

## Cemented Wirewound Resistors



### FEATURES

- All welded construction
- Ceramic core
- Non-flammable cement coating
- Tinned copper-clad iron leads (for axial parts)
- High power dissipation in small volume
- Ideal for pulse application
- 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)

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL               | POWER RATING<br>$P_{40^{\circ}\text{C}}$<br>W | POWER RATING<br>$P_{70^{\circ}\text{C}}$<br>W | LIMITING VOLTAGE<br>$U_{\text{max}}$ | RESISTANCE RANGE <sup>(1)</sup><br>$\Omega$<br>TCR =<br>- 10 ppm/K to - 80 ppm/K | RESISTANCE RANGE <sup>(1)</sup><br>$\Omega$<br>TCR =<br>100 ppm/K to 180 ppm/K | RESISTANCE RANGE <sup>(1)</sup><br>$\Omega$<br>TCR= $\pm$ 100 ppm/K | TOLERANCE<br>$\pm$ % |
|---------------------|-----------------------------------------------|-----------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------|
| AC01                | 1                                             | 0.9                                           | $\sqrt{P \times R}$                  | 0.10 to 33                                                                       | 36 to 2.4K                                                                     | n/a                                                                 | 5                    |
| AC03 <sup>(2)</sup> | 3                                             | 2.5                                           | $\sqrt{P \times R}$                  | 0.10 to 390                                                                      | 430 to 3.3K                                                                    | 3.6K to 5.1K                                                        | 5                    |
| AC04                | 4                                             | 3.5                                           | $\sqrt{P \times R}$                  | 0.10 to 620                                                                      | 680 to 6.8K                                                                    | n/a                                                                 | 5                    |
| AC05                | 5                                             | 4.7                                           | $\sqrt{P \times R}$                  | 0.10 to 910                                                                      | 1K to 10K                                                                      | n/a                                                                 | 5                    |
| AC07                | 7                                             | 5.8                                           | $\sqrt{P \times R}$                  | 0.10 to 1.5K                                                                     | 1.6K to 15K                                                                    | n/a                                                                 | 5                    |
| AC10                | 10                                            | 8.4                                           | $\sqrt{P \times R}$                  | 0.22 to 560                                                                      | 620 to 27K                                                                     | n/a                                                                 | 5                    |

#### Notes

- <sup>(1)</sup> Resistance value to be selected for  $\pm$  5 % from E24  
<sup>(2)</sup> AC03 WSZ:  $P_{40^{\circ}\text{C}}$  = 1.8 W;  $P_{70^{\circ}\text{C}}$  = 1.5 W

### PART NUMBER AND PRODUCT DESCRIPTION

Part Number: AC03000001509JAC00

A C 0 3 0 0 0 0 0 1 5 0 9 J A C 0 0

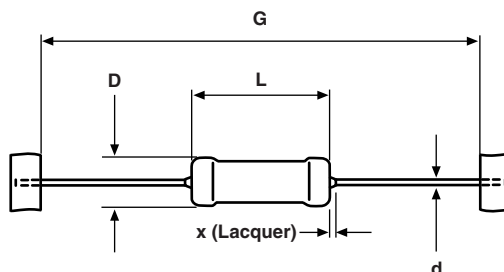
| MODEL                                                                                                    | VARIANT                                                                                                                                                                                                                                                                                                                                                             | TCR/MATERIAL                  | VALUE                                                                                                                                                                                                     | TOLERANCE CODE  | PACKAGING CODE        | SPECIAL                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC01000 = AC01<br>AC03000 = AC03<br>AC04000 = AC04<br>AC05000 = AC05<br>AC07000 = AC07<br>AC10000 = AC10 | 0 = Neutral<br>1 = RT<br>2 = SWI =<br>Special winding <sup>(3)</sup><br>3 = DK SP 20 mm <sup>(4)</sup><br>4 = DK LP 33 mm <sup>(4)</sup><br>5 = DK LP 17.8 mm <sup>(4)</sup><br>6 = NI = Non inductive <sup>(7)</sup><br>7 = DK LP 25.4 mm <sup>(4)</sup><br>9 = WSZ 6720<br>8 = DK SP 25.4 mm<br>Z = Value overflow<br>(Special)<br>C = E/K 25.4 mm <sup>(4)</sup> | 0 = Standard                  | 3 digit value<br>1 digit multiplier<br>MULTIPLIER<br>7 = $\times 10^{-3}$<br>8 = $\times 10^{-2}$<br>9 = $\times 10^{-1}$<br>0 = $\times 10^0$<br>1 = $\times 10^1$<br>2 = $\times 10^2$<br>5 = $10^{-4}$ | J = $\pm$ 5.0 % | (See Packaging table) | The 5 digit BV number will be encoded using a 36 character code. This code contains numbers 0...9 and letters A...Z (36 characters total) and allows to encode at least 46 655 five digit BV numbers.<br><br>00 = Standard |
| Product Description: AC03 15R 5 % AC                                                                     |                                                                                                                                                                                                                                                                                                                                                                     |                               |                                                                                                                                                                                                           |                 |                       |                                                                                                                                                                                                                            |
| AC03                                                                                                     | 15R                                                                                                                                                                                                                                                                                                                                                                 | 5 %                           | AC                                                                                                                                                                                                        |                 |                       |                                                                                                                                                                                                                            |
| MODEL <sup>(5)</sup>                                                                                     | VALUE <sup>(5)</sup>                                                                                                                                                                                                                                                                                                                                                | TOLERANCE CODE <sup>(5)</sup> | PACKAGING DESCRIPTION <sup>(6)</sup>                                                                                                                                                                      |                 |                       |                                                                                                                                                                                                                            |

