

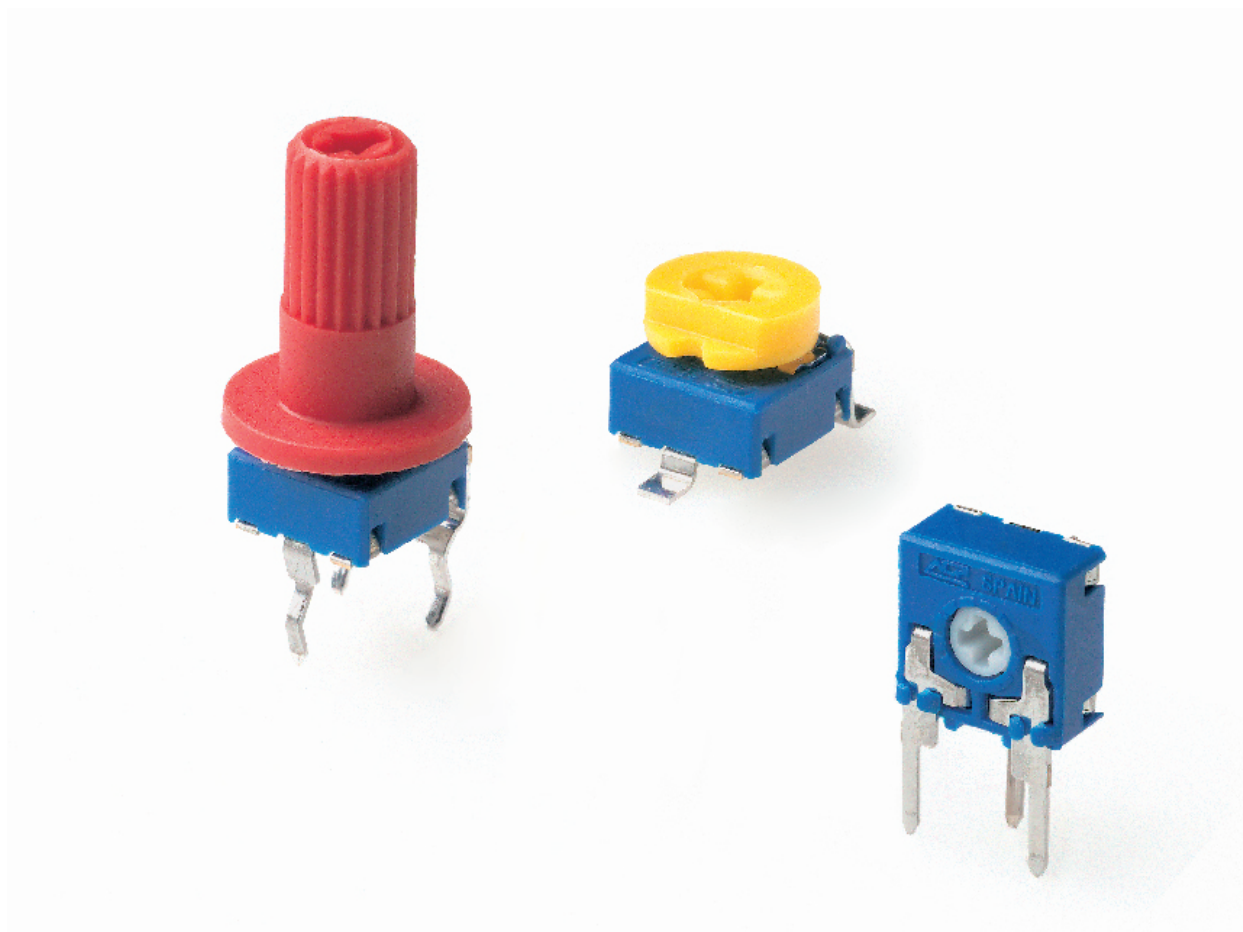


**EN:** This Datasheet/Document is presented by the manufacturer.

Please visit our website for pricing and availability at [www.hestore.hu](http://www.hestore.hu).

# Potentiometers

CA6  
CA9 // CE9  
CA14 // CE14  
MCA9 // MCE9  
MCA14 // MCE14





6mm carbon potentiometers with plastic housing and protection type IP 5 (dust-proof).

CA6 potentiometers are available both in through-hole and in SMD terminal configuration. The substrate in our SMD potentiometers is high temperature resistant, for reflow soldering.

Tapers available include linear, log and antilog, even for SMD potentiometers. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with "snap in"), which is recommended to hold the potentiometer to the board prior to the soldering operation.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer. CA6VSMD potentiometers, with or without thumbwheel, can be requested in Bulk or Tape & Reel (T&R) packaging.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

Our potentiometers can be manufactured in a wide range of possibilities regarding:

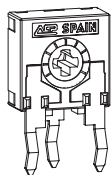
- Resistance value.
- Tolerance.
- Tapers / variation laws of the resistive element (linear, log, antilog).
- Others on request.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Self-extinguishable plastic parts according to UL 94 V-0.

#### **Applications**

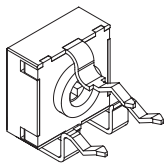
- Small electronic appliances.
- Measurement and test equipment.
- Automotive: alarms, switches
- Telecommunication equipment (antenna amplifiers and receivers, videocomm., intercomm.)
- Alarm systems.

## Models

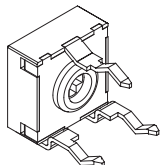
All models shown here have the standard rotor for the 6mm series, the cross (X). Models can be manufactured with any of the rotors listed on the rotor menu. The color of the housing or rotor can also be modified.



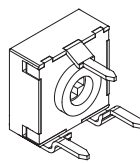
CA6 H2,5



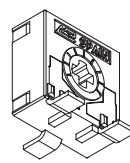
CA6 V 2,5



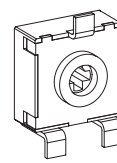
CA6 V5



CA6 VS5



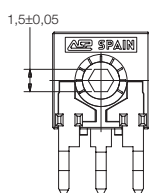
CA6 HSMD



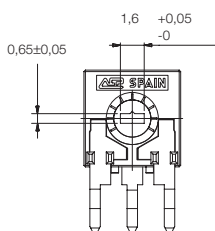
CA6 VSMD

## Rotors

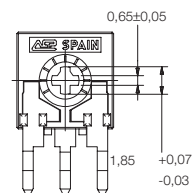
The rotor by default is the cross (X). Accessories are designed for the X rotor.



M



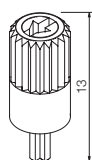
N



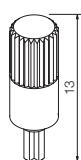
X

## Shafts

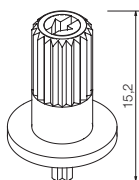
Shafts are offered in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.



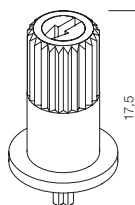
6022



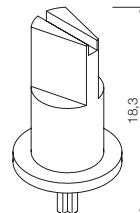
6023



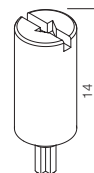
6024



6025



6028



6031

## Thumbwheels

Thumbwheels are offered in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special thumbwheels.



6001



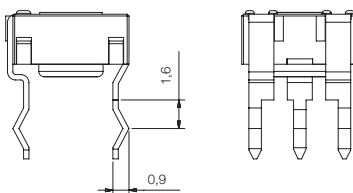
6030



6032

## Terminals

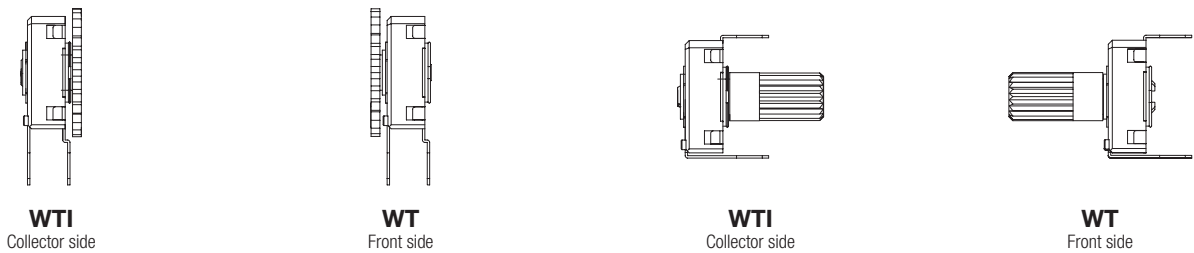
In the CA6 family, ACP will always recommend terminals with “snap in” in order to better hold the component to the board prior to soldering. (Not available for CA6VS5 model).



SNP

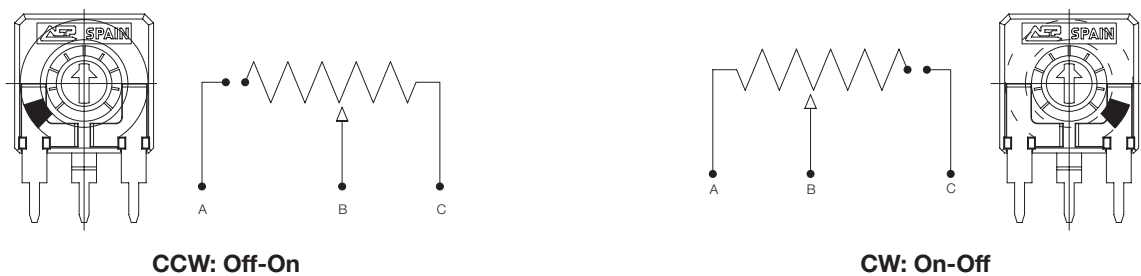
Adjustment possibilities

ACP's potentiometers can be adjusted through either the front side (WT) or the collector side (WTI):



Potentiometers with cut track

The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.  
With cut at the beginning of the track CCW: Off-On.  
With cut at the end of track- CW: On-Off. Others positions available on request.



Packaging

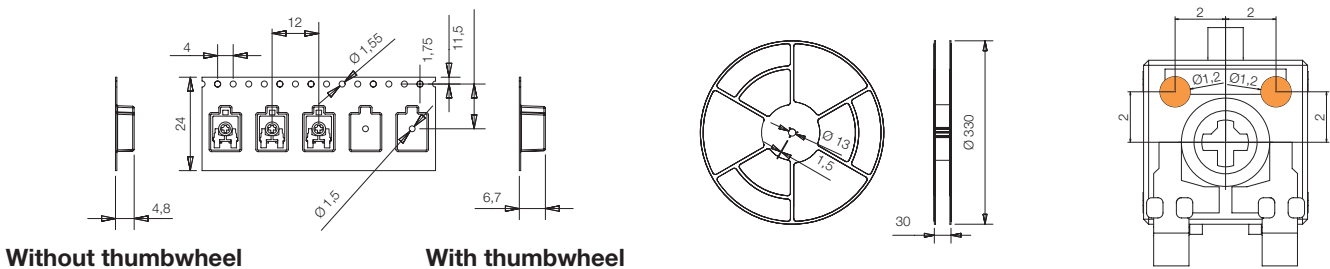
Bulk packaging: Potentiometers are first bagged and then introduced in boxes:

| Potentiometer model                  | + Shaft or thumbwheel inserted | Pieces per box (130 x 60 x 90) |
|--------------------------------------|--------------------------------|--------------------------------|
| H2,5 - V2,5 - V5 - VS5 - HSMD - VSMD | - (only potentiometers)        | 1000                           |
|                                      | 6001, 6030, 6032               | 1000                           |
|                                      | 6022, 6023, 6024, 6031         | 500                            |
|                                      | 6025, 6028                     | 300                            |

Tape and reel (T&R) packaging:

| Potentiometer model | + Shaft or thumbwheel reference | Pieces per reel |
|---------------------|---------------------------------|-----------------|
| VSMD                | - (only potentiometers)         | 1200            |
|                     | 6030                            | 750             |

Dimensions: Reel Ø: 330mm, Tape width: 24mm



## Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                 | Through-Hole                                                                       | SMD                                                               |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)    | 100Ω ... 5MΩ<br>1 KΩ ... 2,2 MΩ                                                    | 100Ω - 1MΩ<br>1KΩ - 1MΩ                                           |
| Tolerance<br>Special tolerances available on request            | 100Ω ... 1MΩ ±20%<br>>1MΩ ... 5MΩ ±30%<br>Out of range:<br>Rn> 5MΩ: +50% -30%      | < 1MΩ ± 25%                                                       |
| Variation laws                                                  | Lin (A), Log (B), Antilog (C) Other tapers available on request                    |                                                                   |
| Residual resistance                                             | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} \cdot R_n$<br>Minimum value 2Ω |                                                                   |
| CRV - Contact Resistance Variation (dynamic)                    | $\leq 3\% R_n$                                                                     |                                                                   |
| CRV - Contact Resistance Variation (static)                     | $\leq 5\% R_n$                                                                     |                                                                   |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>No Lin (B, C) | 0,10W<br>0,06W                                                                     |                                                                   |
| Maximum voltage at 40°C<br>Lin (A)<br>No Lin (B, C)             | 100 VDC<br>60VDC                                                                   |                                                                   |
| Operating temperature                                           | -25°C ... +70°C                                                                    |                                                                   |
| Temperature coefficient                                         | 100Ω - 10KΩ → +200/ -300 ppm.<br>>10KΩ - 5MΩ → +200/ -500 ppm                      | 100Ω - 100KΩ → +200/ -500 ppm.<br>>100KΩ - 1MΩ → +200/ -1000 ppm. |

