

## 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 %
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

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

#### Notes

- PAC02 WSZ:  $P_{25\text{ }^\circ\text{C}} = 1.8$  W
- 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))

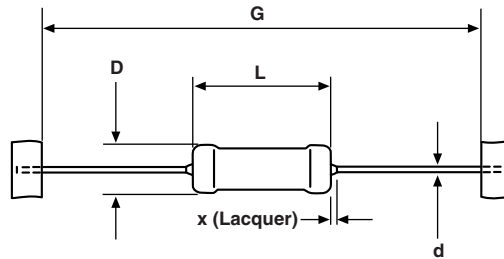


PART NUMBER AND PRODUCT DESCRIPTION																
Part Number: PAC30004701FAC000																
P	A	C	3	0	0	0	4	7	0	1	F	A	C	0	0	0
MODEL	VARIANT	TCR/MATERIAL	VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL										
<b>PAC100</b> = PAC01 <b>PAC200</b> = PAC02 <b>PAC300</b> = PAC03 <b>PAC400</b> = PAC04 <b>PAC500</b> = PAC05 <b>PAC600</b> = PAC06	<b>0</b> = Neutral <b>1</b> = SWI = Special winding <sup>(1)</sup> <b>2</b> = RT <b>3</b> = DK SP 20 mm <b>4</b> = DK LP 33 mm <sup>(2)</sup> <b>5</b> = DK LP 17.8 mm <sup>(2)</sup> <b>7</b> = DK LP 25.4 mm <sup>(2)</sup> <b>8</b> = DK SP 25.4 mm <b>9</b> = WSZ 6720 <b>C</b> = E/K 25.4 mm <sup>(2)</sup> <b>Z</b> = Value overflow (special)	<b>0</b> = Standard ( $\pm 100$ ppm/K)	<b>3 digit value</b> <b>1 digit multiplier</b> <b>MULTIPLIER</b> <b>7</b> = $\times 10^{-3}$ <b>8</b> = $\times 10^{-2}$ <b>9</b> = $\times 10^{-1}$ <b>0</b> = $\times 10^0$ <b>1</b> = $\times 10^1$ <b>2</b> = $\times 10^2$ <b>3</b> = $\times 10^3$ <b>4</b> = $\times 10^4$ <b>5</b> = $\times 10^5$	<b>F</b> = $\pm 1.0$ %	(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</b> = 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"

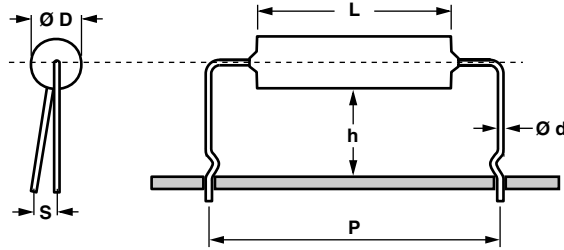
PACKAGING TABLE									
MODEL	AMMO			LOOSE			BLISTER		
	PIECES	PACK CODE	PACK. DESC.	PIECES	PACK CODE	PACK. DESC.	PIECES	PACK CODE	PACK. DESC.
PAC01	1000	A1	A1						
PAC01 DK/EK				500	LC	LC			
PAC01RT	2500	AE	AE						
PAC02	500	AC	AC						
PAC02 DK/EK				500	LC	LC			
PAC02 WSZ							1250	BM	BM
PAC03	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** in millimeters [inches]


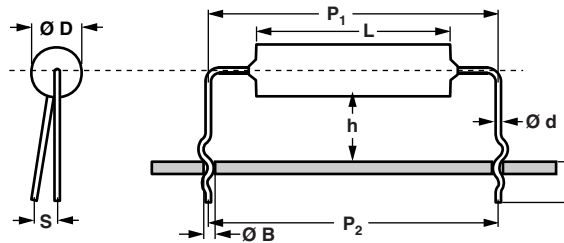
MODEL	$D_{max.}$	$L_{max.}$	$d$	$X_{max.}$	$G$	WEIGHT g PER UNIT
PAC01	4.3 [0.169]	11 [0.433]	0.8 ± 0.03 [0.031 ± 0.001]	2	63 ± 1 [2.480 ± 0.039]	0.52
PAC02	4.8 [0.189]	13 [0.512]		2	63 ± 1 [2.480 ± 0.039]	0.75
PAC03	5.5 [0.217]	16.5 [0.650]		3	63 ± 1 [2.480 ± 0.039]	1.10
PAC04	7.5 [0.295]	18 [0.709]		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

**Note**

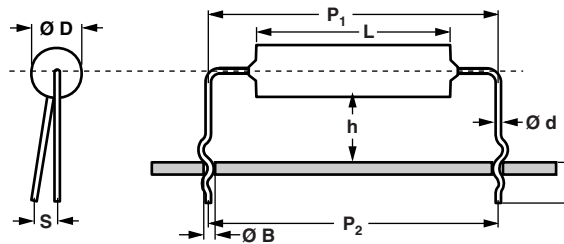
- For packaging dimensions see: [www.vishay.com/doc?28721](http://www.vishay.com/doc?28721)

