

## Cemented Wirewound Precision Resistors



### FEATURES

- High power dissipation in small volume
- Ideal for pulse application
- TCR  $\pm 100$  ppm/K
- Maximum permissible hot spot temperature is 275 °C
- Lead (Pb)-free
- Tolerance 1 %
- Compliant to RoHS directive 2002/95/EC



**RoHS**  
COMPLIANT  
**GREEN**  
(5-2009)\*\*

The resistor element is a resistive wire which is wound in a single layer on a ceramic rod. Metal caps are pressed over the ends of the rod. The ends of the resistance wire and the leads are connected to the caps by welding. Tinned copper-clad iron leads with poor heat conductivity are employed permitting the use of relatively short leads to obtain stable mounting without overheating the solder joint.

The resistor is coated with a green silicon cement which is not resistant to aggressive fluxes. The coating is non-inflammable, will not drip even at high overloads and is resistant to most commonly used cleaning solvents, in accordance with IEC 60068-2-45.

### STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{25\text{ }^\circ\text{C}}$	LIMITING VOLTAGE $U_{\text{max.}}$	RESISTANCE RANGE <sup>(2)</sup>	TOLERANCE
PAC01	1 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 2.2 k $\Omega$	$\pm 1\%$
PAC02 <sup>(1)</sup>	2 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 3.6 k $\Omega$	$\pm 1\%$
PAC03	3 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 4.7 k $\Omega$	$\pm 1\%$
PAC04	4 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 8.2 k $\Omega$	$\pm 1\%$
PAC05	5 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 10 k $\Omega$	$\pm 1\%$
PAC06	6 W	$\sqrt{P \times R}$	0.10 $\Omega$ to 12 k $\Omega$	$\pm 1\%$

#### Notes

<sup>(1)</sup> PAC02 WSZ:  $P_{25\text{ }^\circ\text{C}} = 1.8$  W

<sup>(2)</sup> Resistance value to be selected for  $\pm 1\%$  tolerance from E24 and E96

- For Pulse Diagrams see AC..series ([www.vishay.com/doc?28730](http://www.vishay.com/doc?28730))

\*\* Please see document "Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)



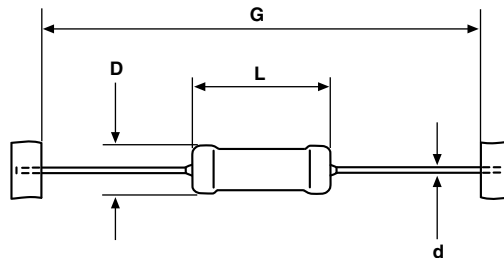
PART NUMBER AND PRODUCT DESCRIPTION							
Part Number: PAC300004701FAC000							
P	A	C	3	0	0	0	
MODEL		VARIANT	TCR/MATERIAL	VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
PAC100 = PAC01 PAC200 = PAC02 PAC300 = PAC03 PAC400 = PAC04 PAC500 = PAC05 PAC600 = PAC06		0 = Neutral 1 = SWI = Special winding (1) 2 = RT 3 = DK SP 20 mm 4 = DK LP 33 mm (2) 5 = DK LP 17.8 mm (2) 7 = DK LP 25.4 mm (2) 8 = DK SP 25.4 mm 9 = WSZ 6720 C = E/K 22.4 mm (2) Z = Value overflow (special)	0 = Standard (± 100 ppm/K)	<b>3 digit value</b> <b>1 digit multiplier</b> MULTIPLIER 7 = *10 <sup>-3</sup> 8 = *10 <sup>-2</sup> 9 = *10 <sup>-1</sup> 0 = *10 <sup>0</sup> 1 = *10 <sup>1</sup> 2 = *10 <sup>2</sup> 3 = *10 <sup>3</sup> 4 = *10 <sup>4</sup> 5 = *10 <sup>5</sup>	F = ± 1.0 %	(See Packaging table)	The 3 digits are used for all special part styles. To encode the non standard specifications all special parts of one series are listed in a cross reference table. <b>000 = Standard</b>
Product Description: PAC03 4K7 1% AC							
PAC03		4K7	1%	AC			
MODEL (3)		VALUE (3)	TOLERANCE CODE (3)	PACKAGING DESCRIPTION (4)			

**Notes**

- (1) Special winding on request
- (2) Other dimensions on request
- (3) See "Part Number and Product Description"
- (4) See "Packaging Table"

