

CA9 

Carbon Potentiometers CA

CE9 

Cermet Potentiometers CE



## CARBON – CA9

9mm carbon potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials can be self-extinguishable according to UL 94 V-0 under request.

Through-hole and SMD configurations are available. Terminals and collector are normally manufactured in tinned brass, although versions with steel terminals are also available under request. Terminals for through-hole models can be provided straight or crimped, which helps hold the component to the PCB during soldering.

Tapers can be linear, log and antilog; special tapers can also be studied.

ACP's potentiometers can be adjusted from either the front or the back, both in the horizontal and the vertical adjustment types. Thumbwheels and shafts can be ordered either separately or already inserted in the potentiometer.

Potentiometers can be manufactured in a wide range of possibilities regarding:

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (standard is at 50% rotation).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 20 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

### Applications

9mm potentiometers are mainly used in control applications, in different markets:

- Industrial: Timers and relays, dimmers, adjustment of output.
- Electronic appliances: volume regulation, temperature controls and function selection.
- Automotive: Lighting regulation (position adjustment and sensing for headlights), dimmers, seat heating controls.

## CERMET – CE9

9mm cermet potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials (housing and rotor) are self-extinguishable according to UL 94 V-0 for ACP's cermet potentiometers.

Cermet potentiometers have better thermal stability, allow for higher thermal dissipation and withstand higher temperatures than carbon potentiometers.

Through-hole and SMD configurations are available. Terminals and collector are manufactured in tinned brass, although versions with steel terminals are also available under request. Terminals for through-hole models can be provided straight or crimped, which helps hold the component to the PCB during soldering.

Tapers can be linear, log and antilog; special tapers can also be studied.

ACP's potentiometers can be adjusted from either the front or the back, both in the horizontal and the vertical adjustment types. Thumbwheels and shafts can be ordered either separately or already inserted in the potentiometer.

Potentiometers can be manufactured in a wide range of possibilities regarding:

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 20 detents available).

### Applications

9mm cermet potentiometers are used in applications where either the operating temperature is high, or where the application requires product with excellent ohmic value stability:

- Electronic appliances: temperature controls.
- Automotive: climate controls, position sensors, seat heating controls.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

# CA9 CE9 HOW TO ORDER

EXAMPLE: **CA9MH2,5-10KA2020 SNP PI WT-9005-BA**

EXAMPLE: **CE9MH2,5-10KA2020 SNP PI WT-9005-BA-V0**

| Standard features |       |       |        |           |       |      |      | Extra features |         |         |         |       |       |      | Assembled accessory |       |       |       |
|-------------------|-------|-------|--------|-----------|-------|------|------|----------------|---------|---------|---------|-------|-------|------|---------------------|-------|-------|-------|
| Series            | Rotor | Model | Packg. | Ohm value | Taper | Tol. | Life | Track          | Detents | Snap in | Housing | Rotor | Wiper | Lin. | Assembly            | Ref # | Color | Flam. |
| 1                 | 2     | 3     | 4      | 5         | 6     | 7    | 8    | 9              | 10      | 11      | 12      | 13    | 14    | 15   | 16                  |       |       |       |
| CA9/CE9           | M     | H2,5  |        | - 10K     | A     | 2020 |      | SNP            |         |         |         | PI    |       |      | WT                  | -9005 | -BA   | -V0   |

| Standard configuration: | CA9 Through-hole                                                         | CA9 SMD                                         | CE9 Through-hole and SMD    |
|-------------------------|--------------------------------------------------------------------------|-------------------------------------------------|-----------------------------|
| Dimensions:             | 9mm                                                                      |                                                 |                             |
| Protection:             | IP 54 (dust-proof)<br>On request: Self-extinguishable, to meet UL 94 V-0 |                                                 |                             |
| Substrate:              | Carbon technology                                                        | Carbon technology, special for high temperature |                             |
| Color:                  | Blue housing + white rotor                                               | Brown housing + grey rotor                      | Brown housing + white rotor |
| Packaging:              | Bulk                                                                     |                                                 |                             |
| Wiper position:         | at 50% ±15°                                                              |                                                 |                             |
| Terminals:              | Straight, without crimping.                                              |                                                 |                             |
| Marking:                | Resistive value marked on housing. Others on request.                    |                                                 |                             |

**Customized products:** A drawing is requested when ordering a customized product. Series, rotor, model and total resistive value are indicated before the code that includes all special specifications. Example: CA9PH2,5-10K CODE C00111.

## 1 - Series

■ CA9 ■ CE9

## 2 - Rotors

C D J K KA M MA MT P R Y

## 3 - Model and pitch

H2,5 H3,8 HS3,8 H5 HSMD V7,5  
V10 VK10 VR10 MAV10 MTV10 VSMD VSMD WT-9002

## 4 - Packaging

### Trough-hole

### SMD models

Bulk (blank)...<sup>(1)</sup> (blank)...<sup>(1)</sup>  
T&R (Tape and 13" reel) (N.A.)<sup>(2)</sup> T&R  
T&R (Tape and 15" reel) (N.A.)<sup>(2)</sup> T&R15

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

## 5 - Resistance value

100Ω 200Ω 220Ω 250Ω 470Ω 500Ω 1KΩ 2KΩ ... 500KΩ 1MΩ 2MΩ 2M2Ω 4M7Ω 5MΩ  
100 200 220 250 470 500 1K 2K 500K 1M 2M 2M2 4M7 5M

## 6 - Resistance law / taper

Lin - Linear A  
Log - Logarithmic B  
Antilog - Antilogarithmic C  
- Special tapers have codes assigned: CODE YXXXXX

## 7 - Tolerance

±20% ±30% +50%,-30% ±10% ±5%  
2020 3030 5030 1010 0505

## 8 - Operating Life (Cycles)

Standard (1.000 cycles) (leave blank)  
Long life: LV + the number of cycles. ex: LV10 for 10.000 cycles. (others on request) LVXX: ex: LV10

## 9 - Cut Track – Open circuit.

Open circuit at beginning of track, fully CCW PCI  
Open circuit at end of track, fully CW PCF

## 10 - Detents (DT)

One detent at the beginning DTI  
One detent at the end DTF  
X number of detents XDT: 10DT

Special detents are available on request: If you need to assign a voltage value to each detent, please inquire.