## Mechanical Specifications

|                                | Through-Hole and SMD                    |
|--------------------------------|-----------------------------------------|
| Resistive element              | Carbon technology                       |
| Angle of rotation (mechanical) | 235° ± 10°                              |
| Wiper position                 | Middle position: 50% ± 15°              |
| Angle of rotation (electrical) | 215° ± 20°                              |
| Max. stop torque               | 4 Ncm                                   |
| Max. push/pull on rotor        | 9,8 N                                   |
| Wiper torque                   | < 2 Ncm                                 |
| Mechanical life                | 1000 cycles (more available on request) |

## Test

### Test // Conditions // Typical variation of Nominal Resistance

Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%

Thermal cycles // 16h at 85°C, plus 2h at -25°C // ±2,5%

Load life // 1.000 h. at 40°C // +0%; -5%

Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C ± 2°C // ±3%

Soldering effect // 2 seconds at 350°C // ±1%

Storage (3 years) // at 23°C ± 2°C // ±3%

For further information on tests, go to TESTS AND RELIABILITY, on pages 10-11



# CA6 HOW TO ORDER

EXAMPLE: CA6XV2,5-10KA2020 SNP PI WT6030-BA-V0

| Standard features |       |       |       |           |       |      |      | Extra features |           |         |       |                | Assembled accessory |       |       |       |
|-------------------|-------|-------|-------|-----------|-------|------|------|----------------|-----------|---------|-------|----------------|---------------------|-------|-------|-------|
| Series            | Rotor | Model | Packg | Ohm value | Taper | Tol  | Life | Track          | Terminals | Housing | Rotor | Wiper position | Assembly            | Ref # | Color | Flam. |
| 1                 | 2     | 3     | 4     | 5         | 6     | 7    | 8    | 9              | 10        | 11      | 12    | 13             |                     | 14    |       | 15    |
| CA6               | X     | V2,5  |       | -10K      | A     | 2020 |      |                | SNP       |         |       | PI             | WT                  | 6030  | -BA   | -V0   |

| Standard configuration |                                                       | Customized products                                                                                              |  |
|------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--|
| Dimensions:            | 6mm                                                   | A drawing is requested to order a customized product. The code assigned will include all special specifications. |  |
| Protection:            | IP 5 (dust proof)                                     |                                                                                                                  |  |
| Resistance:            | Carbon technology                                     |                                                                                                                  |  |
| Color:                 | Blue housing with white rotor                         |                                                                                                                  |  |
| Packaging:             | Bulk                                                  |                                                                                                                  |  |
| Wiper position:        | at 50% ± 15°                                          |                                                                                                                  |  |
| Terminals:             | Snap in P strongly recommended                        |                                                                                                                  |  |
| Marking:               | Resistive value marked on housing; others on request. |                                                                                                                  |  |
|                        |                                                       | Series, rotor, model and total resistive value are given before the special code:<br>CA6XV5-10K CODE C00111      |  |

## 1 - Series

CA6

## 2 - Rotors

X (Standard)

M

N

## 3 - Model and pitch

H2,5

V2,5

V5

VS5

HSMD

VSMD

## 4 - Packaging

Through-hole

SMD models

Bulk -standard-

(blank)...

(blank)...

T&R (Tape and reel)

(N.A.)<sup>(1)</sup>

-T&R

(1) N.A. - Not Available: Tape and Reel packaging is only available for VSMD model.

## 5 - Resistance value

|          | Through-hole                          |                                       | SMD                                    |                                    |
|----------|---------------------------------------|---------------------------------------|----------------------------------------|------------------------------------|
| Taper:   | Lin (A)                               | Log (B), Antilog (C)                  | Lin (A)                                | Log (B), Antilog (C)               |
| Value Rn | 100 Ω / 100<br>... / ...<br>5 MΩ / 5M | 1KΩ / 1K<br>... / ...<br>2,2 MΩ / 2M2 | 100Ω / 100<br>... / ...<br>1 MΩ / 1 MΩ | 1KΩ / 1K<br>... / ...<br>1 MΩ / 1M |

Other resistive values available on request.

## 6 - Resistance law / taper

Lin - Linear

A

Log - Logarithmic

B

Antilog - Antilogarithmic

C

- Special tapers have codes assigned:

CODE YXXXXX

Please, indicate terminal position when ordering a special taper.

## 7 - Tolerance

| Through-hole models                             |      | SMD models |      |
|-------------------------------------------------|------|------------|------|
| 100 Ω ≤ Rn ≤ 1MΩ: ±20%                          | 2020 |            |      |
| 1 MΩ ≤ Rn ≤ 5MΩ: ±30%                           | 3030 |            |      |
| For Rn > 5MΩ, tol : +50% - 30%                  | 5030 |            | 2525 |
| Special tolerances available: <5% ... 10%, etc. |      |            |      |

## 8 - Operating life (cycles)

Standard (1000cycles)

(leave blank)

Long life: LV + the number of cycles. ex: LV06 for 6000 cycles<sup>(1)</sup>

LVXX: ex: LV06

(1) Others on request.

## 9 - Cut track

At beginning of track, CCW: Off - On

PCI

At end of track, CW: On - Off

PCF

## 10 - Terminals (Crimped terminals or snap in:)

Without SNAP IN-

(leave blank)

With SNAP IN P

SNP

## 11 - Housing color

Standard is blue

(leave blank)

With other colors -See color chart below-, for example, red

CJ-color; ex: CJ-RO

## 12 - Rotor color

Standard is white

(leave blank)

With other colors -See color chart below-, for example, red

RT-color; ex: RT-RO

13 - Wiper position

|                          |               |
|--------------------------|---------------|
| (Standard: at 50% ± 15°) | (leave blank) |
| Initial or CCW           | PI            |
| Final or CW              | PF            |

15 - Flammability (according to UL 94 V-0)

|                                                                                                                                                        |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Not self-extinguishable                                                                                                                                | (leave blank) |
| Self-extinguishable (including all plastic parts of the potentiometers: rotor, housing and accessory. If only one part needs to be V0, please, inform) | -V0           |

For ordering spare accessories

|                                                                                                          |            |
|----------------------------------------------------------------------------------------------------------|------------|
| Accessory reference - color- flammability. Ex. 6030-BA-V0 is a white self-extinguishable 6030 thumbwheel | XXXX-YY-__ |
|----------------------------------------------------------------------------------------------------------|------------|

Color chart for rotor, housing and accessories

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

(1) Black is not available for housings.

14 - Potentiometers with assembled accessories

|                                                                     |                            |
|---------------------------------------------------------------------|----------------------------|
| Assembled from front side                                           | WT                         |
| Assembled from collector side                                       | WTI                        |
| Accessory Reference<br>See list of shafts and thumbwheels available | XXXX<br>Example: 6030      |
| Color of shaft or thumbwheel                                        | -YY<br>Example, white: -BA |



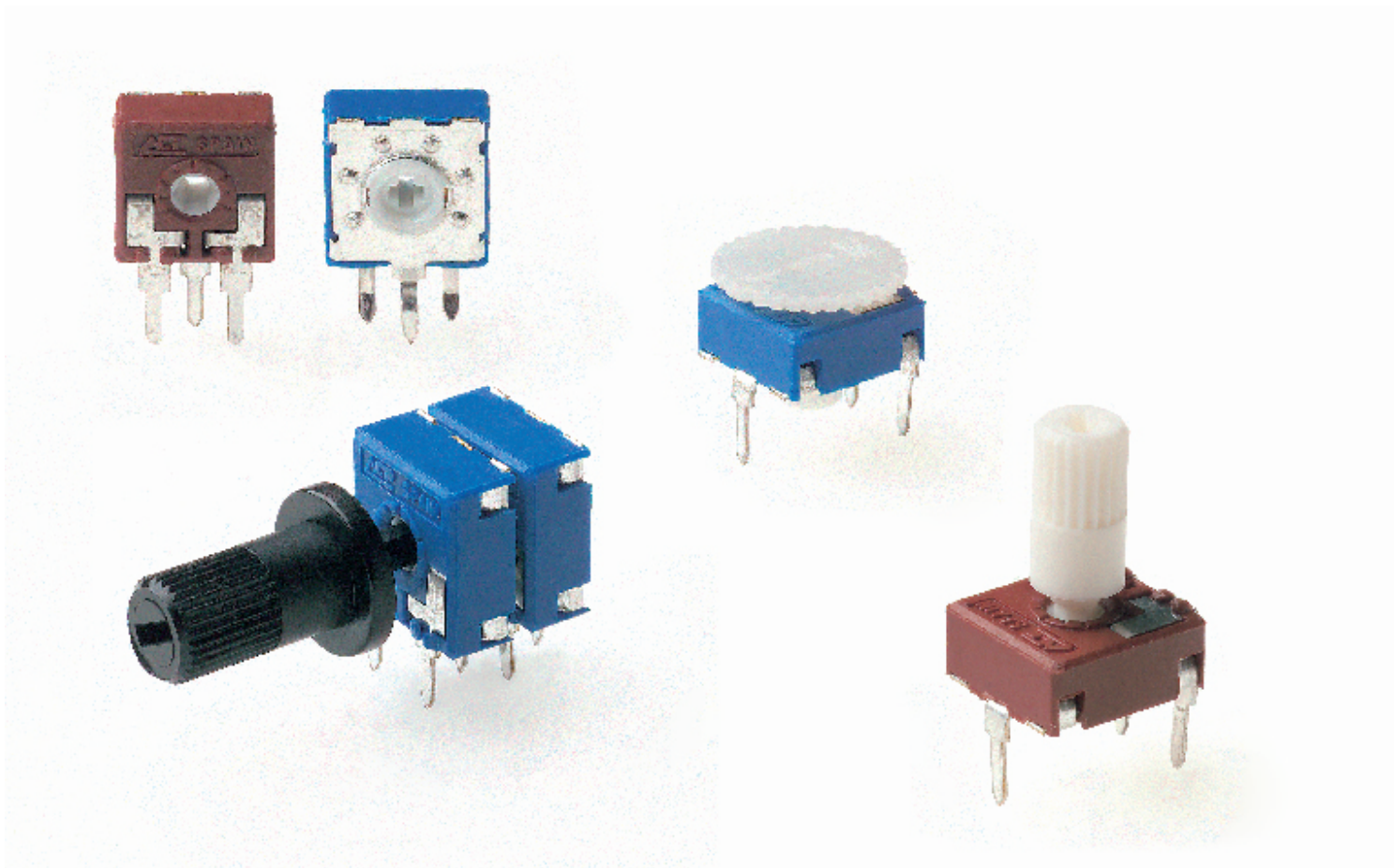
CA9

Carbon  
Potentiometers  
CA



CE9

Cermet  
Potentiometers  
CE





9mm carbon potentiometers with plastic housing and protection type IP 5 (dust-proof).

Standard tapers available include linear, log and antilog. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

Our 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.
- Pause effect (up to 20 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

#### Applications

- Electronic appliances: white goods, brown goods, small household appliances.
- Heating and air conditioning equipment and thermostats.
- Automotive: dimmers, climate controls, lighting regulation (position adjustment and sensing).
- Measurement and test equipment. Timers and relays.
- Multimedia.



9mm Cermet potentiometers with plastic housing and protection type IP 5 (dust-proof). Self-extinguishable according to UL 94 V-0.

Standard taper is linear. Log, Antilog and other tapers are available on request. Laser trimming equipment in-house, allowing for very low tolerances.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

Our potentiometers can be manufactured in a wide range of possibilities regarding:

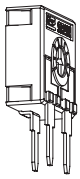
- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Pause effect (up to 20 detents available).

#### Applications

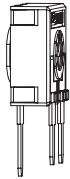
- Electronic appliances: white goods, brown goods, small household appliances, boilers, water heaters, etc.
- Heating and air conditioning equipment and thermostats.
- Automotive: dimmers, climate controls, lighting sensors.
- Industrial electronics: multimeters, oscilloscopes, test equipment, time relay.

## Models

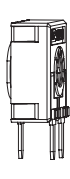
All models shown here have the standard rotor for the 9mm series, the arrow (P). Models can be manufactured with any of the rotors listed on the rotor menu. The color of the housing or rotor can also be modified. SMD configuration can be available on request.



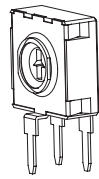
CA9 H2,5  
CE9 H2,5



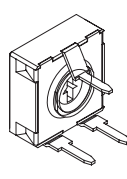
CA9 H3,8  
CE9 H3,8



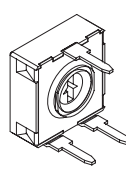
CA9 HS3,8  
CE9 HS3,8



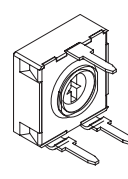
CA9 H5  
CE9 H5



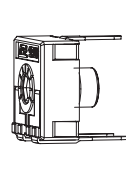
CA9 V7,5  
CE9 V7,5



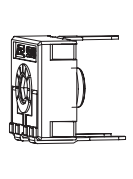
CA9 V10  
CE9 V10



CA9 VR10  
CE9 VR10



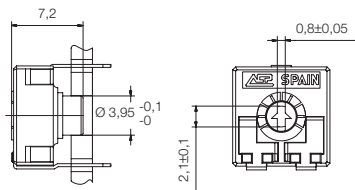
CA9 MAV10  
CE9 MAV10



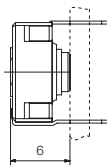
CA9 MTV10  
CE9 MTV10

## Rotors

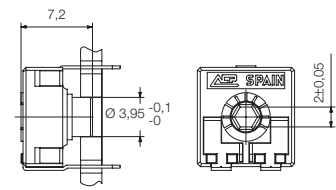
The rotor by default is the arrow (P). Accessories are designed for the M and J rotors, unless otherwise stated.