PACKAGING TABLE									
MODEL	AMMO			LOOSE			BLISTER		
	PIECES	PACK. CODE	PACK. DESC.	PIECES	PACK. CODE	PACK. DESC.	PIECES	PACK. CODE	PACK. DESC.
PAC01	1000	A1	A1						
PAC01 DK/EK				500	LC	LC			
PAC01RT	2500	AE	AE						
PAC02	500	AC	AC						
PAC02 DK/EK				500	LC	LC			
PAC02 WSZ							1250	BM	BM
PAC03	500	AC	AC						
PAC03 DK/EK				500	LC	LC			
PAC04	500	AC	AC						
PAC04 DK/EK				500	LC	LC			
PAC05	500	AC	AC						
PAC05 DK/EK				250	LB	LB			
PAC06	500	AC	AC						
PAC06 DK/EK				250	LB	LB			

**DIMENSIONS**

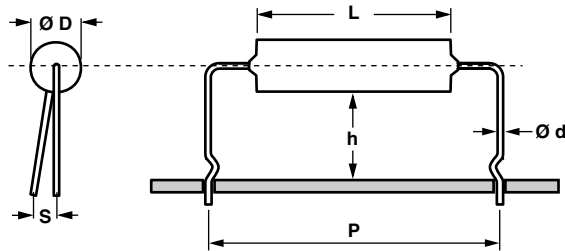


For packaging dimensions see: [www.vishay.com/doc?28721](http://www.vishay.com/doc?28721)

MODEL	DIMENSIONS in millimeters (inches)				
	D <sub>max.</sub>	L <sub>max.</sub>	d	G	WEIGHT g PER UNIT
PAC01	4.3 [0.169]	11 [0.433]	0.8 ± 0.03 [0.031 ± 0.001]	63 ± 1 [2.480 ± 0.039]	0.52
PAC02	4.8 [0.189]	13 [0.512]		63 ± 1 [2.480 ± 0.039]	0.75
PAC03	5.5 [0.217]	16.5 [0.650]		63 ± 1 [2.480 ± 0.039]	1.10
PAC04	7.5 [0.295]	18 [0.709]		73 ± 1 [2.874 ± 0.039]	1.90
PAC05	7.5 [0.295]	26 [1.024]		73 ± 1 [2.874 ± 0.039]	2.60
PAC06	7.5 [0.295]	26 [1.024]		73 ± 1 [2.874 ± 0.039]	2.60

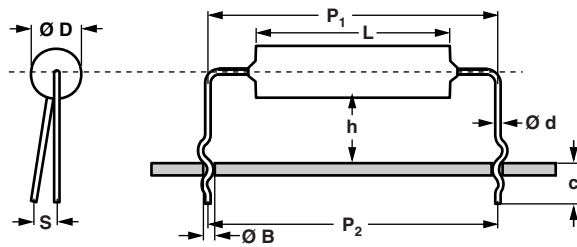
**BENDING FORMS**

**KINK TYPE S = EK**



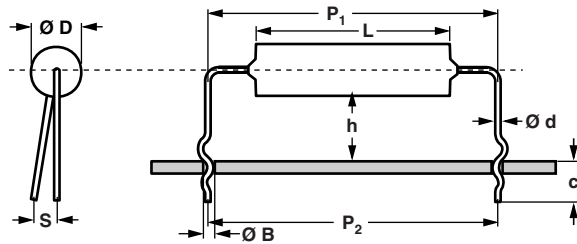
TYPE	Ø d	Ø D <sub>max.</sub>	L	h ± 1	P ± 1	S <sub>max.</sub>
PAC01	0.8	(1)	(1)	8	17.8	2
PAC02 - PAC04					25.4	
PAC05 - PAC06					33.0	

**DOUBLE KINK SP = DK SP**



TYPE	Ø d	Ø D <sub>max.</sub>	L	h ± 1	P <sub>1</sub> ± 1	P <sub>2</sub> ± 3	S <sub>max.</sub>	Ø B	c
PAC01	0.8	(1)	(1)	8	19.8	17.8	2	1.0 ± 0.1	4.5 ± 1
PAC02 - PAC04					22.0	20.0			
					27.4	25.4			
PAC05 - PAC06					35.0	33.0			