## 11 - Terminals

SNAP IN P SNP  
SNAP IN J SNJ  
Shorter tip of terminal, TPXX, where XX is tip length (under request) TPXX, ex: TP25

## 12 - Housing

**Color:** For colors other than standard: -See color chart below- CJ-color, ex., red: CJ-RO

## 13 - Rotor

**Color:** For colors other than standard: -See color chart below- RT-color; ex., blue: RT-AZ

### \* Self-extinguishable property, V0, for housing and rotor:

By default, carbon is non self-extinguishable, cermet is self-extinguishable: (blank)  
For carbon: self-extinguishable property can be added. V0 means housing V0  
and rotor are V0 if only the housing needs to be V0, then CJ-V0. CJ-V0, RT-V0  
If only rotor: RT-V0

## 14 - Wiper

**Wiper position** (Standard: 50% ± 15°) (leave blank)  
Initial or CCW PI  
Final or CW PF  
Others: following clock positions; at 3 hours: P3H PXH, ex: P3H  
**Wiper torque** (Standard: <2.5Ncm, for detents: <3.5) (leave blank)  
Low torque, < 1.5Ncm PGB

## 15 - Linearity

Not controlled (leave blank)  
Independent linearity controlled & below x%, for example, 3%: LN3% LNx%; ex: LN3%  
Absolute linearity controlled & below x% LAX%

## 16 - Potentiometers with assembled accessories

Assembled from terminal side WT  
Assembled from collector side WTI  
Accessory Reference -XXXXX  
See list of shafts and thumbwheels available Example: 9010  
Color of shaft or thumbwheel -YY Example, white: BA  
Non self-extinguishable. (leave blank)  
Self-extinguishable according to standard UL 94 -V0  
(-V0 in box 17 modifies only the accessory, please, note.)  
**For ordering spare accessories:**  
Accessory reference - color- flammability. XXXX-YY-V0  
Ex. 9010-AZ-V0 is a blue self-extinguishable 9010 thumbwheel

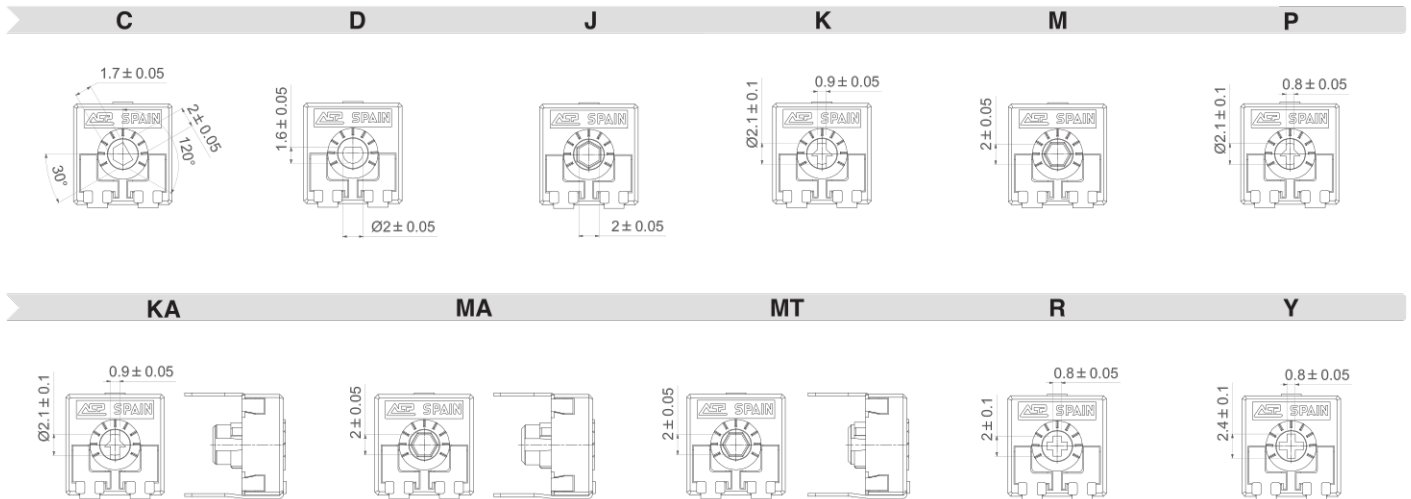
### Color chart for rotor, housing and accessories

|                      |       |         |         |     |       |        |      |      |       |
|----------------------|-------|---------|---------|-----|-------|--------|------|------|-------|
| Black <sup>(1)</sup> | White | Neutral | Transp. | Red | Green | Yellow | Blue | Grey | Brown |
| NE                   | BA    | IN      | TA      | RO  | VE    | AM     | AZ   | GS   | MR    |

(1) black is not an option for housings.

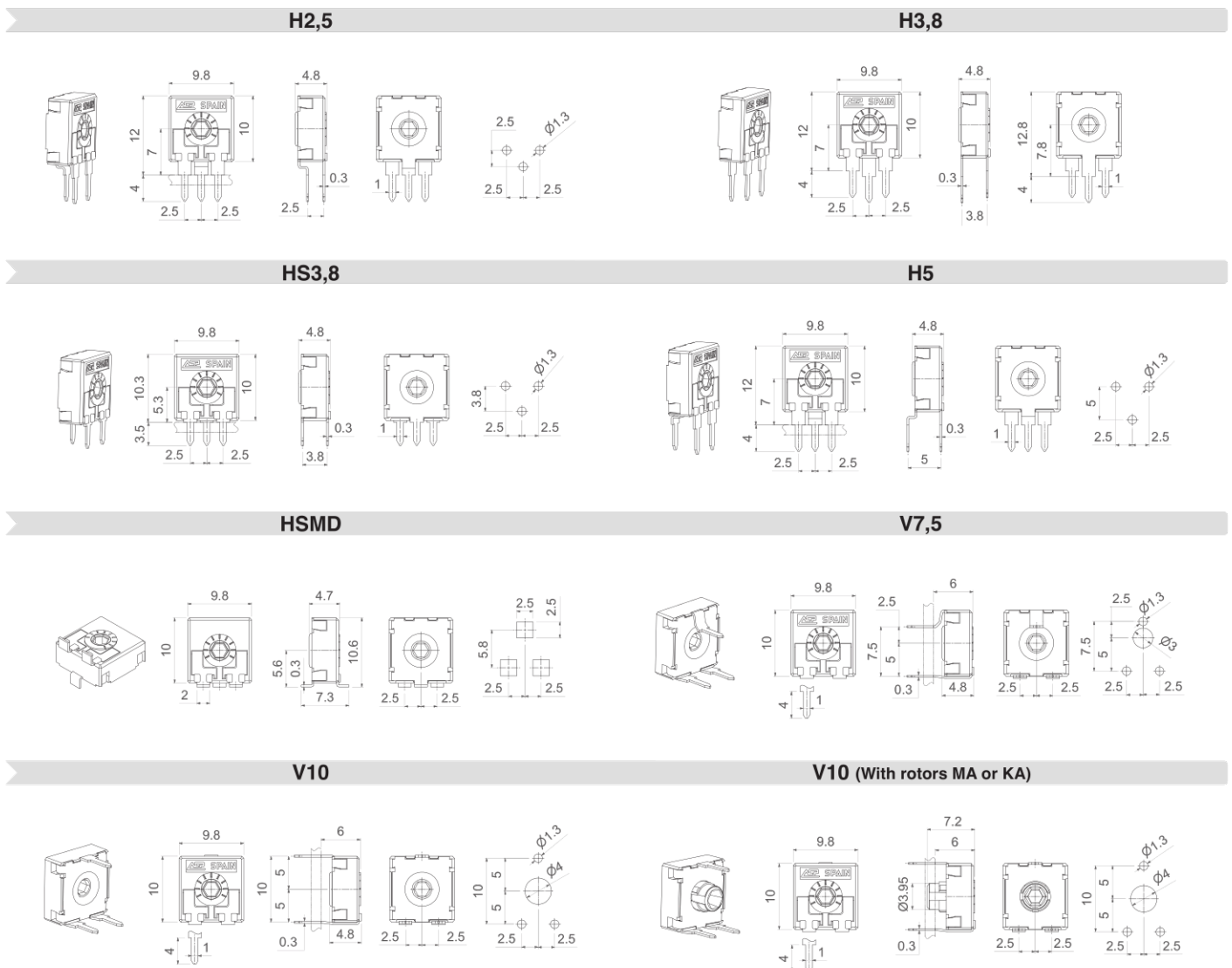
## Rotors

Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.