#### Notes

- <sup>(3)</sup> Special winding on request  
<sup>(4)</sup> Other dimensions and variants on request  
<sup>(5)</sup> See "Part Number and Product Description"  
<sup>(6)</sup> See "Packaging Table"  
<sup>(7)</sup> Resistance range on request

**PACKAGING TABLE**

| MODEL      | AMMO   |            |             | LOOSE  |            |             | BLISTER |            |             |
|------------|--------|------------|-------------|--------|------------|-------------|---------|------------|-------------|
|            | PIECES | PACK. CODE | PACK. DESC. | PIECES | PACK. CODE | PACK. DESC. | PIECES  | PACK. CODE | PACK. DESC. |
| AC01       | 1000   | A1         | A1          |        |            |             |         |            |             |
| AC01 DK/EK |        |            |             | 500    | LC         | LC          |         |            |             |
| AC01RT     | 2500   | AE         | AE          |        |            |             |         |            |             |
| AC03       | 500    | AC         | AC          |        |            |             |         |            |             |
| AC03 DK/EK |        |            |             | 500    | LC         | LC          |         |            |             |
| AC03 WSZ   |        |            |             |        |            |             |         |            |             |
| AC04       | 500    | AC         | AC          |        |            |             | 1250    | BM         | BM          |
| AC04 DK/EK |        |            |             | 500    | LC         | LC          |         |            |             |
| AC05       | 500    | AC         | AC          |        |            |             |         |            |             |
| AC05 DK/EK |        |            |             | 500    | LC         | LC          |         |            |             |
| AC07       | 500    | AC         | AC          |        |            |             |         |            |             |
| AC07 DK/EK |        |            |             | 250    | LB         | LB          |         |            |             |
| AC10       | 250    | AB         | AB          |        |            |             |         |            |             |

**DIMENSIONS**

For packaging dimensions see: [www.vishay.com/doc?28721](http://www.vishay.com/doc?28721)
**DIMENSIONS** - Resistor types, mass and relevant physical dimensions

| MODEL | DIMENSIONS in millimeters [inches] |                   |                               |                   |                        |                   |
|-------|------------------------------------|-------------------|-------------------------------|-------------------|------------------------|-------------------|
|       | D <sub>max.</sub>                  | L <sub>max.</sub> | d                             | x <sub>max.</sub> | G                      | WEIGHT g PER UNIT |
| AC01  | 4.3 [0.169]                        | 11 [0.433]        | 0.8 ± 0.03<br>[0.031 ± 0.001] | 2                 | 63 ± 1 [2.480 ± 0.039] | 0.52              |
| AC03  | 4.8 [0.189]                        | 13 [0.512]        |                               | 2                 | 63 ± 1 [2.480 ± 0.039] | 0.75              |
| AC04  | 5.5 [0.217]                        | 16.5 [0.650]      |                               | 3                 | 63 ± 1 [2.480 ± 0.039] | 1.10              |
| AC05  | 7.5 [0.295]                        | 18 [0.709]        |                               | 3                 | 63 ± 1 [2.480 ± 0.039] | 1.90              |
| AC07  | 7.5 [0.295]                        | 26 [1.024]        |                               | 3                 | 73 ± 1 [2.874 ± 0.039] | 2.60              |
| AC10  | 8.0 [0.315]                        | 44 [1.732]        |                               | 3                 | 88 ± 1 [3.465 ± 0.039] | 4.50              |