**DOUBLE KINK LP = DK LP**

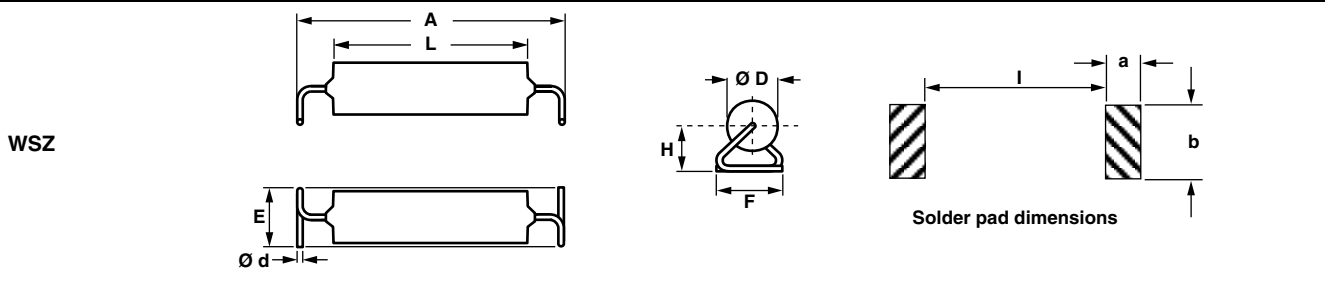


TYPE	Ø d	Ø D <sub>max.</sub>	L	h ± 1	P <sub>1</sub> ± 1	P <sub>2</sub> ± 3	S <sub>max.</sub>	Ø B	c
PAC01 - PAC02	0.8	(1)	(1)	8	17.8	17.8	2	1.0 ± 0.1	4.5 ± 1
PAC02 - PAC04					25.4	25.4			
PAC05 - PAC06					33.0	33.0			

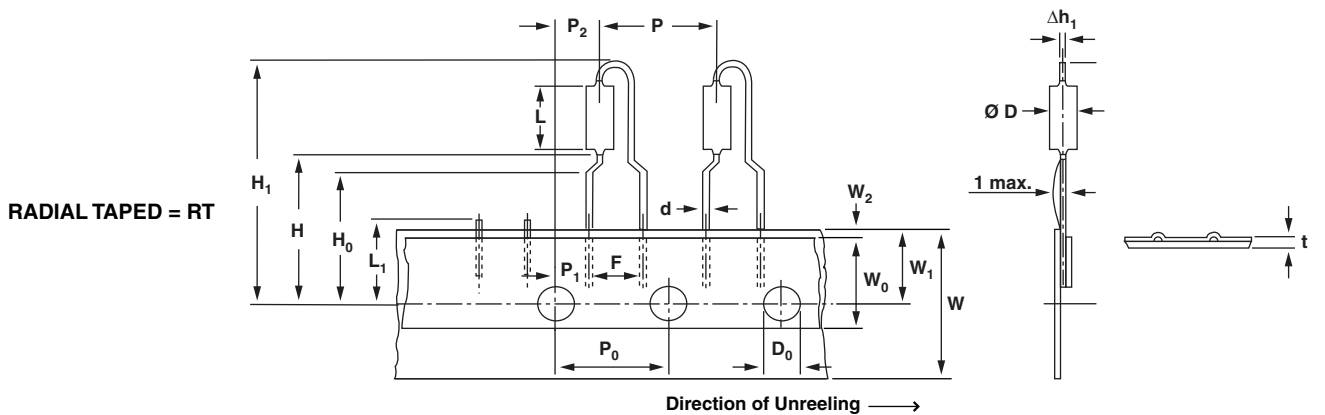
**Note**

(1) See table DIMENSIONS

**BENDING FORMS**



TYPE	$\varnothing d$	$\varnothing D_{max.}$	A	L	F	H	E	a	b	l
PAC02 WSZ	0.8	(1)	$17 \pm 0.5$	11 - 12	$4.8 \pm 0.5$	$3.6 \pm 0.5$	$5.0 \pm 0.5$	2.5	5.5	14.5

