Derating linear	$^{\circ}C$	see next page
Climatic category		55/155/56
Temperature range	$^{\circ}C$	- 55 ... 175
Thermal resistance	KW^{-1}	90
Failure rate (Total, ϑ_0 max., 60% conf. lev.)	$10^{-9} h^{-1}$	< 1
Endurance (P_{70} , @ 70 $^{\circ}C$, 1000h, interm.)	$[\frac{AR}{R}]$ %	$\pm 0,5$
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$[\frac{AR}{R}]$ %	$\pm 1,0$
Climatic sequence	$[\frac{AR}{R}]$ %	$\pm 1,0$
Terminal strength	$[\frac{AR}{R}]$ %	$\pm 0,2$
Terminal tensile strength	N	40
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$[\frac{AR}{R}]$ %	$\pm 0,1$
Solderability	s	2,5 Flowtime, solderglobule test, IEC 60068-2-20-T
Current noise (DIN/IEC 195)	dB	R<1K: -20 R>1K : ± 20 / decade
Nonlinearity (DIN/IEC 440)	dB	110 - 20 / decade
Marking		DIN-IEC-Color code; 4 resp. 5 Colors

Dimensions in mm:



Resistance range	E-series	Tolerance	Temperature coefficient ppm/K
0R3 ... 3M3	E 24	± 2%	100 (T0)*
10R ... 3M32	E 24 / E 96	± 1%	50 (T2)
10R ... 1M	E 96	± 0,5%	25 (T9)

* R <1R : TC200

Packaging:

Type	Packaging	Pieces	Pack.Code
RGU526-0	bulk	1000	B

Ordering example: RGU526-0 1 B 1K
 Type Tolerance Pack.-Code R-Value

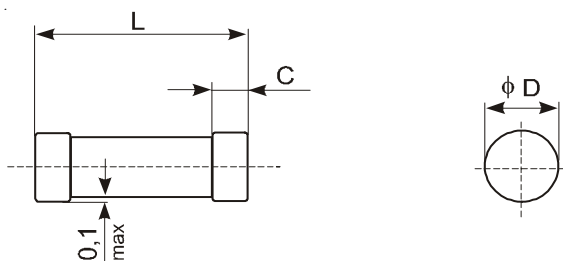
SMD-Metal Film Resistors
MELF Style



Specifications

Type		ZC0204	ZC0207
Style		0204	0207
Power rating P_{70}	W	0,25 (0,4W for min. 8.000h)	1,0
Resistance range	Ω	see next page	
E-Series		see next page	
Tolerances	%	see next page	
Temperature coefficient	$10^{-6} * K^{-1}$	see next page	
max. cont. work. voltage	V_{RMS}	200	500
Voltage coefficient	$10^{-6} * V^{-1}$	< 1	
Insulation voltage (1min.)	V_{RMS}	300	500
Insulation resistance	Ω	> 10^4 M	> 10^4 M
Derating	$^{\circ}C$	linear 70 ... 155 (0W)	linear 70 ... 155 (0W)
Climatic category		55/155/56	55/155/56
Temperature range	$^{\circ}C$	- 55 ... 155	- 55 ... 155
Thermal resistance	KW^{-1}	200	85
Pad size / cut-layer	mm	1,5 x 1,5 / 35μ	5,5 x 5,5 / 70μ
Failure rate (Total, ϑ_0 max., 60% conf. lev.)	$10^{-9} h^{-1}$	< 10	< 5
Endurance (P_{70} , @ 70 $^{\circ}C$, 1000h interm.)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,25$	$\pm 1,5$
Damp heat, steady state (40 $^{\circ}C$, 93% r.h., 56d)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,25$	$\pm 0,5$
Climatic sequence	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,1$	
Terminal strength	$\left[\frac{\Delta R}{R}\right] \%$	Board-bend test CECC 00802; 10 x 2 mm	
Resistance to soldering heat (260 $^{\circ}C$, 10s)	$\left[\frac{\Delta R}{R}\right] \%$	$\pm 0,1$	$\pm 0,25$
Solderability	s	Solder-bath test CECC 00802, 95% wetting	
Current noise (DIN/IEC 195)	dB	R<10K: -25 R>10K: -25 + 8 / decade	
Nonlinearity (DIN/IEC 440)	dB	110	
OR0 (Jumper) Current rating		2A ($R_{max} = R015$)	
Marking		DIN-IEC-Colour code, 5 bands	