**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**


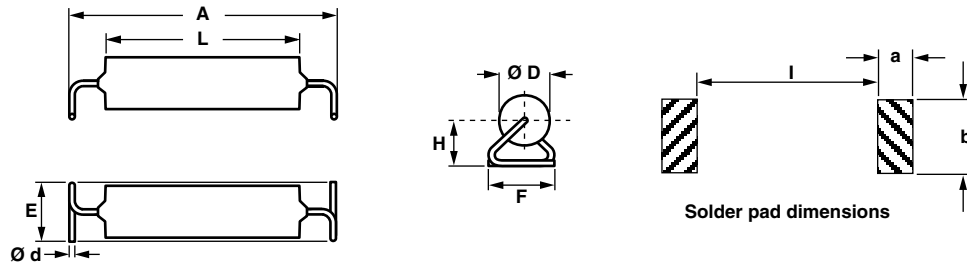
TYPE	Ø D	Ø D <sub>max.</sub>	L	h ± 1	P <sub>1</sub> ± 1	P <sub>2</sub> ± 3	S <sub>max.</sub>	Ø B	c
PAC01 - PAC02	0.8	(1)	(1)	8	17.8	17.8	2	1.0 ± 0.1	4.5 ± 1
PAC02 - PAC04					25.4	25.4			
PAC05 - PAC06					33.0	33.0			

**Note**

(1) See table DIMENSIONS

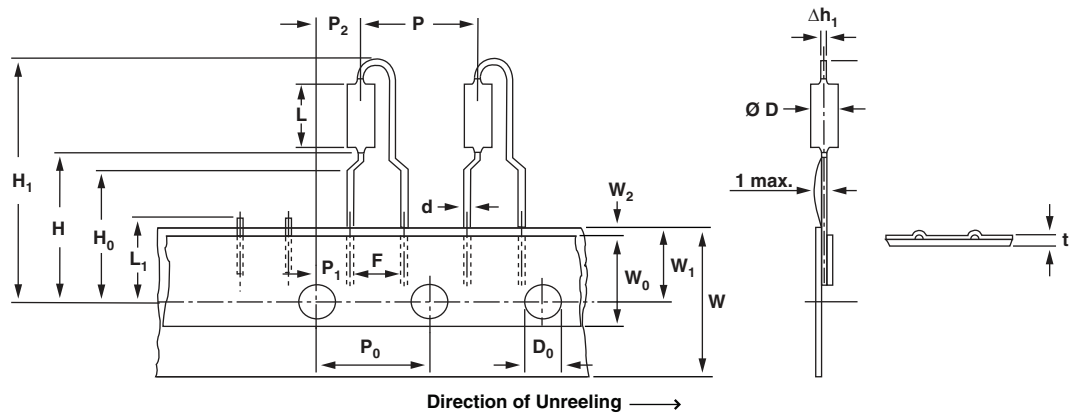
**BENDING FORMS**

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**

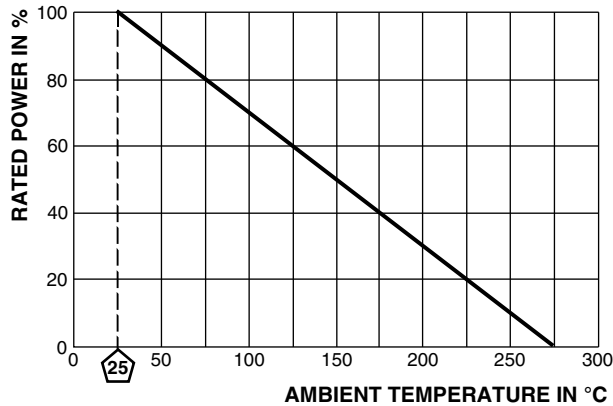
Lead Ø	Ø d	0.8
Diameter	Ø D	(1)
Length	L	(1)
Pitch of components	P	12.7 ± 1.0
Pitch of spocket holes (2)	P <sub>0</sub>	12.7 ± 0.3
Distance between hole center and resistor center	P <sub>1</sub>	3.85 ± 0.7
Distance between hole center and lead center	P <sub>2</sub>	6.35 ± 1.0
Lead spacing	F	5.0 + 0.6, - 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, < 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 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 ammpack of 500 units was: 2306 327 04709.

<b>HISTORICAL 12NC - Resistor type and packaging</b>			
TYPE	2306 327 .....		
	BANDOLIER IN AMMOPACK		
	RADIAL	STRAIGHT LEADS	
	2500 units	500 units	1000 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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