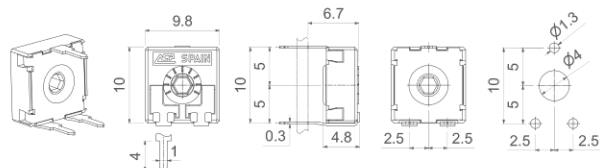


## Models

All models shown here have the most common rotor for 9mm potentiometers: the M rotor. Different rotors are available from the menu above.

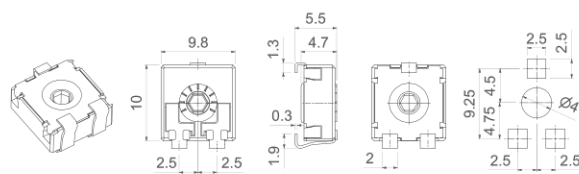


|                         | V10 (With rotor MT) | VK10 |
|-------------------------|---------------------|------|
| 1. <b>General</b>       |                     |      |
| 1.1. <b>General</b>     |                     |      |
| 1.1.1. <b>General</b>   |                     |      |
| 1.1.2. <b>General</b>   |                     |      |
| 1.1.3. <b>General</b>   |                     |      |
| 1.1.4. <b>General</b>   |                     |      |
| 1.1.5. <b>General</b>   |                     |      |
| 1.1.6. <b>General</b>   |                     |      |
| 1.1.7. <b>General</b>   |                     |      |
| 1.1.8. <b>General</b>   |                     |      |
| 1.1.9. <b>General</b>   |                     |      |
| 1.1.10. <b>General</b>  |                     |      |
| 1.1.11. <b>General</b>  |                     |      |
| 1.1.12. <b>General</b>  |                     |      |
| 1.1.13. <b>General</b>  |                     |      |
| 1.1.14. <b>General</b>  |                     |      |
| 1.1.15. <b>General</b>  |                     |      |
| 1.1.16. <b>General</b>  |                     |      |
| 1.1.17. <b>General</b>  |                     |      |
| 1.1.18. <b>General</b>  |                     |      |
| 1.1.19. <b>General</b>  |                     |      |
| 1.1.20. <b>General</b>  |                     |      |
| 1.1.21. <b>General</b>  |                     |      |
| 1.1.22. <b>General</b>  |                     |      |
| 1.1.23. <b>General</b>  |                     |      |
| 1.1.24. <b>General</b>  |                     |      |
| 1.1.25. <b>General</b>  |                     |      |
| 1.1.26. <b>General</b>  |                     |      |
| 1.1.27. <b>General</b>  |                     |      |
| 1.1.28. <b>General</b>  |                     |      |
| 1.1.29. <b>General</b>  |                     |      |
| 1.1.30. <b>General</b>  |                     |      |
| 1.1.31. <b>General</b>  |                     |      |
| 1.1.32. <b>General</b>  |                     |      |
| 1.1.33. <b>General</b>  |                     |      |
| 1.1.34. <b>General</b>  |                     |      |
| 1.1.35. <b>General</b>  |                     |      |
| 1.1.36. <b>General</b>  |                     |      |
| 1.1.37. <b>General</b>  |                     |      |
| 1.1.38. <b>General</b>  |                     |      |
| 1.1.39. <b>General</b>  |                     |      |
| 1.1.40. <b>General</b>  |                     |      |
| 1.1.41. <b>General</b>  |                     |      |
| 1.1.42. <b>General</b>  |                     |      |
| 1.1.43. <b>General</b>  |                     |      |
| 1.1.44. <b>General</b>  |                     |      |
| 1.1.45. <b>General</b>  |                     |      |
| 1.1.46. <b>General</b>  |                     |      |
| 1.1.47. <b>General</b>  |                     |      |
| 1.1.48. <b>General</b>  |                     |      |
| 1.1.49. <b>General</b>  |                     |      |
| 1.1.50. <b>General</b>  |                     |      |
| 1.1.51. <b>General</b>  |                     |      |
| 1.1.52. <b>General</b>  |                     |      |
| 1.1.53. <b>General</b>  |                     |      |
| 1.1.54. <b>General</b>  |                     |      |
| 1.1.55. <b>General</b>  |                     |      |
| 1.1.56. <b>General</b>  |                     |      |
| 1.1.57. <b>General</b>  |                     |      |
| 1.1.58. <b>General</b>  |                     |      |
| 1.1.59. <b>General</b>  |                     |      |
| 1.1.60. <b>General</b>  |                     |      |
| 1.1.61. <b>General</b>  |                     |      |
| 1.1.62. <b>General</b>  |                     |      |
| 1.1.63. <b>General</b>  |                     |      |
| 1.1.64. <b>General</b>  |                     |      |
| 1.1.65. <b>General</b>  |                     |      |
| 1.1.66. <b>General</b>  |                     |      |
| 1.1.67. <b>General</b>  |                     |      |
| 1.1.68. <b>General</b>  |                     |      |
| 1.1.69. <b>General</b>  |                     |      |
| 1.1.70. <b>General</b>  |                     |      |
| 1.1.71. <b>General</b>  |                     |      |
| 1.1.72. <b>General</b>  |                     |      |
| 1.1.73. <b>General</b>  |                     |      |
| 1.1.74. <b>General</b>  |                     |      |
| 1.1.75. <b>General</b>  |                     |      |
| 1.1.76. <b>General</b>  |                     |      |
| 1.1.77. <b>General</b>  |                     |      |
| 1.1.78. <b>General</b>  |                     |      |
| 1.1.79. <b>General</b>  |                     |      |
| 1.1.80. <b>General</b>  |                     |      |
| 1.1.81. <b>General</b>  |                     |      |
| 1.1.82. <b>General</b>  |                     |      |
| 1.1.83. <b>General</b>  |                     |      |
| 1.1.84. <b>General</b>  |                     |      |
| 1.1.85. <b>General</b>  |                     |      |
| 1.1.86. <b>General</b>  |                     |      |
| 1.1.87. <b>General</b>  |                     |      |
| 1.1.88. <b>General</b>  |                     |      |
| 1.1.89. <b>General</b>  |                     |      |
| 1.1.90. <b>General</b>  |                     |      |
| 1.1.91. <b>General</b>  |                     |      |
| 1.1.92. <b>General</b>  |                     |      |
| 1.1.93. <b>General</b>  |                     |      |
| 1.1.94. <b>General</b>  |                     |      |
| 1.1.95. <b>General</b>  |                     |      |
| 1.1.96. <b>General</b>  |                     |      |
| 1.1.97. <b>General</b>  |                     |      |
| 1.1.98. <b>General</b>  |                     |      |
| 1.1.99. <b>General</b>  |                     |      |
| 1.1.100. <b>General</b> |                     |      |
| 1.1.101. <b>General</b> |                     |      |
| 1.1.102. <b>General</b> |                     |      |
| 1.1.103. <b>General</b> |                     |      |
| 1.1.104. <b>General</b> |                     |      |
| 1.1.105. <b>General</b> |                     |      |
| 1.1.106. <b>General</b> |                     |      |
| 1.1.107. <b>General</b> |                     |      |
| 1.1.108. <b>General</b> |                     |      |
| 1.1.109. <b>General</b> |                     |      |
| 1.1.110. <b>General</b> |                     |      |
| 1.1.111. <b>General</b> |                     |      |