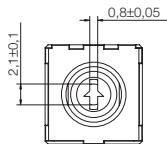
PA



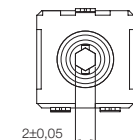
MT



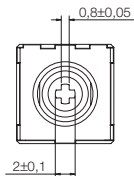
MA



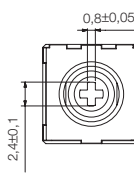
P



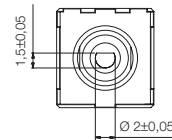
J



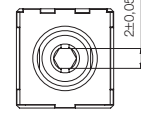
R



Y



D

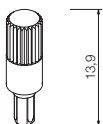


M

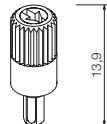
## Shafts

• **CA9.** Shafts are available in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.

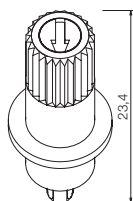
• **CE9.** Shafts in accordance with UL 94 V-0 are available in different colors. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.



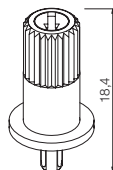
9004



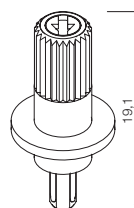
9005



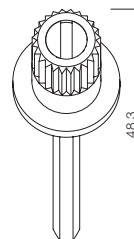
9006



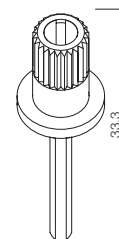
9009



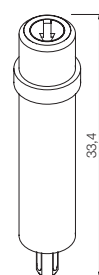
9010



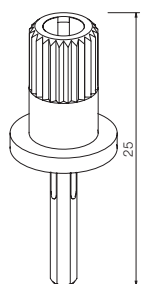
9018  
For 6 potentiometers



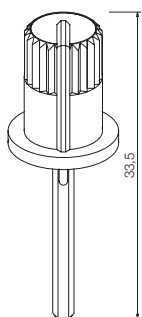
9039  
For 4 potentiometers



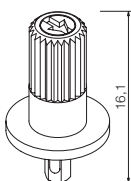
9047



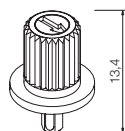
9048  
For 2 potentiometers



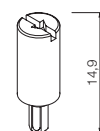
9051  
For 4 potentiometers



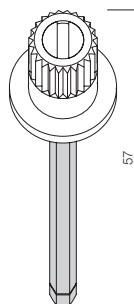
9053



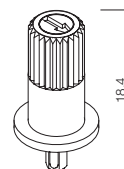
9054



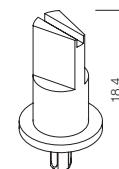
9055



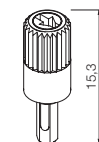
9056  
For 8 potentiometers



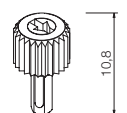
9059



9063



9064



9067

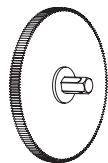
## Thumbwheels

• **CA9.** Thumbwheels are available in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special requests for thumbwheels.

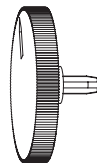
• **CE9.** Thumbwheels in accordance with UL 94 V-0 are available in different colors. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special requests for thumbwheels.



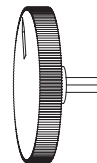
**9002**



**9041**



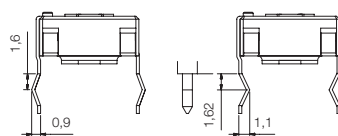
**9060**  
For R rotor



**9061**

## Terminals

By default, terminals are always straight for the 9mm size, as shown on the “models” menu. ACP can provide crimped terminals (with “snap in”), to better hold the component to the board prior to soldering.

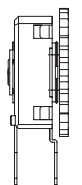


**SNP**

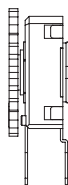
**SNJ**

## Adjustment possibilities

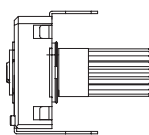
ACP's potentiometers can be adjusted through either the front side (WT) or the collector side (WTI):



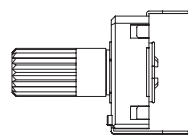
**WTI**  
Collector side



**WT**  
Front side



**WTI**  
Collector side



**WT**  
Front side

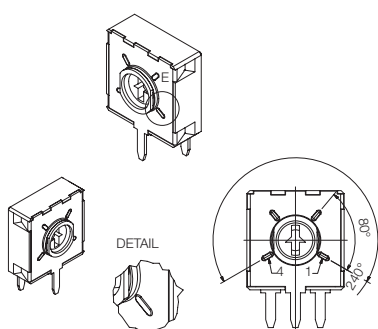
## Potentiometers with detents

ACP's “detent” feature (DT) is specially suitable for control applications. Our patented design has improved the features of these potentiometers:

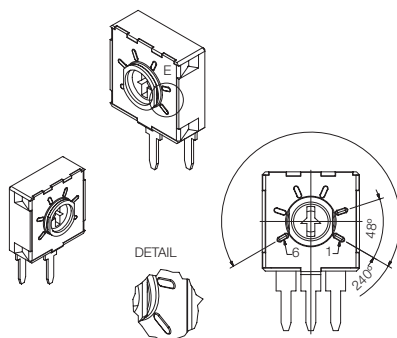
- Longer mechanical life: up to 10.000 cycles.
- More stable electrical parameters.
- Improved reliability and Contact Resistance Variation (CRV).
- Narrower tolerances for detent positioning.

Detents can be lighter or stronger, or even a combination of both feelings. Detents 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, different slopes, etc.

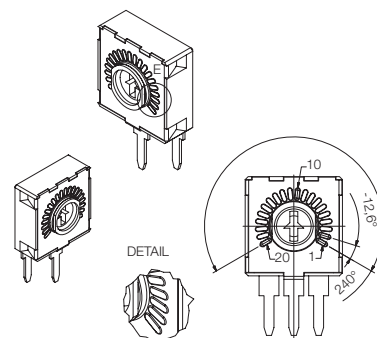
Examples: 4, 6 and 20 detents –evenly distributed–.



**4DT**



**6DT**



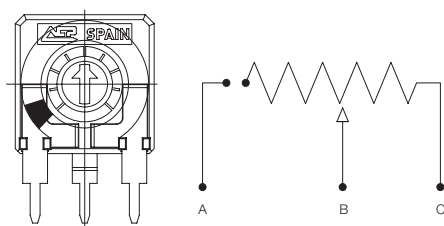
**20DT**

## Potentiometers with cut track

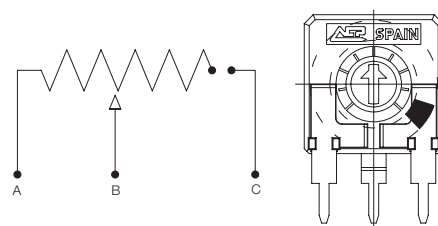
The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.

With cut at the beginning of the track CCW: Off-On.

With cut at the end of track CW: On-Off. Other positions available on request.



CCW: Off-On

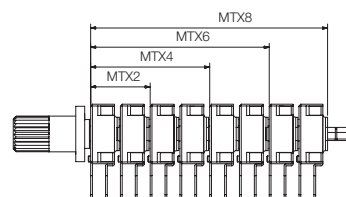
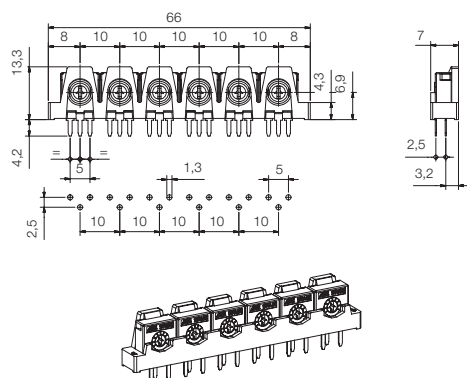


CW: On-Off

## Assemblies of several potentiometers

**STACKING:** Set of 6 potentiometers in a plastic cover. It is used to speed up assembly and soldering process.

**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).



## Packaging

Bulk packaging: Potentiometers are first bagged and then introduced in boxes:

| Potentiometer model                                             | + Shaft or thumbwheel inserted                                                                                                     | Pieces per box (130 x 60 x 90) |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| H2,5 - H3,8 - H5 - HS3,8 - V7,5 - V10 - VR10<br>MAV10* - MTV10* | - (only potentiometers)                                                                                                            | 500 (models with * : 450)      |
|                                                                 | 9002                                                                                                                               | 250                            |
| MTX2                                                            | 9004, 9005, 9006, 9009, 9010, 9018, 9039, 9041,<br>9047, 9048, 9051, 9056, 9059, 9053, 9054, 9055,<br>9060, 9061, 9063, 9064, 9067 | 200                            |
|                                                                 | 9048                                                                                                                               | 150                            |
| MTX4                                                            | 9039, 9051                                                                                                                         | 75                             |
| MTX6                                                            | 9018                                                                                                                               | 50                             |
| MTX8                                                            | 9056                                                                                                                               | 40                             |
| STACKING                                                        | -                                                                                                                                  | 50                             |

Tape and reel (T&R) packaging will be available for SMD configurations, on request.



## CA9. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                           |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                     |
| Tolerance<br>Special tolerances available on request             | $100\Omega \dots 1M\Omega \pm 20\%$<br>$>1M\Omega \dots 5M\Omega \pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A), Log (B), Antilog (C)<br>Other tapers available on request                                                        |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                      |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                            |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                            |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>Non Lin (B, C) | 0,15W<br>0,10W                                                                                                            |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 200VDC<br>150VDC                                                                                                          |
| Operating temperature                                            | -25°C ... +70°C                                                                                                           |
| Temperature coefficient                                          | $100\Omega - 10K\Omega \rightarrow +200/-300$ ppm.<br>$>10K\Omega - 5M\Omega \rightarrow +200/-500$ ppm                   |



## CA9. Mechanical Specifications

|                                |                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------|
| Resistive element              | Carbon technology                                                                       |
| Angle of rotation (mechanical) | $240^\circ \pm 5^\circ$                                                                 |
| Wiper position                 | Middle position: $50\% \pm 15^\circ$                                                    |
| Angle of rotation (electrical) | $220^\circ \pm 20^\circ$                                                                |
| Max. stop torque               | 5 Ncm                                                                                   |
| Max. push/pull on rotor        | 40 N                                                                                    |
| Wiper torque                   | $< 2$ Ncm<br>(0,4 ... 3,5Ncm for pots. with detents)                                    |
| Mechanical life                | 1000 cycles (more available on request)<br>(up to 10.000 cycles for pots. with detents) |



## CA9. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%                             |
| Thermal cycles // 16h at 85°C, plus 2h at -25°C // $\pm 2,5\%$                 |
| Load life // 1.000 h. at 40°C // +0%; -5%                                      |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 3\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 3\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |

All specifications are given at 23°C  $\pm$  2°C and 50%  $\pm$  25% RH.



## CE9. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                           |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                     |
| Tolerance<br>Special tolerances available on request             | $100\Omega \dots 1M\Omega \pm 20\%$<br>$>1M\Omega \dots 5M\Omega \pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A)<br>Log (B), Antilog (C) and other<br>tapers available on request                                                  |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                      |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                            |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                            |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>Non Lin (B, C) | 0,5W<br><i>See note 1</i>                                                                                                 |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 200VDC<br><i>See note 1</i>                                                                                               |
| Operating temperature                                            | -40°C ... +125°C                                                                                                          |
| Temperature coefficient                                          | $\pm 100$ ppm.                                                                                                            |

Note 1: Value depends on taper, please, inquire.



## CE9. Mechanical Specifications

|                                |                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------|
| Resistive element              | Cermet technology                                                                       |
| Angle of rotation (mechanical) | $240^\circ \pm 5^\circ$                                                                 |
| Wiper position                 | Middle position: $50\% \pm 15^\circ$                                                    |
| Angle of rotation (electrical) | $220^\circ \pm 20^\circ$                                                                |
| Max. stop torque               | 5 Ncm                                                                                   |
| Max. push/pull on rotor        | 40 N                                                                                    |
| Wiper torque                   | $< 2$ Ncm<br>(0,4 ... 3,5Ncm for pots. with detents)                                    |
| Mechanical life                | 1000 cycles (more available on request)<br>(up to 10.000 cycles for pots. with detents) |



## CE9. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // $\pm 2\%$                            |
| Thermal cycles // 16h at 90°C, plus 2h at -40°C // $\pm 2\%$                   |
| Load life // 1.000 h. at 70°C // $\pm 2\%$                                     |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 2\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 3\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |

- **EXAMPLE: CA9MH2,5-10KA2020 SNP PI WT9005-BA-V0**
- **EXAMPLE: CE9MH2,5-10KA2020 SNP PI WT9005-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    |       | 17    |
| CA9/CE9           | M     | H2,5  |       | -10K      | A     | 2020 |      |                |         | SNP     |         |       | PI    |     | WT                  | 9005  | -BA   | -V0   |

| Standard configuration |                                                                                                                                                                |  |  |  |  |  |  | Customized products                                                                                              |  |  |  |  |  |  |  |  |  |  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|
| Dimensions:            | 9mm                                                                                                                                                            |  |  |  |  |  |  | A drawing is requested to order a customized product. The code assigned will include all special specifications. |  |  |  |  |  |  |  |  |  |  |
| Protection:            | <ul style="list-style-type: none"><li>• <b>CA9:</b> IP 5 (dust-proof)</li><li>• <b>CE9:</b> IP-5 (dust-proof) Self-extinguishable, to meet UL 94 V-0</li></ul> |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Substrate:             | <ul style="list-style-type: none"><li>• <b>CA9:</b> Carbon technology</li><li>• <b>CE9:</b> Cermet</li></ul>                                                   |  |  |  |  |  |  | Series, rotor, model and total resistive value are given before the special code: CA9PH2,5 10K CODE C00111.      |  |  |  |  |  |  |  |  |  |  |
| Color:                 | <ul style="list-style-type: none"><li>• <b>CA9:</b> Blue housing with white rotor</li><li>• <b>CE9:</b> Brown housing with white rotor</li></ul>               |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Packaging:             | Bulk                                                                                                                                                           |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Wiper position:        | at 50% ±15°                                                                                                                                                    |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Terminals:             | Straight, without SNAP IN                                                                                                                                      |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Marking:               | Resistive value marked on housing. Others on request                                                                                                           |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |

## 1 - Series

- CA9
- CE9

## 3 - Model and pitch

|      |      |       |       |      |
|------|------|-------|-------|------|
| H2,5 | H3,8 | H5    | HS3,8 | V7,5 |
| V10  | VR10 | MAV10 | MTV10 |      |

HSMD and VSMD models can be available on request.