**BENDING FORMS**
**KINK TYPE S = EK**


| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P ± 1 | S <sub>max.</sub> |
|-------------|-----|---------------------|-----|-------|-------|-------------------|
| AC01        | 0.8 | (1)                 | (1) | 8     | 17.8  | 2                 |
| AC03 - AC05 |     |                     |     |       | 25.4  |                   |
| AC07        |     |                     |     |       | 33.0  |                   |

**DOUBLE KINK SP = DK SP**

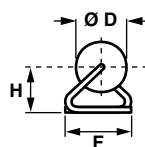
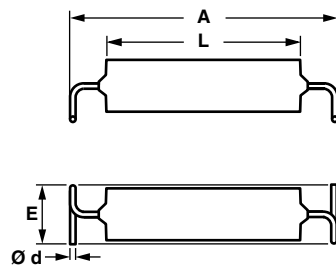

| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P <sub>1</sub> ± 1 | P <sub>2</sub> ± 3 | S <sub>max.</sub> | Ø B       | c       |
|-------------|-----|---------------------|-----|-------|--------------------|--------------------|-------------------|-----------|---------|
| AC01        | 0.8 | (1)                 | (1) | 8     | 19.8               | 17.8               | 2                 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 |     |                     |     |       | 22.0               | 20.0               |                   |           |         |
|             |     |                     |     |       | 27.4               | 25.4               |                   |           |         |
| AC07        |     |                     |     |       | 35.0               | 33.0               |                   |           |         |

**DOUBLE KINK LP = DK LP**

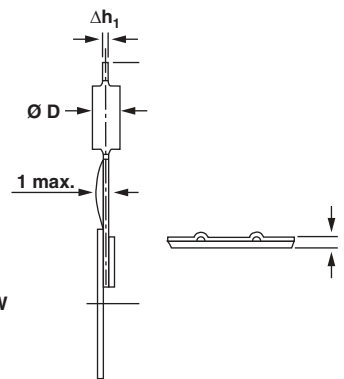
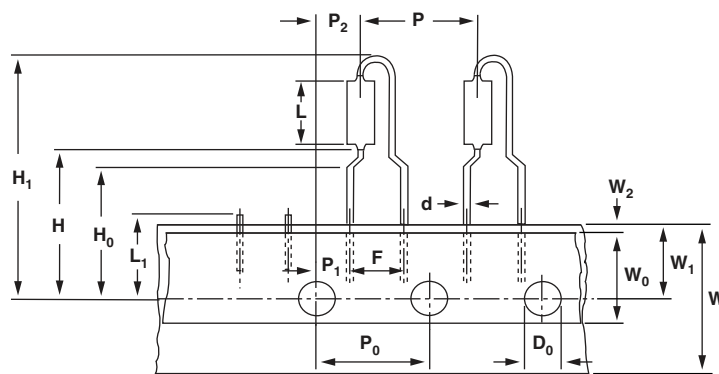

| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P <sub>1</sub> ± 1 | P <sub>2</sub> ± 3 | S <sub>max.</sub> | Ø B       | c       |
|-------------|-----|---------------------|-----|-------|--------------------|--------------------|-------------------|-----------|---------|
| AC01 - AC03 | 0.8 | (1)                 | (1) | 8     | 17.8               | 17.8               | 2                 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 |     |                     |     |       | 25.4               | 25.4               |                   |           |         |
| AC07        |     |                     |     |       | 33.0               | 33.0               |                   |           |         |

**Note**

(1) See table DIMENSIONS

**BENDING FORMS**
**WSZ**

**Solder pad dimensions**

| TYPE     | Ø d | Ø D <sub>max.</sub> | A        | L       | F         | H         | E         | a   | b   | l    |
|----------|-----|---------------------|----------|---------|-----------|-----------|-----------|-----|-----|------|
| AC03 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**

**Direction of Unreeling →**
**TYPE AC01**

|                                                  |                 |                  |
|--------------------------------------------------|-----------------|------------------|
| 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



## PULSE DIAGRAMS



**AC01** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC03** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC04** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC05** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