Dimensions in mm:



Resistance range ZC0207	Resistance range ZC0204	Tolerance	Temperature coefficient	E-Series
0R16 ... 0R2	0R22 ... 0R91	± 5%	100 · 10 ⁻⁶ K ⁻¹	E 24
0R22 ... 0R91	0R51 ... 0R91	± 2%	100 · 10 ⁻⁶ K ⁻¹	E 24
1R ... 10M	1R ... 10M	±1%	50 · 10 ⁻⁶ K ⁻¹	E 24/E96
1R ... 2M2	10R ... 475K	± 0,5%	50 · 10 ⁻⁶ K ⁻¹	E 24/E96
-	10R ... 475K	± 0,5%	25 · 10 ⁻⁶ K ⁻¹	E 24/E96
-	10R ... 221K	± 0,5%	15 · 10 ⁻⁶ K ⁻¹	E 24/E96
10R ... 1M	22R ... 330K	± 0,25%	25 · 10 ⁻⁶ K ⁻¹	E 24/E96
-	22R ... 221K	± 0,25%	15 · 10 ⁻⁶ K ⁻¹	E 24/E96
100R ... 511K	43R ... 330K	± 0,1%	25 · 10 ⁻⁶ K ⁻¹	E 24/E96
-	43R ... 221K	± 0,1%	15 · 10 ⁻⁶ K ⁻¹	E 24/E96

Tolerance	Coding	Temperature coefficient	Coding	Coating
5%	J	100	F	light green
2%	G	50	E	light green
1%	F	25	D	pink
0,5%	D	15	C	violett
0,25%	C			
0,1%	B			

Typ	L	C	ØD max.
ZC0204	3,6 -0,2	0,5 + 0,35	1,4
ZC0207	5,8 -0,3	0,9 ± 0,30	2,2

Packaging:

Type	Packaging	Pieces	Tolerance
ZC0204	8mm Blistertape 7 inch	3000	all
	8mm Blistertape 13 inch	10000	all
ZC0207	12mm Blistertape 7inch	1500	all

Ordering example: ZC0204 F K E 07 1K
 0-0hm = ZC0204 F K E 07 0R
 Type Tolerance Blister Tape TC Reel Diameter R-Value

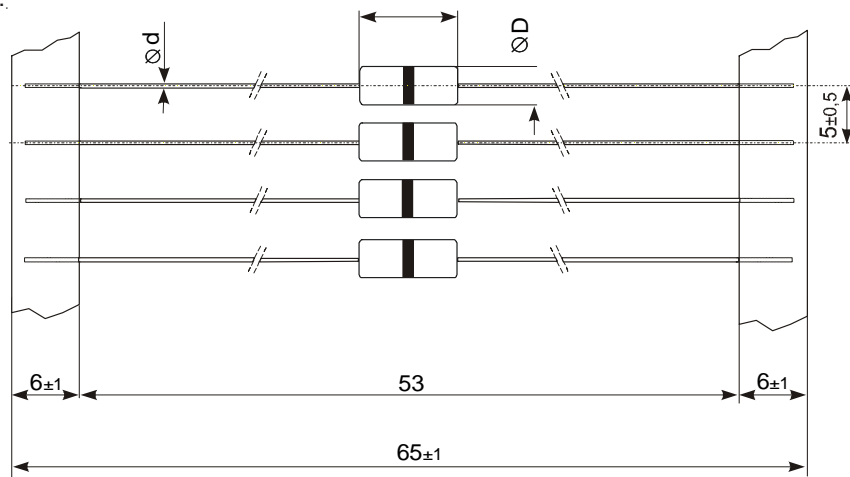
Zero-Ohm, moulded Jumper



Specifications

Type		ZOM0207
Old Type		100-902
Style		0207 moulded
Current rating	A	10
Dielectric withstanding voltage	V _{RMS}	1000
Cross-section area of conductor	mm ²	0,33
Conductor resistance	$\frac{m\Omega}{cm}$	0,54
Marketing		one colour-band: black

Dimensions in mm:



Type	L	ØD	Ød
ZOM 0207	$6,4 \pm 0,2$	$2,3 \pm 0,2$	$0,65 \pm 0,02$

Packaging:	Type	Packaging	Pieces	Pack.Code
	ZOM 0207	Taped/Ampopack	2000	T

Ordering example: ZOM0207 T 0R
 Type Pack.-Code Ohmic Value