## 5 - Resistance value

| Taper:   | Lin (A)                               | Log (B), Antilog (C)                  |
|----------|---------------------------------------|---------------------------------------|
| Value Rn | 100 Ω / 100<br>... / ...<br>5 MΩ / 5M | 1KΩ / 1K<br>... / ...<br>2,2 MΩ / 2M2 |

Other resistive values available on request.

## 7 - Tolerance

|                                                     |      |
|-----------------------------------------------------|------|
| 100 Ω ≤ Rn ≤ 1MΩ: ±20%                              | 2020 |
| 1 MΩ ≤ Rn ≤ 5MΩ: ±30%                               | 3030 |
| For out of range values: Rn > 5MΩ, tol : +50% - 30% | 5030 |

Special tolerances available: <5% ... 10%, etc.

## 9 - Cut track

|                                      |     |
|--------------------------------------|-----|
| At beginning of track, CCW: Off - On | PCI |
| At end of track, CW: On - Off        | PCF |

## 11 - Crimped terminals (SNAP IN)

|           |     |
|-----------|-----|
| SNAP IN P | SNP |
| SNAP IN J | SNJ |

## 2 - Rotors

|              |    |   |   |   |   |    |    |   |
|--------------|----|---|---|---|---|----|----|---|
| P (standard) | PA | R | Y | D | M | MA | MT | J |
|--------------|----|---|---|---|---|----|----|---|

## 4 - Packaging

|                     | Through-hole              | SMD models |
|---------------------|---------------------------|------------|
| Bulk                | (blank)... <sup>(1)</sup> | On request |
| T&R (Tape and reel) | (N.A.) <sup>(2)</sup>     | On request |

(1) If blank, bulk packaging is implied.

(2) N.A. - Not Available: Tape and Reel packaging is only available for SMD terminals.

## 6 - Resistance law / taper

|                                       |                       |
|---------------------------------------|-----------------------|
| Lin - Linear                          | A                     |
| Log - Logarithmic                     | B (on request for CE) |
| Antilog - Antilogarithmic             | C (on request for CE) |
| - Special tapers have codes assigned: | CODE YXXXXX           |

Please, indicate terminal position when ordering a special taper.

## 8 - Operating life (cycles)

|                                                                                |                |
|--------------------------------------------------------------------------------|----------------|
| Standard (1000cycles)                                                          | (leave blank)  |
| Long life: LV + the number of cycles. ex: LV10 for 10000 cycles <sup>(1)</sup> | LVXX: ex: LV10 |

(1) Others on request.

## 10 - Detents (DT)

|                                  |           |
|----------------------------------|-----------|
| One detent at the beginning: CCW | DTI       |
| One detent at the end: CW        | DTF       |
| X number of detents. Ex., 10     | XDT: 10DT |

Detents readily available: 3, 4, 6, 7, 9, 10, up to 20 –evenly distributed along 240°±5°. Others on request.

## 12 - Housing color

- **CA9:** standard is blue

- **CE9:** standard is brown

With other colors -see color chart below-, for example, red CJ-color, ex: CJ-RO

### 13 - Rotor color

|                                                             |                     |
|-------------------------------------------------------------|---------------------|
| Standard is white                                           |                     |
| With other colors -see color chart below-, for example, red | RT-color; ex: RT-RO |

### 15 - Linearity

|                                                                    |                |
|--------------------------------------------------------------------|----------------|
| Independent linearity controlled & below x%, for example, 3%: LN3% | LNx%; ex: LN3% |
| Absolute linearity controlled & below x%                           | LAx%           |

### 17 - Flammability (according to UL 94 V-0)

|                                                                                                                                                                                   |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| • <b>CA9:</b> Not self-extinguishable                                                                                                                                             | (leave blank) |
| Self-extinguishable according to standard UL 94 (including all plastic parts of the potentiometer: rotor, housing and accessory. If only one part needs to be V0, please, inform) | -V0           |
| • <b>CE9:</b> All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94                                         | -V0           |

### For ordering spare accessories

Accessory reference - color- flammability. Ex. 9005-AZ-V0 is a blue self-extinguishable 9005 thumbwheel

XXXX-YY-\_\_

### For ordering special sets of potentiometers

|          |                                                                                       |                                                          |
|----------|---------------------------------------------------------------------------------------|----------------------------------------------------------|
| STACKING | STK + ... (POTENTIOMETER CODE)                                                        | Example: STK+CA9MH2,5-10KA2020 <sup>(1)</sup>            |
| GANGED   | MTX + (number of potentiometers: 2, 4, 6, 8) + ... (POT. CODE + ASSEMBLED SHAFT CODE) | Example: MTX4+CA9PH2,5-10KA2020 WT9051-BA <sup>(1)</sup> |

(1) Note: If not all potentiometers in the set are identical, please, order potentiometers separately and indicate assembly order.

### Color chart for rotor, housing and accessories

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

(1) Black is not an option for housings.

### 14 - Wiper

|                                                   |               |
|---------------------------------------------------|---------------|
| <b>Wiper position</b> (Standard is at 50% ± 15°)  | (leave blank) |
| Initial or CCW                                    | PI            |
| Final or CW                                       | PF            |
| Others: following clock positions; at 3hours: P3H | PXH, ex: P3H  |
| <b>Wiper torque</b> (Standard: <2 Ncm)            | (leave blank) |
| Low torque (< 1.5Ncm)                             | PGB           |

### 16 - Potentiometers with assembled accessories

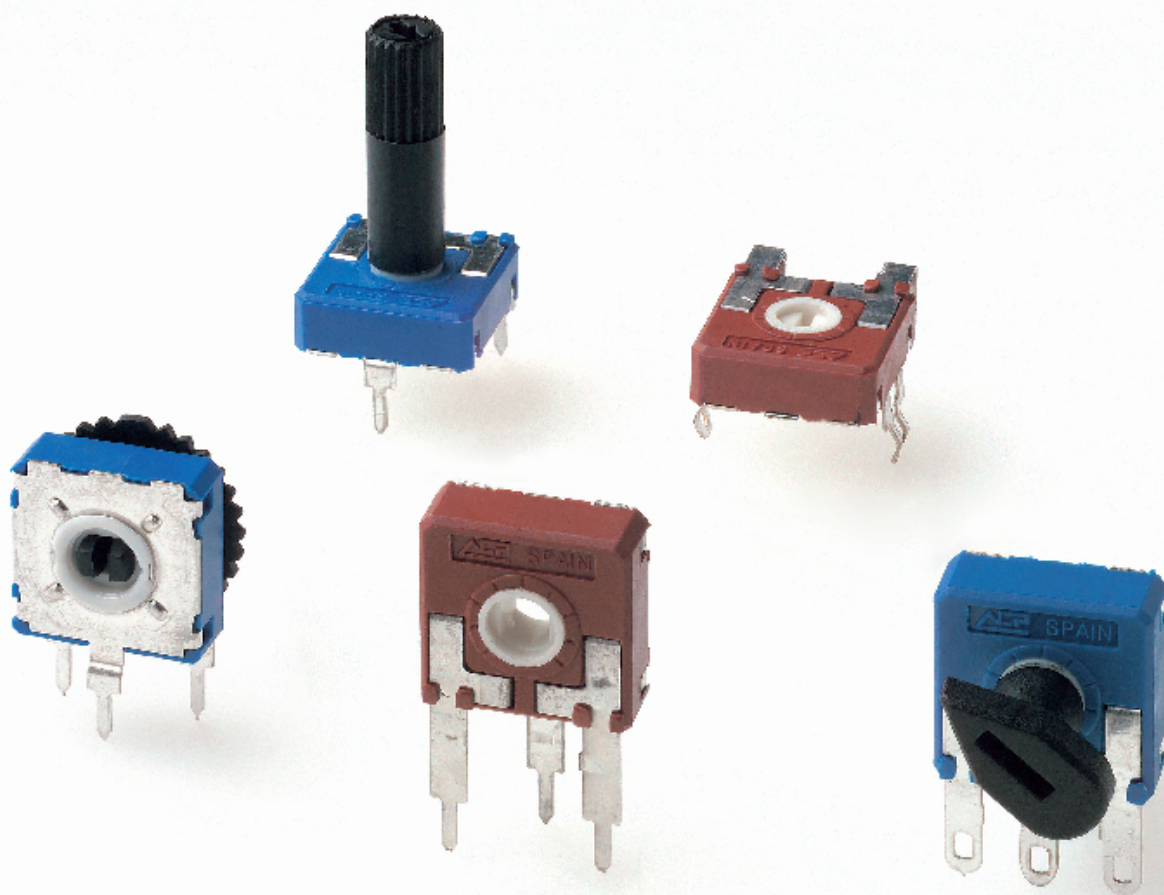
|                                                                     |                           |
|---------------------------------------------------------------------|---------------------------|
| Assembled from front side                                           | WT                        |
| Assembled from collector side                                       | WTI                       |
| Accessory Reference<br>See list of shafts and thumbwheels available | XXXX<br>Example: 9005     |
| Color of shaft or thumbwheel                                        | -YY<br>Example, white: BA |

Specifications on this catalogue are for reference only; they are subject to change without notice.

# CA14 CE14

Carbon  
Potentiometers  
CA

Cermet  
Potentiometers  
CE



## CA14

14mm carbon potentiometers with plastic housing and protection type IP 5 (dust-proof).

Standard tapers available include linear, log and antilog. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

Our 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%).
- Housing and rotor color.
- Mechanical life.
- Pause effect (up to 38 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

### Applications

- Electronic appliances: white goods, brown goods, small household appliances
- Heating and air conditioning equipment and thermostats.
- Automotive: dimmers, climate controls, lighting regulation (position adjustment and sensing).
- Measurement and test equipment.

## CE14

14mm cermet potentiometers with plastic housing and protection type IP 5 (dust-proof). Self-extinguishable according to UL 94 V-0.

Standard taper is linear. Log, Antilog and other tapers are available on request. Laser trimming equipment in-house, allowing for very low tolerances.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

Our 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.
- Pause effect (up to 38 detents available).

### Applications

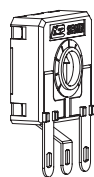
- Electronic appliances: white goods, brown goods, small household appliances, boilers, water heaters, etc.
- Heating and air conditioning equipment and thermostats.
- Automotive: dimmers, climate controls, position sensors.
- Industrial electronic: multimeters, oscilloscopes, test equipment, time relay.

## Models

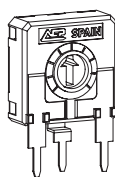
All models shown here have the standard rotor for the 14mm series, the arrow (P). Models can be manufactured with any rotor listed on the rotor menu. The color of the housing or rotor can also be modified. SMD configuration can be available on request.



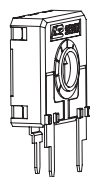
CA14 H0  
CE14 H0



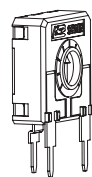
CA14 HC0  
CE14 HC0



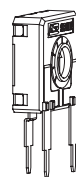
CA14 H2,5  
CE14 H2,5



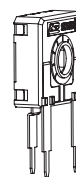
CA14 H4  
CE14 H4



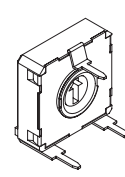
CA14 H5  
CE14 H5



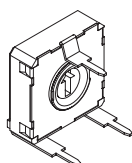
CA14 HA5  
CE14 HA5



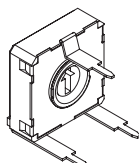
CA14 HL5  
CE14 HL5



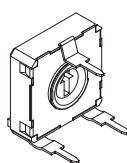
CA14 V12,5  
CE14 V12,5



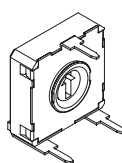
CA14 VA12,5  
CE14 VA12,5



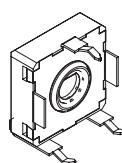
CA14 VL12,5  
CE14 VL12,5



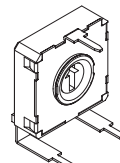
CA14 VR12,5  
CE14 VR12,5



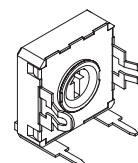
CA14 V15  
CE14 V15



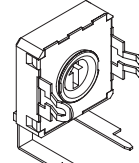
CA14 V15...CFF  
CE14 V15...CFF



CA14 V17,5  
CE14 V17,5



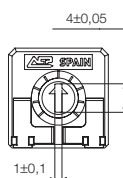
CA14 VD7,5  
CE14 VD7,5



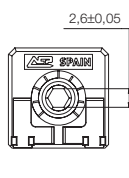
CA14 VD11  
CE14 VD11

## Rotors

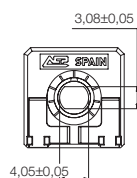
The rotor by default is the arrow (P). Accessories are designed for the N, Z and T rotors, unless otherwise stated.