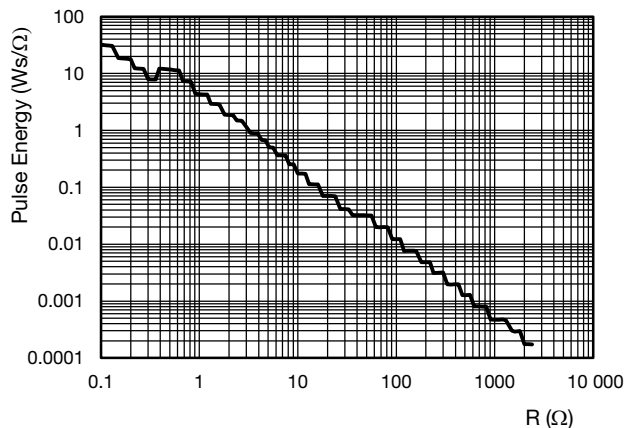
**AC07** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC10** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



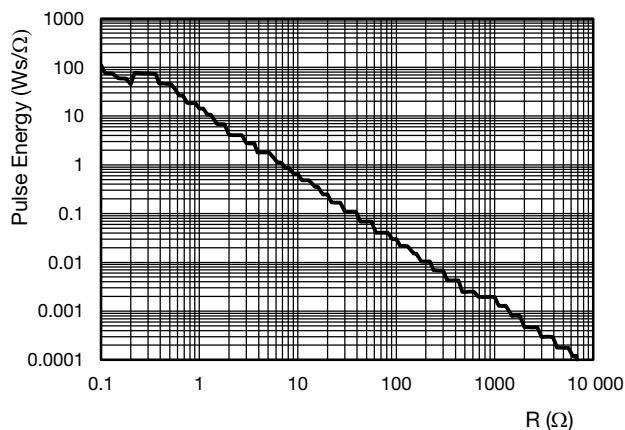
PULSE DIAGRAMS



AC01 Pulse capability; E (Ws) as a function of R (Ω)



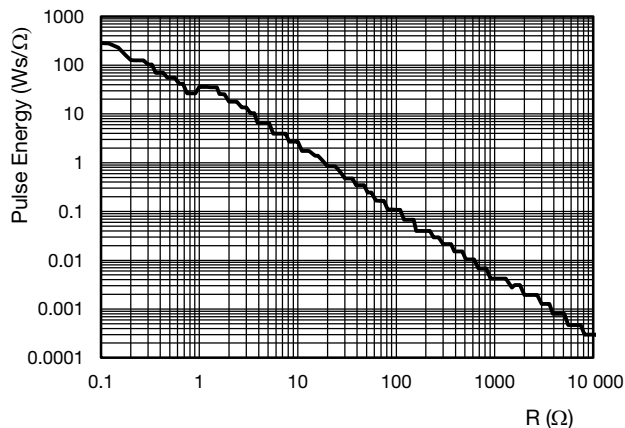
AC03 Pulse capability; E (Ws) as a function of R (Ω)



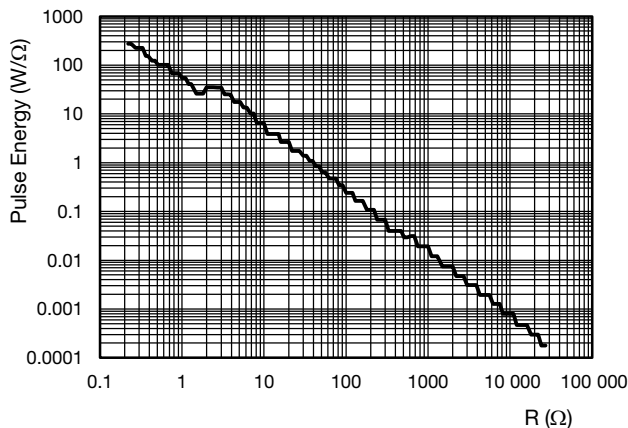
AC04 Pulse capability; E (Ws) as a function of R (Ω)



AC05 Pulse capability; E (Ws) as a function of R (Ω)