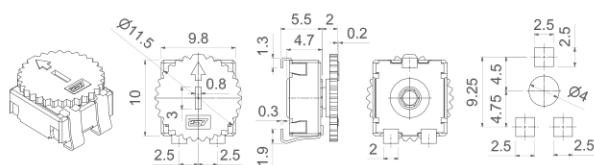


VR10

VSMD



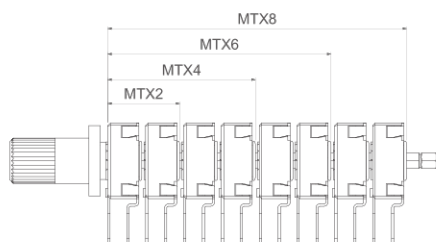
**VSMD WT-9002**



**GANGED**

**GANGED:** Set of potentiometers in a row that allows for simultaneous adjustment of all of them through one shaft. Recommended potentiometer model is H2.5. MTX2 (2 potentiometers), MTX4 (4), MTX6 (6), MTX8 (8).

| Model | MTX2             | MTX4       | MTX6 | MTX8 |
|-------|------------------|------------|------|------|
| Shaft | 9048, 9074, 9076 | 9039, 9051 | 9018 | 9056 |



## Tapers

The standard taper is linear (A). Log (B) and Antilog (C) tapers are also available, as well as special tapers according to customer's specifications. For example, a special taper can be matched with a potentiometer with detents (click effect) to guarantee a value in a specific position – see “detents” section.-

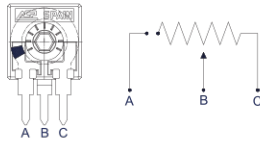
| REGULAR TAPERS                                                                                                                                                                                                                                                                  | SPECIAL TAPERS                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. <b>100% TAPER</b></p> <p>2. <b>90% TAPER</b></p> <p>3. <b>80% TAPER</b></p> <p>4. <b>70% TAPER</b></p> <p>5. <b>60% TAPER</b></p> <p>6. <b>50% TAPER</b></p> <p>7. <b>40% TAPER</b></p> <p>8. <b>30% TAPER</b></p> <p>9. <b>20% TAPER</b></p> <p>10. <b>10% TAPER</b></p> | <p>1. <b>100% TAPER</b></p> <p>2. <b>90% TAPER</b></p> <p>3. <b>80% TAPER</b></p> <p>4. <b>70% TAPER</b></p> <p>5. <b>60% TAPER</b></p> <p>6. <b>50% TAPER</b></p> <p>7. <b>40% TAPER</b></p> <p>8. <b>30% TAPER</b></p> <p>9. <b>20% TAPER</b></p> <p>10. <b>10% TAPER</b></p> |



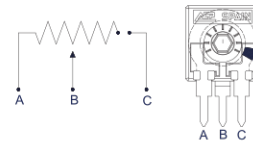
## Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications. Mechanical life with cut track needs to be confirmed.  
 PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.  
 PCF = Cut at final position, when the potentiometer is turned fully clockwise.  
 Other positions are available on request.

### PCI



### PCF

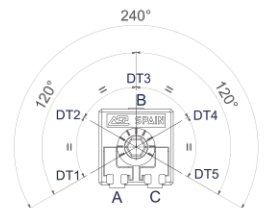
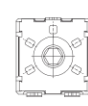
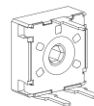
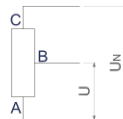
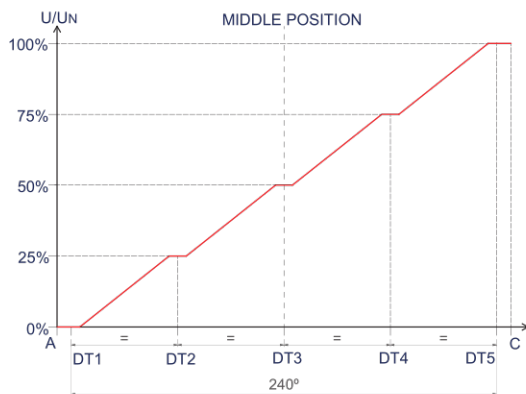


## Potentiometers with detents

ACP's patented detent (DT) feature is especially suitable for control applications where the end used will turn a knob inserted in the potentiometer. Detents can be used to add a click feeling to the turning of the potentiometer or to control the position in which the wiper is placed, assuring a particular output value with a narrow tolerance.

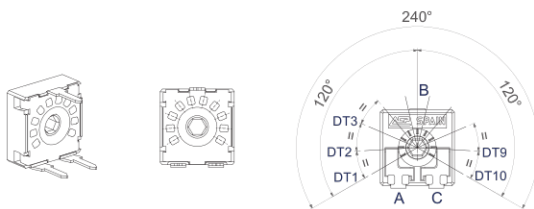
Detents can be light or strong, or even a combination of different feelings. They can be evenly distributed along the angle (standard) or tailored to match customers' request. They can also be combined with special tapers: constant value areas, open circuit zone, different slopes, etc. One common example is a potentiometer with detents and matching non-overlapping voltage values in specific angular positions, used to feed in a voltage value to a microprocessor:

### Example of 5DT with control of value in each DT.

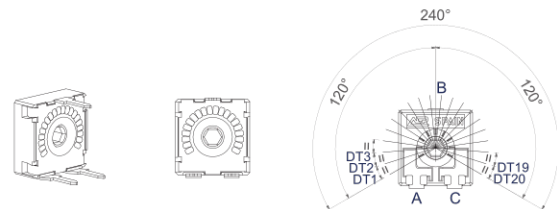


Other examples of potentiometers with detents:

### 10DT



### 20DT



Number of standard detents (evenly distributed) already available.

1 (Initial, final or central), 2 DT (initial and final), 3, 4, 5, 6, 7, 8, 10, 20.

Maximum number of detents for feeling only

20

Maximum number of detents when the voltage value in each detent is controlled and non-overlapping.

10

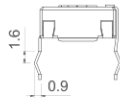
Our patented design with two wipers has improved the performance of these potentiometers, giving them more stable electrical parameters, improved reliability and Contact Resistance Variation (CRV) as well as narrower tolerances for detent positioning.

For potentiometers with detents, mechanical life is also 1.000 cycles if no additional cycles are mentioned. Please, indicate the number of cycles needed with LV (number of cycles), for example: LV07, for 7.000 cycles.