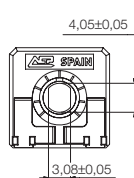
P



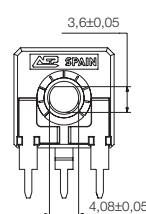
M



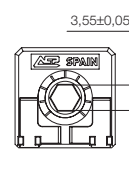
N



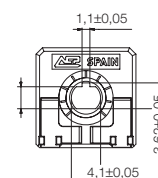
Z



D



E

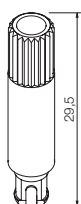


T

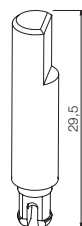
## Shafts

• **CA14.** Shafts are available in different colors. They can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.

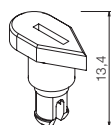
• **CE14.** Shafts provided in accordance with UL 94 V-0 are available in different colors. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.



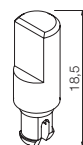
14008



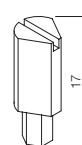
14015



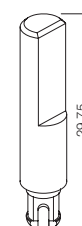
14042



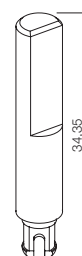
14056



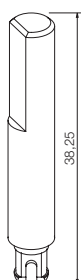
14065  
For the M rotor



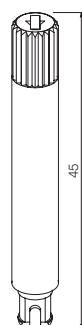
14066



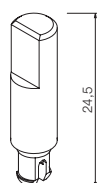
14067



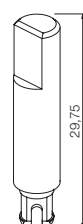
14072



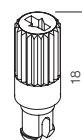
14073



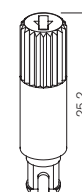
14081



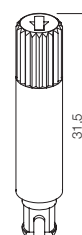
14084



14117



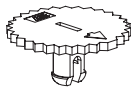
14187



14250

Thumbwheels

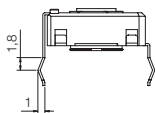
- **CA14.** This thumbwheel is available in different colors. It can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special requests for thumbwheels.
- **CE14.** This thumbwheel in accordance with UL 94 V-0 is available in different colors. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special requests for thumbwheels.



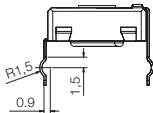
14003

Terminals

By default, terminals are always straight for the 14mm size, as shown on the “models” menu. ACP can provide crimped terminals (with “snap in”), to better hold the component to the board prior to soldering.



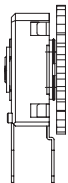
SNP



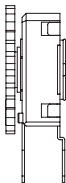
SNR

Adjustment possibilities

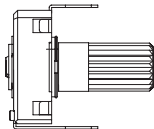
ACP’s potentiometers can be adjusted through either the front side (WT) or the collector side (WTI):



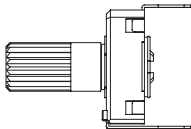
WTI  
Collector side



WT  
Front side



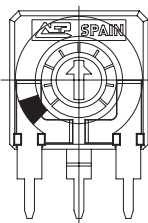
WTI  
Collector side



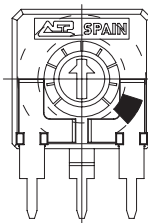
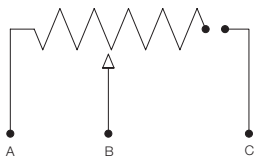
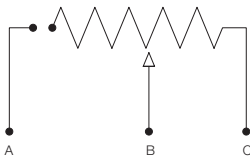
WT  
Front side

Potentiometers with cut track

The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.  
With cut at the beginning of the track CCW: Off-On.  
With cut at the end of track- CW: On-Off. Others position available on request.



CCW: Off-On



CW: On-Off

Packaging

Bulk packaging: Potentiometers are first bagged and then introduced in boxes:

| Potentiometer model                            | + Shaft or thumbwheel inserted                                                       | Pieces per box (130 x 60 x 90) |
|------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------|
| H2,5 - H4 - H5 - HA5 - HL5 - HC0 - H0          | - (only potentiometers)                                                              | 200 (models with * : 150)      |
| V12,5 - VA12,5 - VL12,5 - V15 - V17,5* - VD11* | 14003, 14117, 14042                                                                  | 100                            |
| VD7,5 - VR12,5                                 | 14008, 14015, 14250, 14187, 14056, 14065<br>14066, 14067, 14072, 14073, 14081, 14084 | 75                             |

Tape and reel (T&R) packaging will be available for SMD configurations, on request.

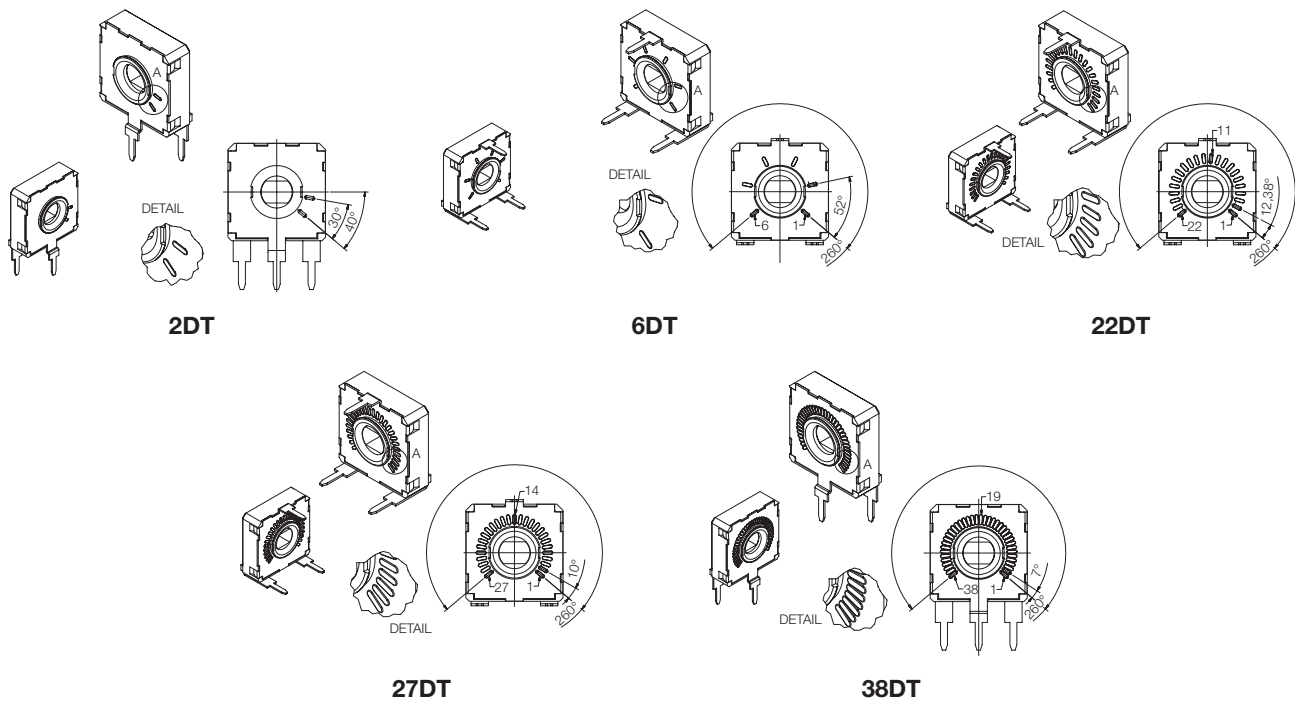
## Potentiometers with detents

ACP's "detent" (DT) feature is specially suitable for control applications. Our patented design has improved the performance of these potentiometers:

- Longer mechanical life: 10.000 cycles.
- More stable electrical parameters.
- Improved reliability and Contact Resistance Variation (CRV).
- Narrower tolerances for detent positioning.

Detents can be lighter or stronger, or even a combination of both feelings. They can also be evenly distributed along the angle (standard) or tailored to match customers' request. They can also be combined with special tapers: constant value areas, different slopes, etc.

Examples:





## CA14. Electric Specifications

These are standard features; other specifications can be studied on request.

|                                                                 |                                                                             |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)    | 100Ω ≤ Rn ≤ 5MΩ<br>1 KΩ ... 2,2 MΩ                                          |
| Tolerance<br>Special tolerances available on request            | 100Ω ... 1MΩ ±20%<br>>1MΩ ... 5MΩ ±30%<br>Out of range: Rn> 5MΩ: +50%, -30% |
| Variation laws                                                  | Lin (A), Log (B), Antilog (C)<br>Other tapers available on request          |
| Residual resistance                                             | Lin (A), Log (B), Antilog (C) ≤ 5*10 <sup>-3</sup> *Rn<br>Minimum value 2Ω  |
| CRV - Contact Resistance Variation (dynamic)                    | ≤3%Rn                                                                       |
| CRV - Contact Resistance Variation (static)                     | ≤5%Rn                                                                       |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>No Lin (B, C) | 0,25W<br>0,13W                                                              |
| Maximum voltage at 40°C<br>Lin (A)<br>No Lin (B, C)             | 250VDC<br>200VDC                                                            |
| Operating temperature                                           | -25°C ... +70°C                                                             |
| Temperature coefficient                                         | 100Ω - 10KΩ → +200/ -300 ppm.<br>>10KΩ - 5MΩ → +200/ -500 ppm               |



## CA14. Mechanical Specifications

|                                |                                                                                   |
|--------------------------------|-----------------------------------------------------------------------------------|
| Resistive element              | Carbon technology                                                                 |
| Angle of rotation (mechanical) | 265° ± 5°                                                                         |
| Wiper position                 | Middle position: 50% ± 15°                                                        |
| Angle of rotation (electrical) | 245° ± 20°                                                                        |
| Max. stop torque               | 10 Ncm                                                                            |
| Max. push/pull on rotor        | 50 N                                                                              |
| Wiper torque                   | < 2,5 Ncm<br>(0,5 ... 3,5Ncm for pots. with detents)                              |
| Mechanical life                | 1000 cycles (more available on request)<br>(10.000 cycles for pots. with detents) |



## CA14. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                               |
|-------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%                            |
| Thermal cycles // 16h at 85°C, plus 2h at -25°C // ±2,5%                      |
| Load life // 1.000 h. at 40°C // +0%; -5%                                     |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C ± 2°C // ±3%          |
| Soldering effect // 2 seconds at 350°C // ±1%                                 |
| Storage (3 years) // at 23°C ± 2°C // ±3%                                     |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11. |



## CE14. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                             |
|------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) and Antilog(C)  | 100Ω ≤ Rn ≤ 5MΩ<br>1KΩ ... 2,2MΩ                                            |
| Tolerance<br>Special tolerances available on request             | 100Ω ... 1MΩ ±20%<br>>1MΩ ... 5MΩ ±30%<br>Out of range: Rn> 5MΩ: +50%, -30% |
| Variation laws                                                   | Lin (A)<br>Log (B), Antilog (C) and other<br>tapers available on request    |
| Residual resistance                                              | Lin (A) ≤ 2Ω                                                                |
| CRV - Contact Resistance Variation (dynamic)                     | ≤3%Rn                                                                       |
| CRV - Contact Resistance Variation (static)                      | ≤5%Rn                                                                       |
| Maximum power dissipation at 70° C.<br>Lin (A)<br>Non Lin (B, C) | 0,7W<br><i>See note 1</i>                                                   |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 250VDC<br><i>See note 1</i>                                                 |
| Operating temperature                                            | -40°C ... +125°C                                                            |
| Temperature coefficient                                          | ±100ppm.                                                                    |

Note 1: Value depends on taper, please, inquire.



