

## 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 $P_{25\text{ °C}}$	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:  $P_{25\text{ °C}} = 1.8\text{ W}$

<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	0	4	7	0	1	F	A	C	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 <sup>(1)</sup> 2 = RT 3 = DK SP 20 mm 4 = DK LP 33 mm <sup>(2)</sup> 5 = DK LP 17.8 mm <sup>(2)</sup> 7 = DK LP 25.4 mm <sup>(2)</sup> 8 = DK SP 25.4 mm 9 = WSZ 6720 C = E/K 22.4 mm <sup>(2)</sup> Z = Value overflow (special)					0 = Standard (± 100 ppm/K)		3 digit value 1 digit multiplier 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. 000 = Standard	
Product Description: PAC03 4K7 1 % AC																		
PAC03			4K7					1 %			AC							
MODEL <sup>(3)</sup>			VALUE <sup>(3)</sup>					TOLERANCE CODE <sup>(3)</sup>			PACKAGING DESCRIPTION <sup>(4)</sup>							

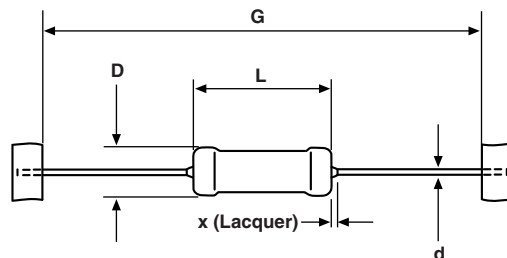
## Notes

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

## PACKAGING TABLE

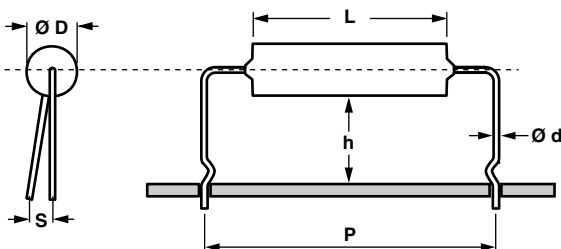
MODEL	AMMO			LOOSE			BLISTER		
	PIECES	PACK. CODE	PACK. DESC.	PIECES	PACK. CODE	PACK. DESC.	PIECES	PACK. CODE	PACK. DESC.
PAC01	1000	A1	A1						
PAC01 DK/EK				500	LC	LC			
PAC01RT	2500	AE	AE						
PAC02	500	AC	AC						
PAC02 DK/EK				500	LC	LC			
PAC02 WSZ							1250	BM	BM
PAC03	500	AC	AC						
PAC03 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

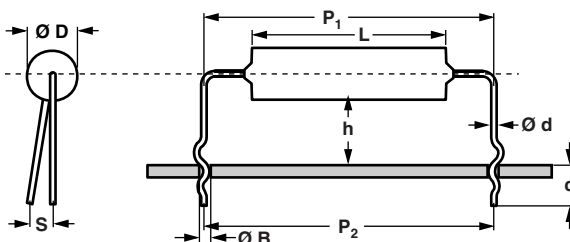


For packaging dimensions see: [www.vishay.com/doc?28721](http://www.vishay.com/doc?28721)

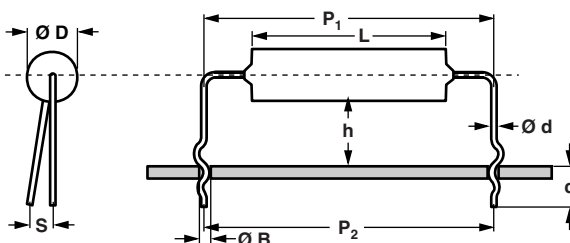
MODEL	DIMENSIONS in millimeters (inches)					
	D <sub>max.</sub>	L <sub>max.</sub>	d	x <sub>max.</sub>	G	WEIGHT g PER UNIT
PAC01	4.3 [0.169]	11 [0.433]	0.8 ± 0.03 [0.031 ± 0.001]	2	63 ± 1 [2.480 ± 0.039]	0.52
PAC02	4.8 [0.189]	13 [0.512]		2	63 ± 1 [2.480 ± 0.039]	0.75
PAC03	5.5 [0.217]	16.5 [0.650]		3	63 ± 1 [2.480 ± 0.039]	1.10
PAC04	7.5 [0.295]	18 [0.709]		3	73 ± 1 [2.874 ± 0.039]	1.90
PAC05	7.5 [0.295]	26 [1.024]		3	73 ± 1 [2.874 ± 0.039]	2.60
PAC06	7.5 [0.295]	26 [1.024]		3	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**


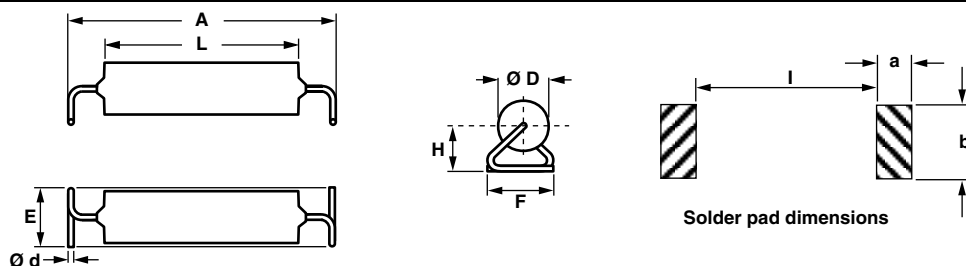
TYPE	Ø d	Ø D <sub>max.</sub>	L	h ± 1	P <sub>1</sub> ± 1	P <sub>2</sub> ± 3	S <sub>max.</sub>	Ø B	c
PAC01 - PAC02	0.8	(1)	(1)	8	17.8	17.8	2	1.0 ± 0.1	4.5 ± 1
PAC02 - PAC04					25.4	25.4			
PAC05 - PAC06					33.0	33.0			