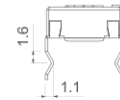
## Terminals

By default, terminals are always straight, as shown on the “models” section. ACP can provide crimped terminals (with snap in, “SNP” or “SNJ”) to better hold the component to the PCB during the soldering operation.

### SNP



### SNJ

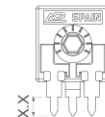
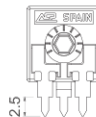
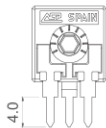


Also, there is an option of having shorter terminal tips:

### Standard Terminal

### Shorter terminal, for H5 TP25

### Shorter terminal, TPXX (under request)



## Possibilities for insertion of accessories

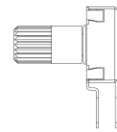
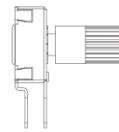
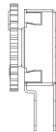
Accessories can be mounted on potentiometers through either the front side (WT) or the collector side (WTI). For the specific angular position of shafts with planes, a drawing with the exact position is requested.

### WT Front side

### WTI Collector side

### WT Front side

### WTI Collector side



## Shafts

Shafts are available in different colors (color chart in “how to order” section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.

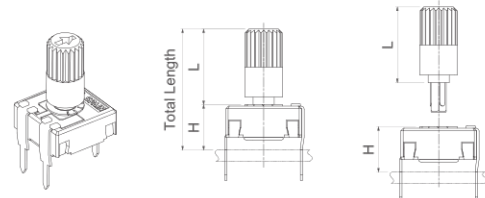
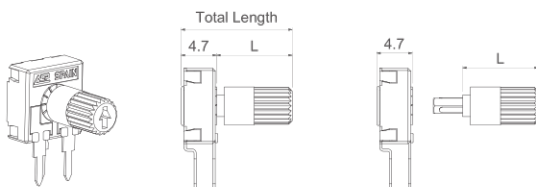
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

Unless otherwise stated, the arrow in the shafts is in line with the wiper and it points to 50% when assembled with M rotors.

When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with “L” in the table below, as shown in the drawings:

### H potentiometer + shaft

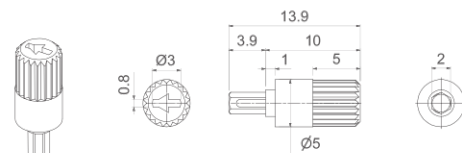
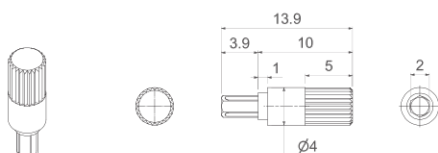
### V potentiometer + shaft



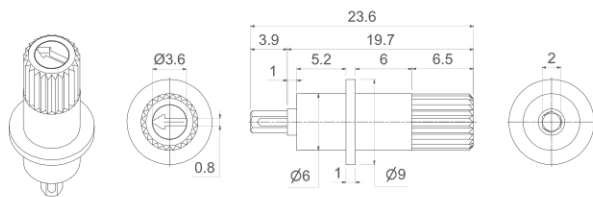
| Shaft       | 9071 | 9067 | 9072 | 9074 | 9054 | 9004 | 9005 | 9064 | 9055 | 9070 | 9076 | 9053 | 9018 | 9039 | 9048 | 9056 | 9009 | 9059 | 9063 | 9010 | 9051 | 9006 | 9019 | 9073 | 9020 | 9047 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| L Dimension | 3.5  | 5.5  | 6.5  | 9.3  | 9.5  | 10   | 10   | 10   | 10.8 | 11.9 | 12   | 12.1 | 12.8 | 12.8 | 12.8 | 12.8 | 14.5 | 14.5 | 14.5 | 15   | 15   | 19.7 | 19.9 | 25.5 | 25.9 | 29.8 |

### 9004

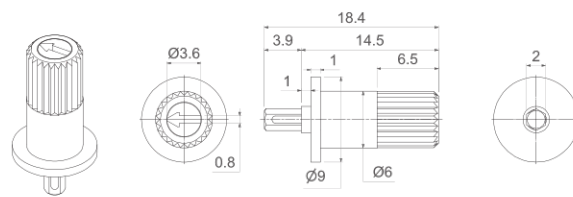
### 9005



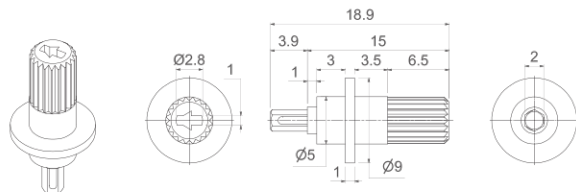
9006



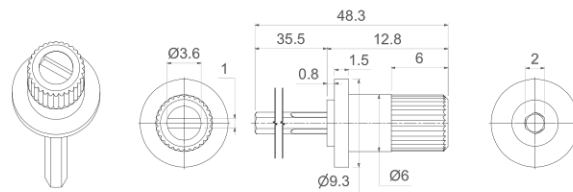
9009



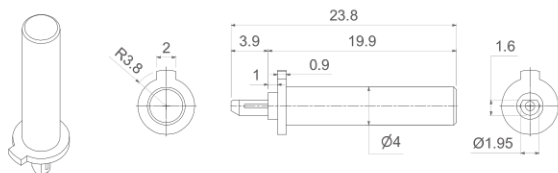
9010



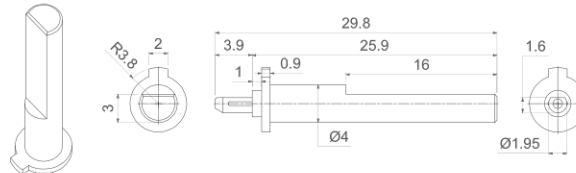
9018 (for 6 ganged potentiometers)



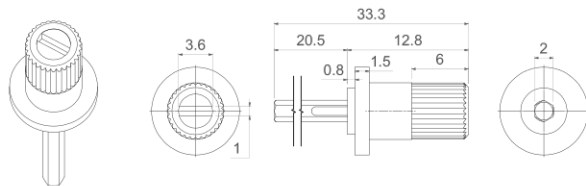
9019 (Designed for D rotor)



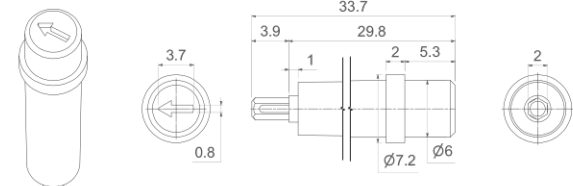
9020 (Designed for D rotor)



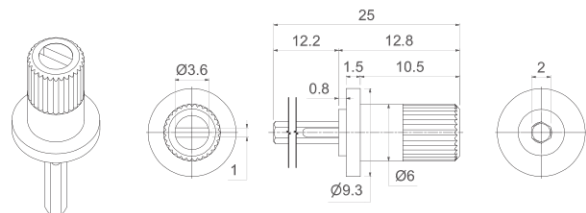
9039 (for 4 ganged potentiometers)