## CE14. Mechanical Specifications

|                                |                                                                                   |
|--------------------------------|-----------------------------------------------------------------------------------|
| Resistive element              | Cermet                                                                            |
| Angle of rotation (mechanical) | 265° ± 5°                                                                         |
| Wiper position                 | Middle position: 50% ± 15°                                                        |
| Angle of rotation (electrical) | 245° ± 20°                                                                        |
| Max. stop torque               | 10 Ncm                                                                            |
| Max. push/pull on rotor        | 50 N                                                                              |
| Wiper torque                   | < 2,5 Ncm<br>(0,5 ... 3,5Ncm for pots. with detents)                              |
| Mechanical life                | 1000 cycles (more available on request)<br>(10.000 cycles for pots. with detents) |



## CE14. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                               |
|-------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // ±2%                                 |
| Thermal cycles // 16h at 90°C, plus 2h at -40°C // ±2%                        |
| Load life // 1.000 h. at 70°C // ±2%                                          |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C ± 2°C // ±2%          |
| Soldering effect // 2 seconds at 350°C // ±1%                                 |
| Storage (3 years) // at 23°C ± 2°C // ±1%                                     |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11. |

# CA14 CE14 HOW TO ORDER

- **EXAMPLE: CA14NH2,5-10KA2020 10DT SNP PI WT14117-BA**
- **EXAMPLE: CE14NH2,5-10KA2020 10DT SNP PI WT14117-BAV0**

| 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    |       | 17    |
| CA14/CE14         | N     | H2,5  |       | -10K      | A     | 2020 |      | 10DT           | SNP     |         |         |       | PI    |     |  | WT                  | 14117 | -BA   | -V0   |

| Standard configuration |                                                                                                                                                                      | Customized products                                                                                              |  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--|
| Dimensions:            | 14mm                                                                                                                                                                 | A drawing is requested to order a customized product. The code assigned will include all special specifications. |  |
| Protection:            | <ul style="list-style-type: none"> <li>• <b>CA14:</b> IP 5 (dust-proof)</li> <li>• <b>CE14:</b> IP 5 (dust-proof). Self-extinguishable, to meet UL 94 V-0</li> </ul> | Series, rotor, model and total resistive value are given before the special code: CA14PH2,5 10K CODE C00111.     |  |
| Substrate:             | <ul style="list-style-type: none"> <li>• <b>CA14:</b> Carbon technology</li> <li>• <b>CE14:</b> Cermet</li> </ul>                                                    |                                                                                                                  |  |
| Color:                 | <ul style="list-style-type: none"> <li>• <b>CA14:</b> Blue housing with white rotor</li> <li>• <b>CE14:</b> Brown housing with white rotor</li> </ul>                |                                                                                                                  |  |
| Packaging:             | Bulk                                                                                                                                                                 |                                                                                                                  |  |
| Wiper position:        | at 50% ±15°                                                                                                                                                          |                                                                                                                  |  |
| Terminals:             | Straight, without SNAP IN.                                                                                                                                           |                                                                                                                  |  |
| Marking:               | Resistive value marked on housing. Others on request                                                                                                                 |                                                                                                                  |  |

## 1 - Series

- CA14
- CE14

## 3 - Model and pitch

| H0     | HC0    | H2,5   | H4   | H5    | HA5 | HL5   | V12,5     |
|--------|--------|--------|------|-------|-----|-------|-----------|
| VA12,5 | VL12,5 | VR12,5 | VD11 | VD7,5 | V15 | V17,5 | V15...OFF |

HSMD and VSMD models can be available on request.

## 5 - Resistance value

| Taper:   | Lin (A)                               | Log (B), Antilog (C)                  |
|----------|---------------------------------------|---------------------------------------|
| Value Rn | 100 Ω / 100<br>... / ...<br>5 MΩ / 5M | 1KΩ / 1K<br>... / ...<br>2,2 MΩ / 2M2 |

Other resistive values available on request.

## 7 - Tolerance

|                                                     |      |
|-----------------------------------------------------|------|
| 100 Ω ≤ Rn ≤ 1MΩ: ±20%                              | 2020 |
| 1 MΩ ≤ Rn ≤ 5MΩ: ±30%                               | 3030 |
| For out of range values: Rn > 5MΩ, tol : +50% - 30% | 5030 |

Special tolerances available: <5% ... 10%, etc.

## 9 - Cut track

|                                      |     |
|--------------------------------------|-----|
| At beginning of track, CCW: Off - On | PCI |
| At end of track, CW: On - Off        | PCF |

## 11 - Crimped terminals (SNAP IN)

|           |     |
|-----------|-----|
| SNAP IN P | SNP |
| SNAP IN R | SNR |

## 2 - Rotors

| P (standard) | M | N | Z | D | E | T | F |
|--------------|---|---|---|---|---|---|---|
|--------------|---|---|---|---|---|---|---|

## 4 - Packaging

|                     | Through-hole              | SMD models |
|---------------------|---------------------------|------------|
| Bulk                | (blank)... <sup>(1)</sup> | On request |
| T&R (Tape and reel) | (N.A.) <sup>(2)</sup>     | On request |

(1) If blank, bulk packaging is implied.

(2) N.A. - Not Available: Tape and Reel packaging is only available for SMD terminals.

## 6 - Resistance law / taper

|                                       |                       |
|---------------------------------------|-----------------------|
| Lin - Linear                          | A                     |
| Log - Logarithmic                     | B (on request for CE) |
| Antilog - Antilogarithmic             | C (on request for CE) |
| - Special tapers have codes assigned: | CODE YXXXXX           |

Please, indicate terminal position when ordering a special taper.

## 8 - Operating life (cycles)

|                                                                                |                |
|--------------------------------------------------------------------------------|----------------|
| Standard (1000cycles)                                                          | -(leave blank) |
| Long life: LV + the number of cycles. ex: LV10 for 10000 cycles <sup>(1)</sup> | LVXX: ex: LV10 |

(1) Others on request.

## 10 - Detents (DT)

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

Detents readily available: 1, 2, 3, 4, 5, 6, 8, 9, 17, 22, 27, up to 38 -evenly distributed along 260°±3°.

Others on request.

## 12 - Housing color

- **CA14:** standard is blue
- **CE14:** standard is brown

With other colors -See color chart below-, for example, red CJ-color, ex.: CJ-RO

13 - Rotor color

|                                                           |                           |
|-----------------------------------------------------------|---------------------------|
| Standard: white. With other colors: see color chart below | RT-color; ex., red: RT-RO |
|-----------------------------------------------------------|---------------------------|

15 - Linearity

|                                                                    |                |
|--------------------------------------------------------------------|----------------|
| Independent linearity controlled & below x%, for example, 3%: LN3% | LNx%; ex: LN3% |
| Absolute linearity controlled & below x%                           | LAx%           |

17 - Flammability (according to UL 94 V-0)

|                                                                                                                                                                                   |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| • CA14: Not self-extinguishable                                                                                                                                                   | (leave blank) |
| Self-extinguishable according to standard UL 94 (including all plastic parts of the potentiometer: rotor, housing and accessory. If only one part needs to be V0, please, inform) | -V0           |
| • CE14: All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94                                               | -V0           |

For ordering spare accessories

|                                                                                                           |            |
|-----------------------------------------------------------------------------------------------------------|------------|
| Accessory reference - color- flammability. Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumbwheel | XXXX-YY-__ |
|-----------------------------------------------------------------------------------------------------------|------------|

Color chart for rotor, housing and accessories

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

(1) Black is not an option for housings.

14 - Wiper

|                                                   |               |
|---------------------------------------------------|---------------|
| Wiper position (Standard: 50% ± 15°)              | (leave blank) |
| Initial or CCW                                    | PI            |
| Final or CW                                       | PF            |
| Others: following clock positions; at 3hours: P3H | PXH, ex: P3H  |
| Wiper torque (Standard: <2,5Ncm)                  | (leave blank) |
| Low torque (< 1.5Ncm)                             | PGB           |

16 - Potentiometers with assembled accessories

|                                                                     |                           |
|---------------------------------------------------------------------|---------------------------|
| Assembled from terminal side                                        | WT                        |
| Assembled from collector side                                       | WTI                       |
| Accessory Reference<br>See list of shafts and thumbwheels available | XXXXX<br>Example: 14117   |
| Color of shaft or thumbwheel                                        | -YY<br>Example, white: BA |

 **MCA9**  
**Control**  
**Carbon**  
**Potentiometers**  
**CA**

 **MCE9**  
**Control**  
**Cermet**  
**Potentiometers**  
**CE**





9mm carbon control potentiometers with low cost plastic enclosure and shaft and protection type IP 5 (dust-proof).

Standard tapers available include linear, log and antilog. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Our 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.
- Pause effect (up to 20 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

#### Applications

- Electronic appliances: white and brown goods, small household appliances.
- Measurement and test equipment. Timers and relays.
- Lighting regulation.



9mm cermet control potentiometers with low cost plastic enclosure and shaft and protection type IP 5 (dust-proof). Self-extinguishable plastic parts according to UL 94 V-0.

Standard taper is linear. Log, Antilog and other tapers are available on request. Laser trimming equipment in-house, allowing for very low tolerances.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Our potentiometers can be manufactured in a wide range of possibilities regarding:

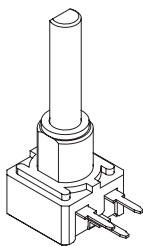
- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Pause effect (up to 20 detents available).

#### Applications

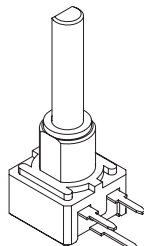
- Electronic appliances: white and brown goods, small household appliances.
- Measurement and test equipment. Timers and relays.

## Models

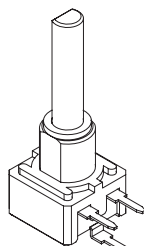
The color of the housing or rotor can be modified. SMD configuration can be available on request.



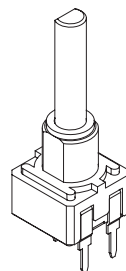
**MCA9 H2,5  
MCE9 H2,5**



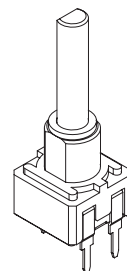
**MCA9 H3,8  
MCE9 H3,8**



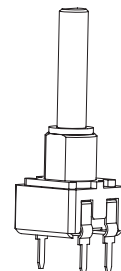
**MCA9 H5  
MCE9 H5**



**MCA9 V7,5  
MCE9 V7,5**



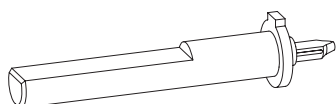
**MCA9 V10  
MCE9 V10**



**MCA9 VR10  
MCE9 VR10**

## Shafts

Shafts are black by default. Other colors are available. ACP can also study special shafts. D dimension specified on drawings (end of catalogue).



**9006**



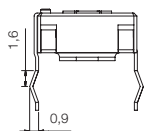
**9019**

| Shafts | D (±0,5 mm) |
|--------|-------------|
| 9006   | 23,3        |
| 9019   | 17,2        |

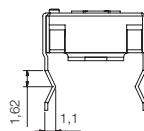
## Terminals

By default, terminals are always straight for the 9mm size, as shown on the “models” menu.

ACP can provide crimped terminals (with “snap in”), to better hold the component to the board prior to soldering.



**SNP**



**SNJ**

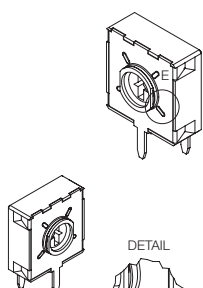
## Potentiometers with detents

ACP’s “detent” feature (DT) is specially suitable for control applications. Our patented design has improved the features of these potentiometers:

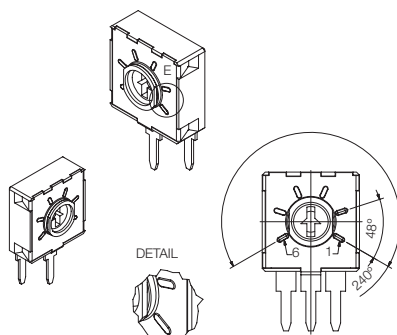
- Longer mechanical life: >10.000cycles.
- More stable electrical parameters.
- Improved reliability and Contact Resistance Variation (CRV).
- Narrower tolerances for detent positioning.

Detents can be lighter or stronger, or even a combination of both feelings. Detents 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, different slopes, etc.

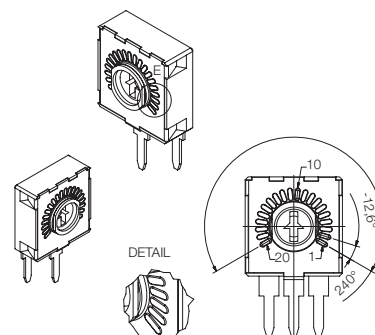
Examples: 4, 6 and 20 detents –evenly distributed–.



**4DT**



**6DT**



**20DT**

## Adjustment possibilities

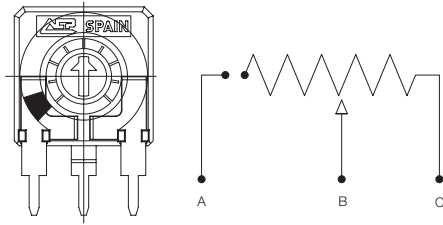
Should the shaft need to be positioned differently than shown on the “models” section, please, enclose a drawing.

## Potentiometers with cut track

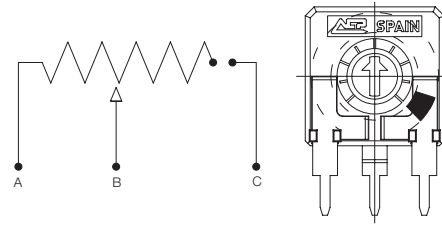
The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.

With cut at the beginning of the track CCW: Off-On.

With cut at the end of track- CW: On-Off. Others position available on request.



**CCW: Off-On**



**CW: On-Off**



## MCA9. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                             |
| Tolerance<br>Special tolerances available on request             | 100 $\Omega$ ... 1M $\Omega$ $\pm 20\%$<br>>1M $\Omega$ ... 5M $\Omega$ $\pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A), Log (B), Antilog (C)<br>Other tapers available on request                                                                |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                              |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                                    |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                                    |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>Non Lin (B, C) | 0,15W<br>0,10W                                                                                                                    |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 200VDC<br>150VDC                                                                                                                  |
| Operating temperature                                            | -25°C ... +70°C                                                                                                                   |
| Temperature coefficient                                          | 100 $\Omega$ - 10K $\Omega$ $\rightarrow$ +200/ -300 ppm.<br>>10K $\Omega$ - 5M $\Omega$ $\rightarrow$ +200/ -500 ppm             |



## MCA9. Mechanical Specifications

|                                |                                                    |
|--------------------------------|----------------------------------------------------|
| Resistive element              | Carbon technology                                  |
| Angle of rotation (mechanical) | 240° $\pm$ 5°                                      |
| Wiper position                 | Middle position: 50% $\pm$ 15°                     |
| Angle of rotation (electrical) | 220° $\pm$ 20°                                     |
| Wiper torque                   | < 2 Ncm<br>(0,4 ... 3,5Ncm for pots. with detents) |
| Mechanical life                | 10.000 cycles (more available on request)          |
| Max. stop torque               | 25Ncm                                              |
| Max. push/pull on shaft        | 40N / 50N                                          |
| Max. torque on the nut         | 50Ncm                                              |



## MCA9. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%                             |
| Thermal cycles // 16h at 85°C, plus 2h at -25°C // $\pm 2,5\%$                 |
| Load life // 1.000 h. at 40°C // +0%; -5%                                      |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 3\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 3\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |



## MCE9. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                             |
| Tolerance<br>Special tolerances available on request             | 100 $\Omega$ ... 1M $\Omega$ $\pm 20\%$<br>>1M $\Omega$ ... 5M $\Omega$ $\pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A)<br>Log (B), Antilog (C) and other<br>tapers available on request                                                          |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                              |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                                    |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                                    |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>Non Lin (B, C) | 0,5W<br><i>See note 1</i>                                                                                                         |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 200VDC<br><i>See note 1</i>                                                                                                       |
| Operating temperature                                            | -40°C ... +125°C                                                                                                                  |
| Temperature coefficient                                          | $\pm 100$ ppm.                                                                                                                    |

Note 1: Value depends on taper, please, inquire.