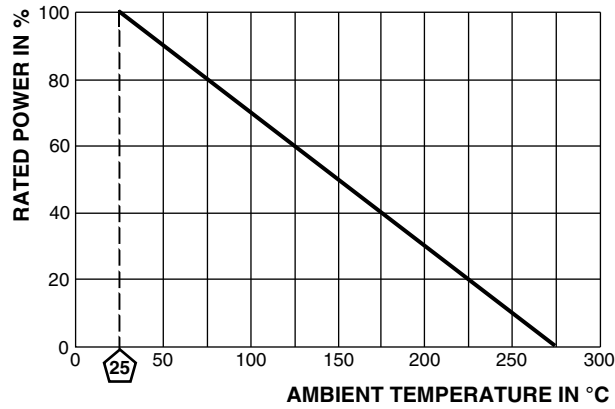


TYPE PAC01		
Lead $\varnothing$	$\varnothing d$	0.8
Diameter	$\varnothing D$	(1)
Length	L	(1)
Pitch of components	P	$12.7 \pm 1.0$
Pitch of spocket holes (2)	$P_0$	$12.7 \pm 0.3$
Distance between hole center and resistor center	$P_1$	$3.85 \pm 0.7$
Distance between hole center and lead center	$P_2$	$6.35 \pm 1.0$
Lead spacing	F	$5.0 + 0.6, - 0.1$
Angle of insertion	$\Delta h_1$	2 max.
Width of carrier tape	W	$18.0 \pm 0.5$
Width of adhesive tape	$W_0$	$12.0 \pm 0.5$
Position of holes	$W_1$	$9.0 \pm 0.5$
Position of adhesive tape	$W_2$	0.5 max.
Body to hole center	H	$19.5 \pm 1.0$
Lead crimp to hole center (3)	$H_0$	$16.0 \pm 0.5$
Hole $\varnothing$	$D_0$	$4.0 \pm 0.2$
Thickness of tape (4)	t	0.9 max.
Height for cutting	$L_1$	11 max.
Height for insertion	$H_1$	32 max.

**Notes**

- (1) See table DIMENSIONS
- (2) Test over 10 holes - 9 intervals  $P_0 12.7 \times 9 = 114.3 \pm 0.5$
- (3) Parallelism, < 0.5 mm
- (4) Thickness of carrier tape:  $0.55 \text{ mm} \pm 0.1$

**DERATING**



Maximum dissipation ( $P_{max.}$ ) as a function of the ambient temperature ( $T_{amb}$ )

<b>PERFORMANCE</b>	
<b>TEST</b>	<b>PERMISSIBLE CHANGE</b>
Climatic category (LCT/UCT/Days)	55/200/56
Climatic Sequence IEC 60115-1 4.23	$\Delta R = \pm (0.5 \% R + 0.05 \Omega)$
Damp Heat, Steady State, IEC 60115-1, 4.24 ( $40 \pm 2$ ) °C, 56 days, ( $93 \pm 3$ ) % RH	$\Delta R = \pm (1.0 \% R + 0.05 \Omega)$
Endurance at room temperature ( $116 \% P_{70}$ ), 1000 h, IEC 60115-1, 4.25.2	$\Delta R = \pm (0.5 \% R + 0.05 \Omega)$
Storage, UCT, IEC 60115-1, 4.25.3 1000 h, 200 °C, no load	$\Delta R = \pm (1.0 \% R + 0.05 \Omega)$
Resistance to Soldering Heat, IEC 60115-1, 4.18 ( $260 \pm 5$ ) °C, ( $10 \pm 1$ ) s	$\Delta R = \pm (0.2 \% R + 0.05 \Omega)$
Robustness of Termination, IEC 60115-1, 4.16 10N	$\Delta R = \pm (0.1 \% R + 0.05 \Omega)$
Short Time Overload, IEC 60115-1, 4.13 10 x Rated Power for 5 s	$\Delta R = \pm (0.2 \% R + 0.05 \Omega)$



## HISTORICAL 12NC INFORMATION

- The resistors had a 12-digit ordering code starting with 2306 327
- The subsequent first digit indicated the resistor type and packaging.
- The remaining 4 digits indicated the resistance value:
  - The first 3 digits indicated the resistance value.
  - The last digit indicated the resistance decade in accordance with Resistance Decade table.

## Resistance Decade

RESISTANCE DECADE	LAST DIGIT
0.10 to 0.976 Ω	7
1 to 9.76 Ω	8
10 to 97.6 Ω	9
100 to 976 Ω	1
1 to 9.76 kΩ	2
10 to 12 kΩ	3

## Ordering Example

The ordering code for an PAC02, resistor value 47 Ω with ± 1 % tolerance, supplied in ammopack of 500 units was: 2306 327 04709.

HISTORICAL 12NC - Resistor type and packaging			
TYPE	2306 327 .....		
	BANDOLIER IN AMMOPACK		
	RADIAL	STRAIGHT LEADS	
	2500 units	500 units	1 000 units
PAC01	RT <sup>(1)</sup>	-	2306 327 5....
PAC02	-	2306 327 0....	-
PAC03	-	2306 327 1....	-
PAC04	-	2306 327 2....	-
PAC05	-	2306 327 3....	-
PAC06	-	2306 327 4....	-

### Note

<sup>(1)</sup> Radial parts with tin plated copper leads



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