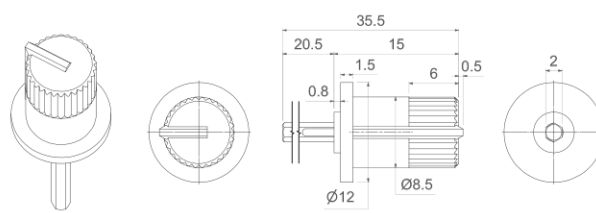
9047



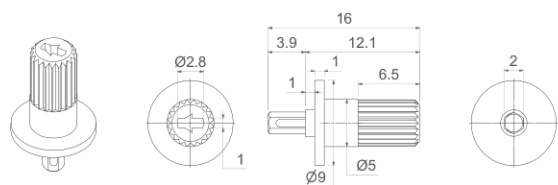
9048 (for 2 ganged potentiometers)



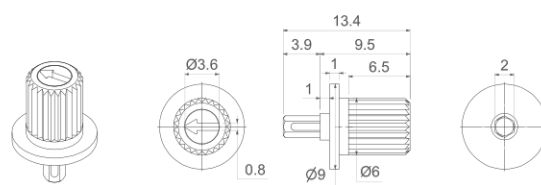
9051 (for 4 ganged potentiometers)



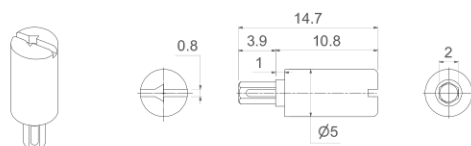
9053



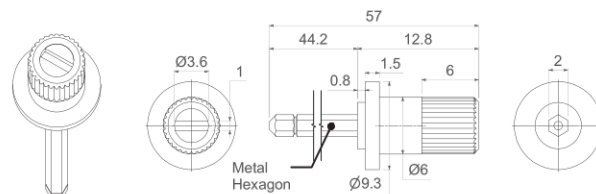
9054



9055

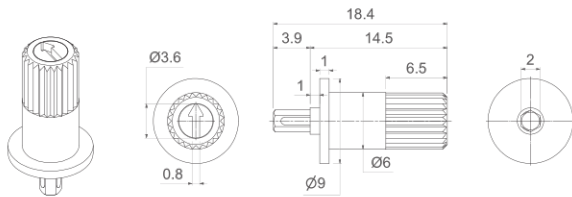


9056 (for 8 ganged potentiometers)



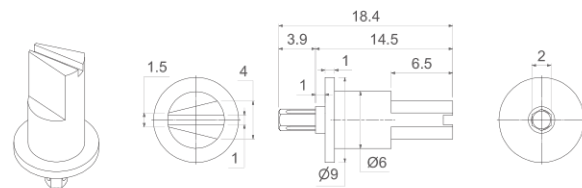
## Shafts

9059

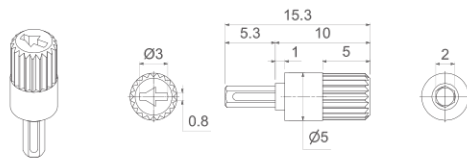


The arrow is in line with the wiper when potentiometer has rotor J (with M rotor, there is a 30° difference).

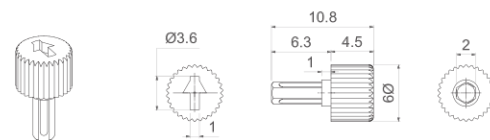
9063



9064

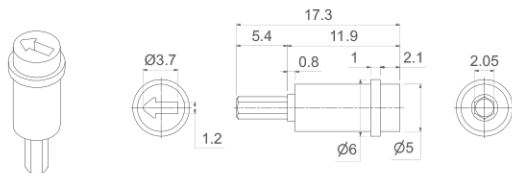


9067

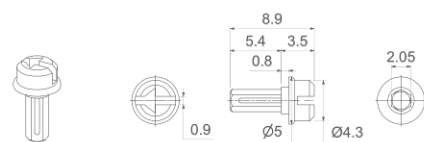


The arrow is in line with the wiper when potentiometer has rotor J (with M rotor, there is a 30° difference).

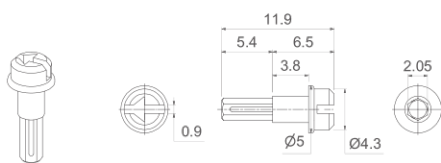
9070



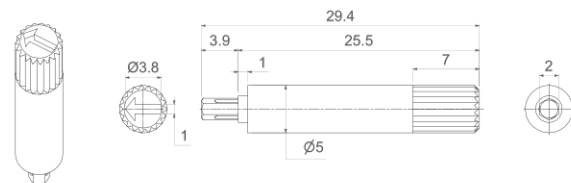
9071



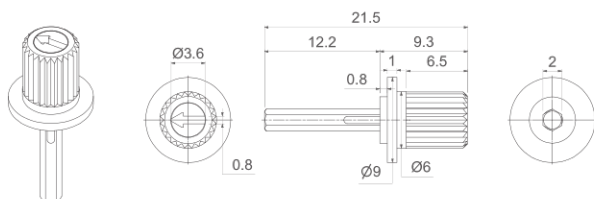
9072



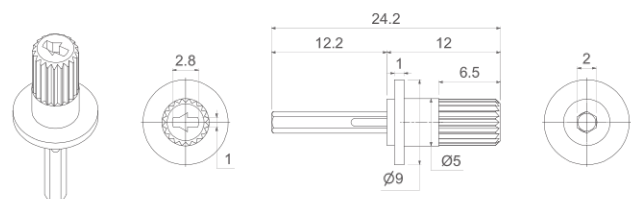
9073



9074 (for 2 ganged potentiometers)



9076 (for 2 ganged potentiometers)

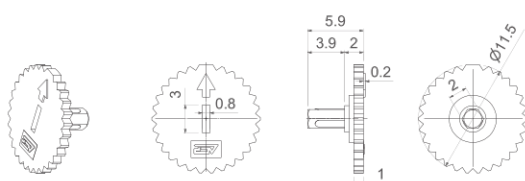


## Thumbwheel

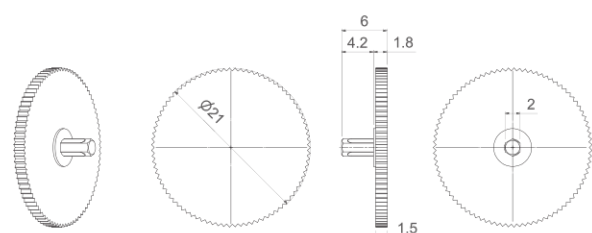
Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

Thumbwheels can be mounted on the potentiometers at ACP or sold separately. ACP can study special thumbwheel designs.