## MCE9. Mechanical Specifications

|                                |                                                    |
|--------------------------------|----------------------------------------------------|
| Resistive element              | Cermet                                             |
| Angle of rotation (mechanical) | 240° $\pm$ 5°                                      |
| Wiper position                 | Middle position: 50% $\pm$ 15°                     |
| Angle of rotation (electrical) | 220° $\pm$ 20°                                     |
| Wiper torque                   | < 2 Ncm<br>(0,4 ... 3,5Ncm for pots. with detents) |
| Mechanical life                | 10.000 cycles (more available on request)          |
| Max. stop torque               | 25Ncm                                              |
| Max. push/pull on shaft        | 40N / 50N                                          |
| Max. torque on the nut         | 50Ncm                                              |



## MCE9. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // $\pm 2\%$                            |
| Thermal cycles // 16h at 85°C, plus 2h at -25°C // $\pm 2\%$                   |
| Load life // 1.000 h. at 40°C // $\pm 2\%$                                     |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 2\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 3\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |



# **HOW TO ORDER**

- **EXAMPLE: MCA9DH5-10KA2020 SNP PI WT9006-BA**
- **EXAMPLE: MCE9DH5-10KA2020 SNP PI WT9006-V0BA**

| 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    |       | 17    |
| MCA9/MCE9         | D     | H5    |       | -10K      | A     | 2020 |      |                |         | SNP     |         |       | PI    |     | WT                  | 9006  | -BA   |       |

| Standard configuration |                                                                                                                                                                  |  |  |  |  |  |  | Customized products                                                                                              |  |  |  |  |  |  |  |  |  |  |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|
| Dimensions:            | 9mm                                                                                                                                                              |  |  |  |  |  |  | A drawing is requested to order a customized product. The code assigned will include all special specifications. |  |  |  |  |  |  |  |  |  |  |
| Protection:            | <ul style="list-style-type: none"><li>• <b>MCA9:</b> IP 5 (dust-proof)</li><li>• <b>MCE9:</b> IP 5 (dust-proof) Self-extinguishable, to meet UL 94 V-0</li></ul> |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Substrate:             | <ul style="list-style-type: none"><li>• <b>MCA9:</b> Carbon technology</li><li>• <b>MCE9:</b> Cermet</li></ul>                                                   |  |  |  |  |  |  | Series, rotor, model and total resistive value are given before the special code: MCA9DH2,5 10K CODE C00111.     |  |  |  |  |  |  |  |  |  |  |
| Color:                 | <ul style="list-style-type: none"><li>• <b>MCA9:</b> Blue housing with white rotor</li><li>• <b>MCE9:</b> Brown housing with white rotor</li></ul>               |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Packaging:             | Blister                                                                                                                                                          |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Wiper position:        | at 50% ±15°                                                                                                                                                      |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Terminals:             | Straight, without SNAP IN.                                                                                                                                       |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |
| Marking:               | Resistive value marked on housing. Others on request.                                                                                                            |  |  |  |  |  |  |                                                                                                                  |  |  |  |  |  |  |  |  |  |  |

## 1 - Series

- MCA9
- MCE9

## 3 - Model and pitch

|      |      |    |      |     |      |
|------|------|----|------|-----|------|
| H2,5 | H3,8 | H5 | V7,5 | V10 | VR10 |
|------|------|----|------|-----|------|

## 5 - Resistance value

| Taper:   | Lin (A)     | Log (B), Antilog (C) |
|----------|-------------|----------------------|
| Value Rn | 100 Ω / 100 | 1KΩ / 1K             |
|          | 5 MΩ / 5M   | 2,2 MΩ / 2M2         |

Other resistive values available on request.

## 7 - Tolerance

|                                                     |      |
|-----------------------------------------------------|------|
| 100 Ω ≤ Rn ≤ 1MΩ: ±20%                              | 2020 |
| 1 MΩ ≤ Rn ≤ 5MΩ: ±30%                               | 3030 |
| For out of range values: Rn > 5MΩ, tol : +50% - 30% | 5030 |
| Special tolerances available: <5% ... 10%, etc.     |      |

## 9 - Cut track

|                                      |     |
|--------------------------------------|-----|
| At beginning of track, CCW: Off - On | PCI |
| At end of track, CW: On - Off        | PCF |

## 11 - Crimped terminals (SNAP IN)

|           |     |
|-----------|-----|
| SNAP IN P | SNP |
| SNAP IN J | SNJ |

## 2 - Rotors

|   |
|---|
| D |
|---|

## 4 - Packaging

|         |                                      |
|---------|--------------------------------------|
| Blister | 84 units per blister                 |
|         | 420 units per box of 430 x 270 x 120 |

## 6 - Resistance law / taper

|                                                                   |                       |
|-------------------------------------------------------------------|-----------------------|
| Lin - Linear                                                      | A                     |
| Log - Logarithmic                                                 | B (on request for CE) |
| Antilog - Antilogarithmic                                         | C (on request for CE) |
| - Special tapers have codes assigned:                             | CODE YXXXXX           |
| Please, indicate terminal position when ordering a special taper. |                       |

## 8 - Operating life (cycles)

|                                                                                |                |
|--------------------------------------------------------------------------------|----------------|
| Standard (10.000cycles)                                                        | (leave blank)  |
| Long life: LV + the number of cycles. ex: LV45 for 45000 cycles <sup>(1)</sup> | LVXX: ex: LV45 |
| <sup>(1)</sup> Others on request.                                              |                |

## 10 - Detents (DT)

|                                                                                                              |           |
|--------------------------------------------------------------------------------------------------------------|-----------|
| One detent at the beginning CCW                                                                              | DTI       |
| One detent at the end CW                                                                                     | DTF       |
| X number of detents. Ex., 10                                                                                 | XDT: 10DT |
| Detents readily available: 3, 4, 6, 7, 9, 10, up to 20 –evenly distributed along 240°±5°. Others on request. |           |

## 12 - Housing color

- **MCA9:** standard is blue
  - **MCE9:** standard is brown
- With other colors -see color chart below-, for example, red CJ-color, ex: CJ-RO

13 - Rotor color

|                                                             |                     |
|-------------------------------------------------------------|---------------------|
| Standard is white                                           |                     |
| With other colors -see color chart below-, for example, red | RT-color; ex: RT-RO |

15 - Linearity

|                                                                    |                |
|--------------------------------------------------------------------|----------------|
| Independent linearity controlled & below x%, for example, 3%: LN3% | LNx%; ex: LN3% |
| Absolute linearity controlled & below x%                           | LAx%           |

17 - Flammability (according to UL 94 V-0)

|                                                                                                                                                                                      |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| • <b>MCA9:</b> Not self-extinguishable                                                                                                                                               | (leave blank) |
| Self-extinguishable according to standard UL 94<br>(including all plastic parts of the potentiometer: rotor, housing and accessory. If only one part needs to be V0, please, inform) | -V0           |
| • <b>MCE9:</b> All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94                                           | -V0           |

14 - Wiper position

|                                                   |               |
|---------------------------------------------------|---------------|
| Standard is at 50% ± 15°                          | (leave blank) |
| Initial or CCW                                    | PI            |
| Final or CW                                       | PF            |
| Others: following clock positions; at 3hours: P3H | PXH, ex: P3H  |

16 - Assembled accessories

|                                    |                           |
|------------------------------------|---------------------------|
| Assembled                          | WT                        |
| Reference (9006 or 9019)           | 9XXX<br>Example: 9006     |
| Color of shaft (standard is black) | -YY<br>Example, white: BA |

Color chart for rotor, housing and accessories

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

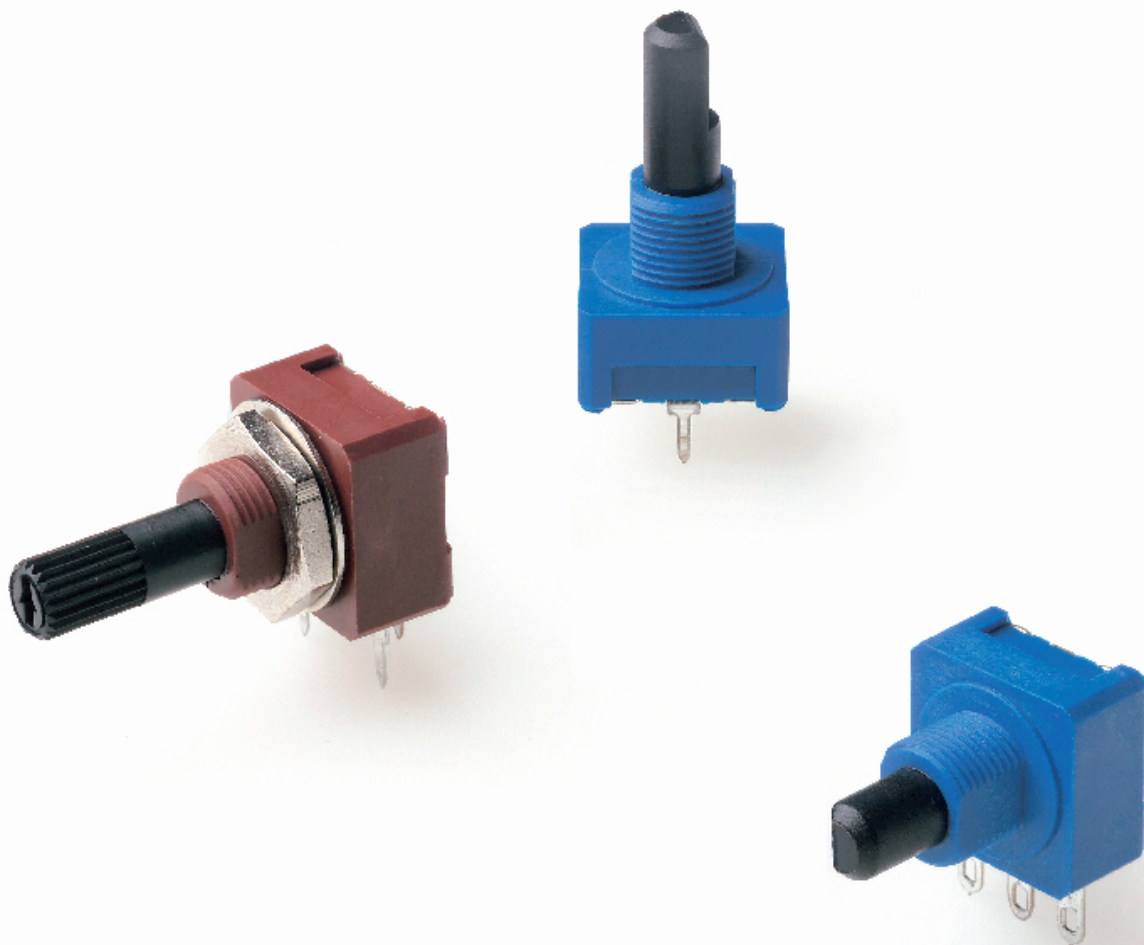
(1) Black is not an option for housings.



MCA14
Control  
Carbon  
Potentiometers  
CA



MCE14
Control  
Cermet  
Potentiometers  
CE





## MCA14

14mm control carbon potentiometers with low cost plastic enclosure and shaft and protection type IP 5 (dust-proof).

Standard tapers available include linear, log and antilog. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Our 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, rotor or accessory color.
- Mechanical life.
- Pause effect (up to 38 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

### Applications

- Electronic appliances: white and brown goods, small household appliances.
- Measurement and test equipment.
- Lighting regulation.



## MCE14

14mm control cermet potentiometers with low cost plastic enclosure and shaft and protection type IP 5 (dust-proof). Self-extinguishable plastic parts according to UL 94 V-0.

Standard taper is linear. Log, Antilog and other tapers are available on request. Laser trimming equipment in-house, allowing for very low tolerances.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

Our 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, rotor or accessory color.
- Mechanical life.
- Pause effect (up to 38 detents available).

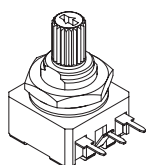
### Applications

- Electronic appliances: white and brown goods, small household appliances.
- Measurement and test equipment.
- Lighting regulation.

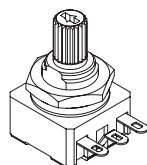
# MCA14 MCE14

## Models

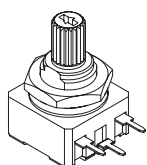
The color of the housing or rotor can be modified. SMD configuration can be available on request.