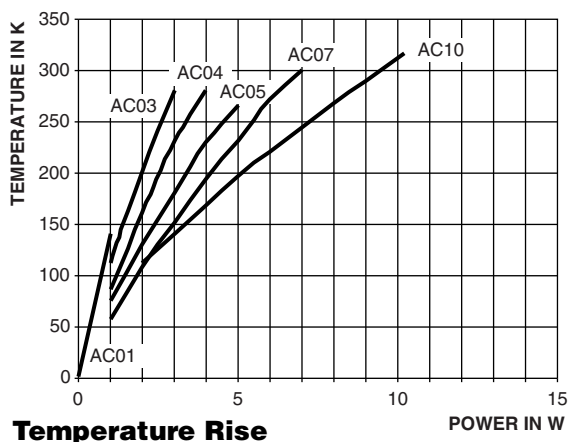
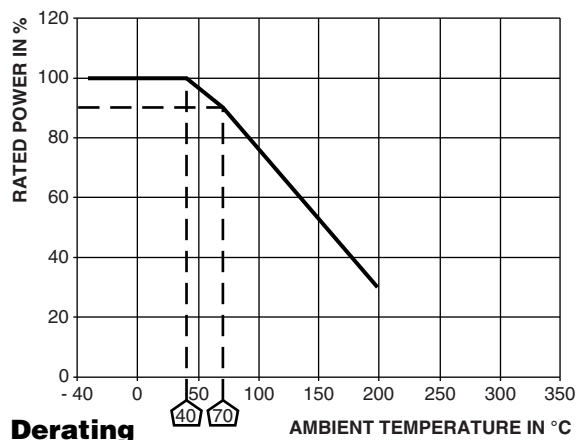
AC07 Pulse capability; E (Ws) as a function of R (Ω)



AC10 Pulse capability; E (Ws) as a function of R (Ω)



## FUNCTIONAL PERFORMANCE



| PERFORMANCE                                                                       |                                           |
|-----------------------------------------------------------------------------------|-------------------------------------------|
| TEST                                                                              | PERMISSIBLE CHANGE                        |
| Climatic Category (LCT/UCT/Days)                                                  | 40/200/56                                 |
| Climatic Sequence, IEC 60115-1, 4.23                                              | $\Delta R = \pm (1 \% R + 0.05 \Omega)$   |
| Damp Heat, Steady State, IEC 60115-1, 4.24<br>(40 ± 2) °C, 56 days, (93 ± 3) % RH | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Endurance at room temperature (116 % P70), 1000 h, IEC 60115-1, 4.25.2            | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Endurance at UCT, 200 °C (30 % P70), 1000 h, IEC 60115-1, 4.25.3                  | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Resistance to Soldering Heat, IEC 60115-1, 4.18<br>(260 ± 5) °C, (10 ± 1) s       | $\Delta R = \pm (0.5 \% R + 0.05 \Omega)$ |
| Robustness of Termination, IEC 60115-1, 4.16<br>10N                               | $\Delta R = \pm (0.5 \% R + 0.05 \Omega)$ |
| Short Time Overload, IEC 60115-1, 4.13<br>10 x Rated Power for 5 s                | $\Delta R = \pm (2 \% R + 0.1 \Omega)$    |

**HISTORICAL 12NC INFORMATION**

- The resistors had a 12-digit ordering code starting with 23.
- The subsequent 7 digits indicated the resistor type, specification and packaging.
- The remaining 3 digits indicated the resistance value:
  - The first 2 digits indicated the resistance value.
  - The last digit indicated the resistance decade in accordance with resistance decade table.

**Resistance Decade**

| RESISTANCE DECADE              | LAST DIGIT |
|--------------------------------|------------|
| 0.1 $\Omega$ to 0.91 $\Omega$  | 7          |
| 1 $\Omega$ to 9.1 $\Omega$     | 8          |
| 10 $\Omega$ to 91 $\Omega$     | 9          |
| 100 $\Omega$ to 910 $\Omega$   | 1          |
| 1 k $\Omega$ to 9.1 k $\Omega$ | 2          |
| 10 k $\Omega$ to 56 k $\Omega$ | 3          |

**12NC Example**

The 12NC code of an AC01 resistor, value 47  $\Omega$  supplied in ammpack of 1000 units was: 2306 328 33479.

**HISTORICAL 12NC - Resistor type and packaging**

| TYPE                | 23.. ... ..                 |                |              |              |
|---------------------|-----------------------------|----------------|--------------|--------------|
|                     | BANDOLIER IN AMMOPACK       |                |              |              |
|                     | RADIAL                      | STRAIGHT LEADS |              |              |
|                     | 2500 units                  | 250 units      | 500 units    | 1000 units   |
| AC01                | 06 328 90... <sup>(2)</sup> | -              | -            | 06 328 33... |
| AC03 <sup>(1)</sup> | -                           | -              | 22 329 03... | -            |
| AC04 <sup>(1)</sup> | -                           | -              | 22 329 04... | -            |
| AC05 <sup>(1)</sup> | -                           | -              | 22 329 05... | -            |
| AC07 <sup>(1)</sup> | -                           | -              | 22 329 07... | -            |
| AC10                | -                           | -              | -            | -            |

**Notes**

- <sup>(1)</sup> Products with bent leads and bulk packaging (100 pieces) are available on request  
<sup>(2)</sup> Radial parts with tin plated copper leads



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