9002

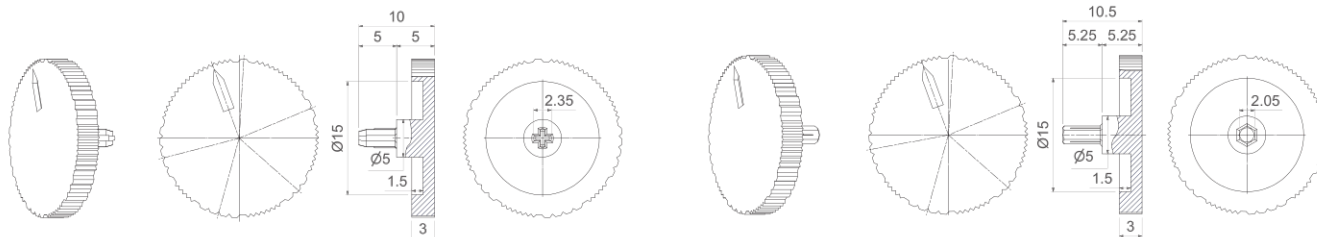


9041



## 9060 (Designed for R rotor)

## 9061



## Packaging

## Bulk packaging:

| Potentiometer model                                                 | With shaft or thumbwheel inserted?                                                                                                  | Pieces per small box (150 x 100 x 70) | Pieces per bigger box (250 x 150 x 70, CG on description) |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------|
| H2,5 - H3,8 - HS3,8 - H5<br>HSMD - V7,5 - V10<br>VK10 - VR10 - VSMD | None, only potentiometers.                                                                                                          | 500                                   | 1.500                                                     |
|                                                                     | 9002                                                                                                                                | 250                                   | 1.000                                                     |
|                                                                     | 9004, 9005, 9006, 9009, 9010, 9018, 9039, 9041, 9047, 9048, 9051, 9053, 9054, 9055, 9056, 9059, 9060, 9061, 9063, 9064, 9067, 9070. | 200                                   | 1.000 in general                                          |
|                                                                     | 9071, 9072                                                                                                                          | 400                                   | 1.250                                                     |
|                                                                     | 9048, 9074, 9076                                                                                                                    | 150                                   | To be determined.                                         |
| MTX2                                                                | 9039, 9051                                                                                                                          | 75                                    | To be determined.                                         |
| MTX4                                                                | 9018                                                                                                                                | 50                                    | To be determined.                                         |
| MTX6                                                                | 9056                                                                                                                                | 40                                    | To be determined.                                         |
| MTX8                                                                |                                                                                                                                     |                                       |                                                           |

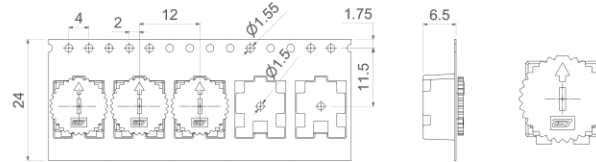
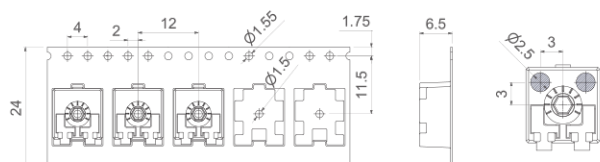
## Tape &amp; Reel packaging:

|      | With thumbwheel inserted?  | 13" Reel (Standard), with 24mm width tape     | 15" Reel, with 24mm width tape                  |
|------|----------------------------|-----------------------------------------------|-------------------------------------------------|
| VSMD | None, only potentiometers. | 900 pcs per reel, 12mm step between cavities. | 1.250 pcs per reel, 12mm step between cavities. |
|      | 9002                       | 700 pcs per reel, 12mm step between cavities. | To be determined.                               |
| HSMD |                            | 350 pcs per reel, 16 mm step between cavities | 500 pcs per reel, 16 mm step between cavities   |

The 13" reel is the standard. For the 15" reel, T&R15 is added to the description.

## VSMD-T&amp;R

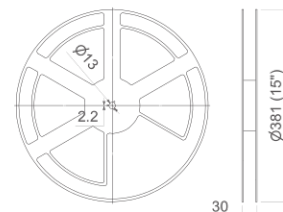
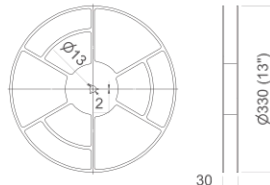
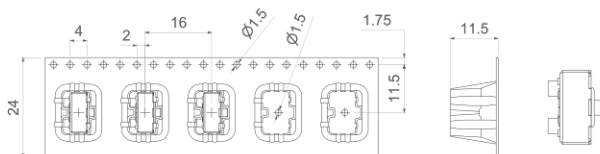
## VSMD-T&amp;R...WT-9002



## HSMD-T&amp;R

## 13" Reel

## 15" Reel



## Electric Specifications

These are standard features; other specifications and out of range values can be studied on request.

|                                                                                                   | CA9 Through-hole                                                               | CA9 SMD                                                                 | CE9 Through-hole and SMD                                                 |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Range of resistance values*<br>Lin (A)<br>Log (B) Antilog (C)                                     | $100\Omega \leq R_n \leq 5M\Omega$<br>$1K\Omega \leq R_n \leq 2M2\Omega$       | $100\Omega \leq R_n \leq 1M\Omega$<br>$1K\Omega \leq R_n \leq 1M\Omega$ | $100\Omega \leq R_n \leq 5M\Omega$<br>$1K\Omega \leq R_n \leq 2M2\Omega$ |
| Tolerance*<br>Rn < 100Ω:<br>100Ω ≤ Rn ≤ 100KΩ<br>100K < Rn ≤ 1MΩ:<br>1MΩ < Rn ≤ 5MΩ:<br>Rn > 5MΩ: | +50%, -30% (out of range)<br>±20%<br>±20%<br>±30%<br>+50%, -30% (out of range) | -<br>±30%<br>±40%<br>±50%<br>-                                          | -<br>±20%<br>±20%<br>±30%<br>-                                           |
| Variation laws                                                                                    | Lin (A), Log (B), Antilog (C). Other tapers available on request               |                                                                         |                                                                          |
| Residual resistance                                                                               | Lin (A), Log (B), Antilog (C) ≤ 5*10 <sup>-3</sup> *Rn. Minimum value 2Ω       |                                                                         | ≤2Ω                                                                      |
| CRV - Contact Resistance<br>Variation (dynamic)                                                   | Lin (A) Electrical Angle 220°±20° ≤ 3%Rn.<br>Other tapers, please inquire      |                                                                         |                                                                          |
| CRV - Contact Resistance<br>Variation (static)                                                    | Lin (A) Electrical Angle 220°±20° ≤ 5%Rn.<br>Other tapers, please inquire      |                                                                         |                                                                          |
| Maximum power dissipation**<br>Lin (A)<br>Log (B), Antilog (C)                                    | at 50°C<br>0.15W<br>0.10W                                                      |                                                                         | at 70°C.<br>0.5W<br>0.20W                                                |
| Maximum voltage<br>Lin (A)<br>Log (B), Antilog (C)                                                | 200VDC<br>150VDC                                                               |                                                                         | 200VDC                                                                   |
| Operating temperature                                                                             | -25°C ... +70°C (+85°C on request)                                             |                                                                         | -40°C ... +90°C (+125°C on request)                                      |
| Temperature coefficient<br>100Ω ≤ Rn ≤ 10KΩ<br>10KΩ < Rn ≤ 5MΩ                                    | +200/-300 ppm<br>+200/-500 ppm                                                 | +200/-500 ppm<br>+200/-1000 ppm                                         | ±100 ppm<br>±100 ppm                                                     |

\* Out of range ohm values and tolerances are available on request, please, inquire.