**Note**

(1) See table DIMENSIONS

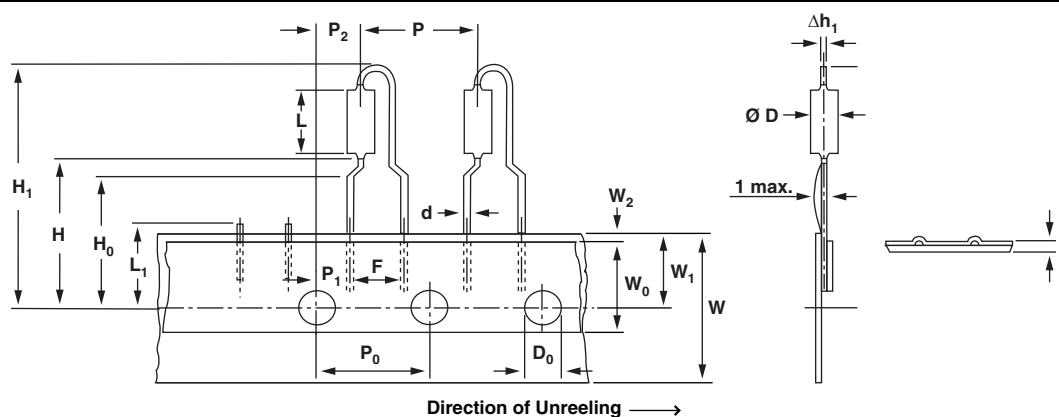
**BENDING FORMS**

WSZ



TYPE	Ø d	Ø D <sub>max.</sub>	A	L	F	H	E	a	b	l
PAC02 WSZ	0.8	(1)	17 ± 0.5	11 - 12	4.8 ± 0.5	3.6 ± 0.5	5.0 ± 0.5	2.5	5.5	14.5

RADIAL TAPED = RT

**TYPE PAC01**

Lead Ø	Ø d	0.8
Diameter	Ø D	(1)
Length	L	(1)
Pitch of components	P	12.7 ± 1.0
Pitch of spocket holes (2)	P <sub>0</sub>	12.7 ± 0.3
Distance between hole center and resistor center	P <sub>1</sub>	3.85 ± 0.7
Distance between hole center and lead center	P <sub>2</sub>	6.35 ± 1.0
Lead spacing	F	5.0 + 0.6, - 0.1
Angle of insertion	Δh <sub>1</sub>	2 max.
Width of carrier tape	W	18.0 ± 0.5
Width of adhesive tape	W <sub>0</sub>	12.0 ± 0.5
Position of holes	W <sub>1</sub>	9.0 ± 0.5
Position of adhesive tape	W <sub>2</sub>	0.5 max.
Body to hole center	H	19.5 ± 1.0
Lead crimp to hole center (3)	H <sub>0</sub>	16.0 ± 0.5
Hole Ø	D <sub>0</sub>	4.0 ± 0.2
Thickness of tape (4)	t	0.9 max.
Height for cutting	L <sub>1</sub>	11 max.
Height for insertion	H <sub>1</sub>	32 max.

**Notes**

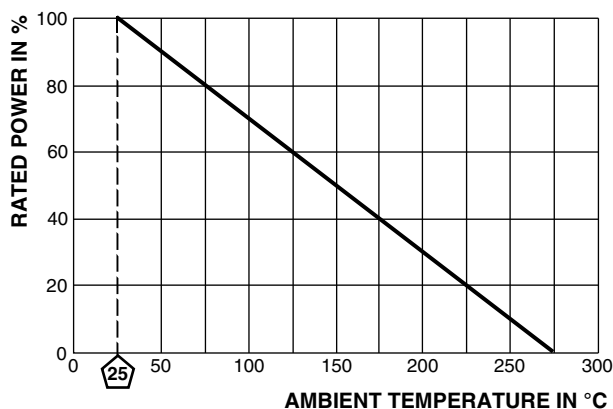
(1) See table DIMENSIONS

(2) Test over 10 holes - 9 intervals P<sub>0</sub> 12.7 x 9 = 114.3 ± 0.5

(3) Parallelism, &lt; 0.5 mm

(4) Thickness of carrier tape: 0.55 mm ± 0.1

## DERATING



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

PERFORMANCE	
TEST	PERMISSIBLE CHANGE
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 ± 2) °C, 56 days, (93 ± 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 ± 5) °C, (10 ± 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 $\Omega$	7
1 to 9.76 $\Omega$	8
10 to 97.6 $\Omega$	9
100 to 976 $\Omega$	1
1 to 9.76 k $\Omega$	2
10 to 12 k $\Omega$	3

## Ordering Example

The ordering code for an PAC02, resistor value 47  $\Omega$  with  $\pm 1\%$  tolerance, supplied in ammpack 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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