\*\* Dissipation of special tapers will vary, please, inquire.

## Mechanical Specifications

|                                  | CA9 Through-hole                                               | CA9 SMD           | CE9 Through-hole and SMD |
|----------------------------------|----------------------------------------------------------------|-------------------|--------------------------|
| Resistive element                | Carbon technology                                              | Carbon technology | Cermet                   |
| Angle of rotation (mechanical)   | 240° ± 5°                                                      |                   |                          |
| Angle of rotation (electrical)   | 220° ± 20°                                                     |                   |                          |
| Wiper standard delivery position | 50% ± 15°                                                      |                   |                          |
| Max. stop torque                 | 5 Ncm                                                          |                   |                          |
| Max. push/pull on rotor          | 40 N                                                           |                   |                          |
| Wiper torque*                    | <2 Ncm<br>Potentiometers with detents: <2.5 Ncm                |                   |                          |
| Mechanical life                  | 1.000 cycles (many more available on request, please, inquire) |                   |                          |

\* Stronger or softer torque feeling is available on request.

## Test results

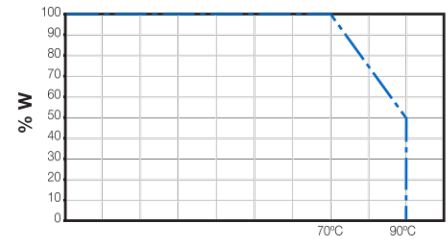
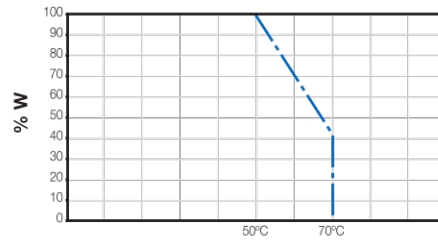
The following typical test results are given at 23°C ±2°C and 50% ±25% RH.

|                   | CA9 Through-hole and SMD                       |                                         | CE9 Through-hole and SMD                       |                                         |
|-------------------|------------------------------------------------|-----------------------------------------|------------------------------------------------|-----------------------------------------|
|                   | Test conditions                                | Typical variation of nominal resistance | Test conditions                                | Typical variation of nominal resistance |
| Damp heat         | 500 h. at 40°C and 95% RH                      | +5%, -2%                                | 500 h. at 40°C and 95% RH                      | ±2%                                     |
| Thermal cycles    | 16 h at 85°C, plus 2 h at -25°C                | ±2.5%                                   | 16 h at 90°C, plus 2 h at -40°C                | ±2%                                     |
| Load life         | 1.000 h. at 50°C                               | +0%; -6%                                | 1.000 h. at 70°C                               | ±2%                                     |
| Mechanical life   | 1.000 cycles at 10 c.p.m.<br>and at 23°C ± 2°C | ±3%                                     | 1.000 cycles at 10 c.p.m.<br>and at 23°C ± 2°C | ±3%                                     |
| Soldering effect  | 2 seconds at 350°C                             | ±1%                                     | 2 seconds at 350°C                             | ±1%                                     |
| Storage (3 years) | 3 years at 23°C ± 2°C                          | ±3%                                     | 3 years at 23°C ± 2°C                          | ±1%                                     |

CA9 Through-hole and SMD

CE9 Through-hole and SMD

Power derating curve:

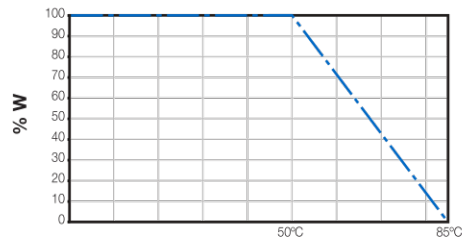


For temperatures out of range

The normal operation temperature for a carbon ACP potentiometer is -25°C to +70°C. When the temperature goes up to 85°C, the following variations should be observed:

|           |                  |          |                  |           |
|-----------|------------------|----------|------------------|-----------|
| Load life | 1.000 h. at 50°C | +0%; -6% | 1.000 h. at 85°C | +0%; -15% |
|-----------|------------------|----------|------------------|-----------|

The power derating curve to consider is:

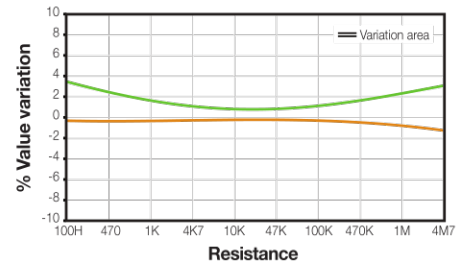
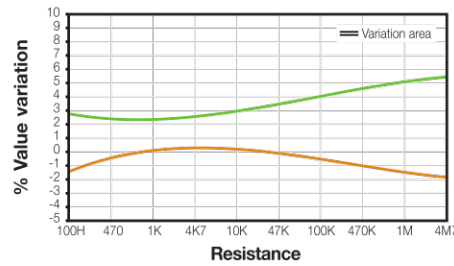


Representation of the typical variation of nominal resistance (with 95% confidence) throughout the ohm value range:

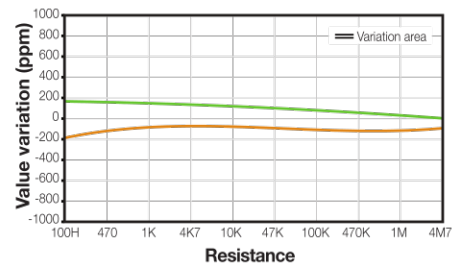
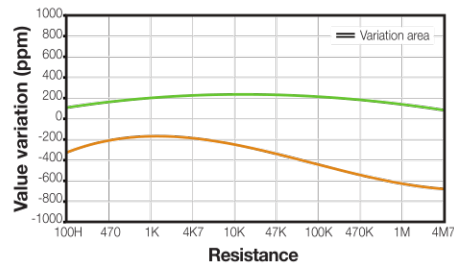
CA9 Through-hole and SMD

CE9 Through-hole and SMD

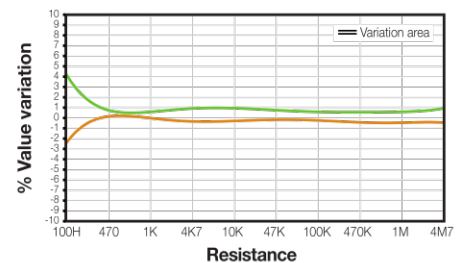
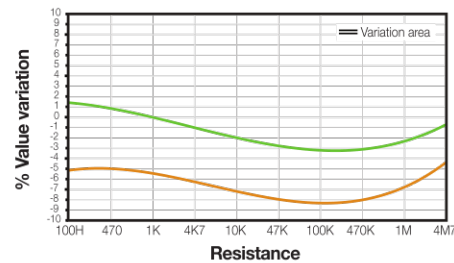
Damp heat



Temperature Coefficient



Load life



Mechanical life