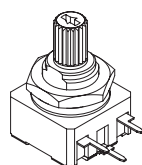
**MCA14 H0**  
**MCE14 H0**



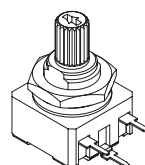
**MCA14 HC0**  
**MCE14 HC0**



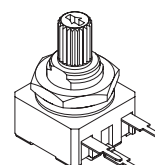
**MCA14 H2,5**  
**MCE14 H2,5**



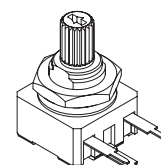
**MCA14 H4**  
**MCE14 H4**



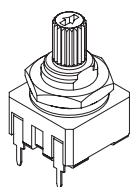
**MCA14 H5**  
**MCE14 H5**



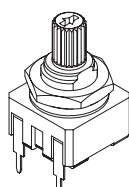
**MCA14 HA5**  
**MCE14 HA5**



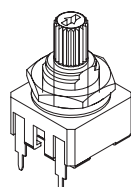
**MCA14 HL5**  
**MCE14 HL5**



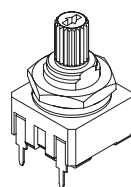
**MCA14 V12,5**  
**MCE14 V12,5**



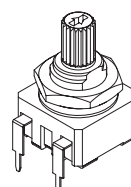
**MCA14 VA12,5**  
**MCE14 VA12,5**



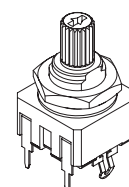
**MCA14 VL12,5**  
**MCE14 VL12,5**



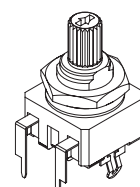
**MCA14 V15**  
**MCE14 V15**



**MCA14 V17,5**  
**MCE14 V17,5**



**MCA14 VD7,5**  
**MCE14 VD7,5**



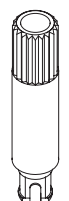
**MCA14 VD11**  
**MCE14 VD11**

## Shafts

Shafts are black by default. Other colors are available. ACP can also study special shafts. D dimension specified on drawings (end of catalogue).

| Shafts | D (±0,5mm) |
|--------|------------|
| 14008  | 20,6       |
| 14015  | 20         |
| 14066  | 20,6       |
| 14067  | 24,8       |
| 14072  | 28,8       |

| Shafts | D (±0,5mm) |
|--------|------------|
| 14073  | 35,5       |
| 14081  | 15,2       |
| 14084  | 20,2       |
| 14187  | 15,6       |
| 14250  | 22         |



**14008**



**14015**



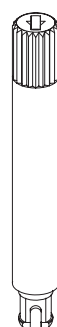
**14066**



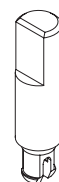
**14067**



**14072**



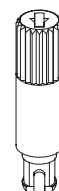
**14073**



**14081**



**14084**



**14187**

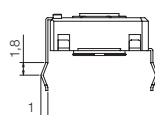


**14250**

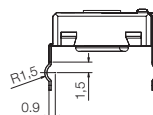
## Terminals

By default, terminals are always straight for the 14mm size, as shown on the “models” menu.

ACP can provide crimped terminals (with “snap in”), to better hold the component to the board prior to soldering.



**SNP**



**SNR**

## Adjustment and orientation

Should the shaft need to be positioned differently than shown on this catalogue, please, enclose a drawing.

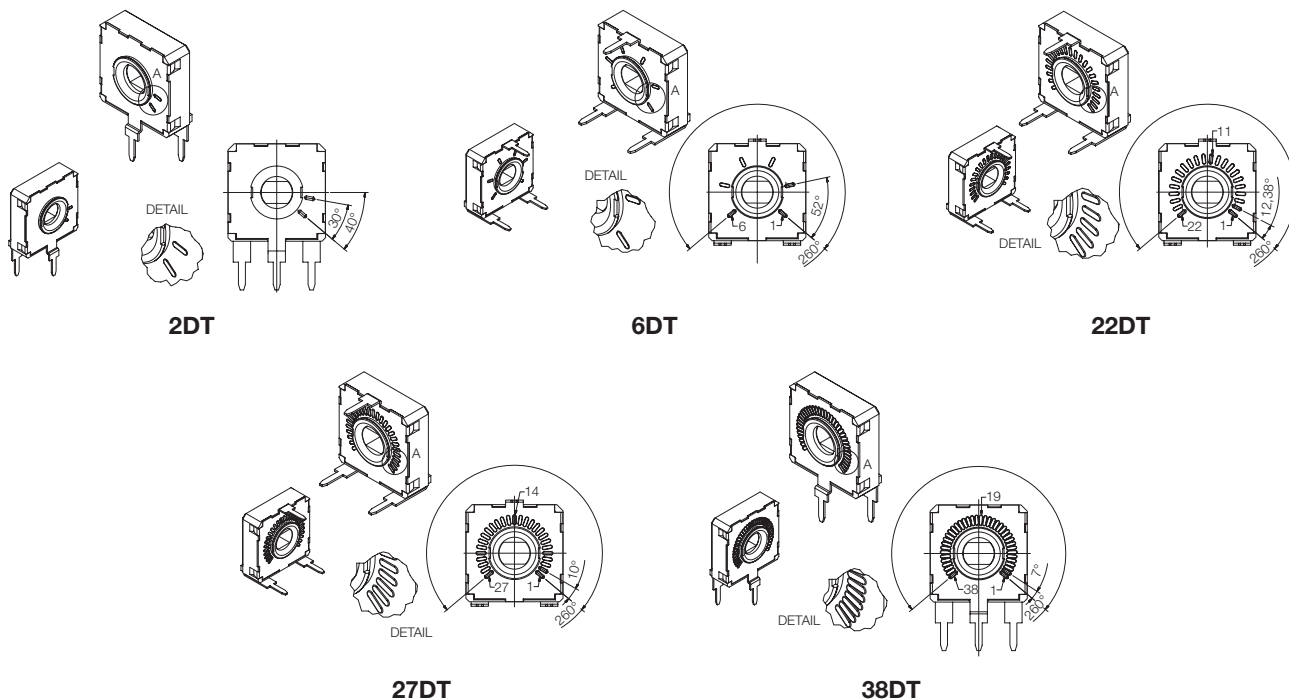
## Potentiometers with detents

ACP's "detent" feature (DT) is specially suitable for control applications. Our patented design has improved the features of these potentiometers:

- Longer mechanical life: >10.000cycles.
- More stable electrical parameters.
- Improved reliability and Contact Resistance Variation (CRV).
- Narrower tolerances for detent positioning.

Detents can be lighter or stronger, or even a combination of both feelings. Detents 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, different slopes, etc.

Examples:

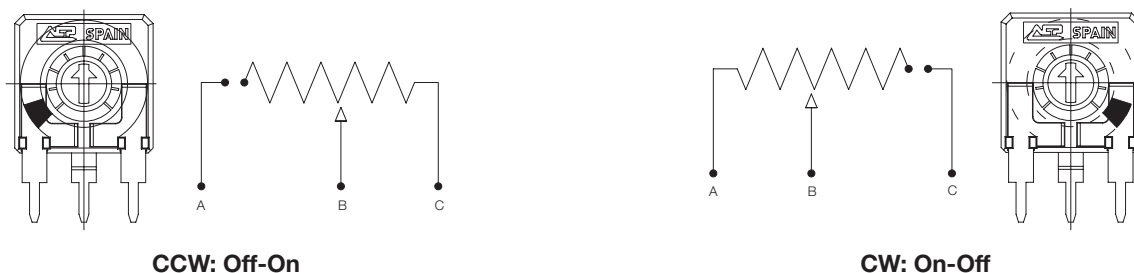


## Potentiometers with cut track

The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.

With cut at the beginning of the track CCW: Off-On.

With cut at the end of track- CW: On-Off. Other positions available on request.





## MCA14. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                             |
| Tolerance<br>Special tolerances available on request             | 100 $\Omega$ ... 1M $\Omega$ $\pm 20\%$<br>>1M $\Omega$ ... 5M $\Omega$ $\pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A)<br>Log (B), Antilog (C) and other<br>tapers available on request                                                          |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                              |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                                    |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                                    |
| Maximum power dissipation at 40° C.<br>Lin (A)<br>Non Lin (B, C) | 0,25W<br>0,13W                                                                                                                    |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 250VDC<br>200VDC                                                                                                                  |
| Operating temperature                                            | -25°C ... +70°C                                                                                                                   |
| Temperature coefficient                                          | 100 $\Omega$ - 10K $\Omega$ $\rightarrow$ +200/ -300 ppm.<br>>10K $\Omega$ - 5M $\Omega$ $\rightarrow$ +200/ -500 ppm             |



## MCA14. Mechanical Specifications

|                                |                                                    |
|--------------------------------|----------------------------------------------------|
| Resistive element              | Carbon technology                                  |
| Angle of rotation (mechanical) | 265° $\pm$ 5°                                      |
| Wiper position                 | Middle position: 50% $\pm$ 15°                     |
| Angle of rotation (electrical) | 245° $\pm$ 20°                                     |
| Wiper torque                   | < 2 Ncm<br>(0,4 ... 3,5Ncm for pots. with detents) |
| Mechanical life                | 10.000 cycles (more available on request)          |
| Max. stop torque               | 15Ncm                                              |
| Max. push/pull on shaft        | 50 N / 25 N                                        |
| Max. torque on the nut         | 80 Ncm                                             |



## MCA14. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%                             |
| Thermal cycles // 16h at 85°C, plus 2h at -25°C // $\pm 2,5\%$                 |
| Load life // 1.000 h. at 40°C // +0%; -5%                                      |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 3\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 3\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |



## MCE14. Electric Specifications

These are standard features; other specifications can always be studied on request.

|                                                                  |                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Range of resistance values<br>Lin (A)<br>Log (B) Antilog (C)     | $100\Omega \leq R_n \leq 5M\Omega$<br>1 K $\Omega$ ... 2,2 M $\Omega$                                                             |
| Tolerance<br>Special tolerances available on request             | 100 $\Omega$ ... 1M $\Omega$ $\pm 20\%$<br>>1M $\Omega$ ... 5M $\Omega$ $\pm 30\%$<br>Out of range: $R_n > 5M\Omega$ : +50%, -30% |
| Variation laws                                                   | Lin (A)<br>Log (B), Antilog (C) and other<br>tapers available on request                                                          |
| Residual resistance                                              | Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} R_n$<br>Minimum value 2 $\Omega$                                              |
| CRV - Contact Resistance Variation (dynamic)                     | $\leq 3\% R_n$                                                                                                                    |
| CRV - Contact Resistance Variation (static)                      | $\leq 5\% R_n$                                                                                                                    |
| Maximum power dissipation at 70° C.<br>Lin (A)<br>Non Lin (B, C) | 0,7W<br><i>See note 1</i>                                                                                                         |
| Maximum voltage at 40°C<br>Lin (A)<br>Non Lin (B, C)             | 250VDC<br><i>See note 1</i>                                                                                                       |
| Operating temperature                                            | -40°C ... +125°C                                                                                                                  |
| Temperature coefficient                                          | $\pm 100$ ppm.                                                                                                                    |

Note 1: Value depends on taper, please, inquire.



## MCE14. Mechanical Specifications

|                                |                                                    |
|--------------------------------|----------------------------------------------------|
| Resistive element              | Cermet                                             |
| Angle of rotation (mechanical) | 265° $\pm$ 5°                                      |
| Wiper position                 | Middle position: 50% $\pm$ 15°                     |
| Angle of rotation (electrical) | 245° $\pm$ 20°                                     |
| Wiper torque                   | < 2 Ncm<br>(0,4 ... 3,5Ncm for pots. with detents) |
| Mechanical life                | 10.000 cycles (more available on request)          |
| Max. stop torque               | 15Ncm                                              |
| Max. push/pull on shaft        | 50 N / 25 N                                        |
| Max. torque on the nut         | 80 Ncm                                             |



## MCE14. Test

### Test // Conditions // Typical variation of Nominal Resistance

|                                                                                |
|--------------------------------------------------------------------------------|
| Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%                             |
| Thermal cycles // 16h at 90°C, plus 2h at -40°C // $\pm 2\%$                   |
| Load life // 1.000 h. at 70°C // $\pm 2\%$                                     |
| Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C $\pm$ 2°C // $\pm 2\%$ |
| Soldering effect // 2 seconds at 350°C // $\pm 1\%$                            |
| Storage (3 years) // at 23°C $\pm$ 2°C // $\pm 1\%$                            |
| For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.  |



# MCA14 MCE14 HOW TO ORDER

- **EXAMPLE: MCA14NH2,5-10K2020 SNP PI WT14187-BA**
- **EXAMPLE: MCE14NH2,5-10K2020 SNP PI WT14187-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    |       | 17    |
| MCA14/MCE14       | N     | H2,5  |       | 10K       | A     | 2020 |      |                |         | SNP     |         |       | PI    |     | WT                  | 14187 | -BA   |       |

| Standard configuration |                                                                                                                                                                                | Customized products                                                                                              |  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--|
| Dimensions:            | 14mm                                                                                                                                                                           | A drawing is requested to order a customized product. The code assigned will include all special specifications. |  |
| Protection:            | <ul style="list-style-type: none"><li>• <b>MCA14:</b> IP 5 (dust-proof)</li><li>• <b>MCE14:</b> IP 5 (dust-proof) Self-extinguishable, to meet UL 94 V-0</li></ul>             |                                                                                                                  |  |
| Substrate:             | <ul style="list-style-type: none"><li>• <b>MCA14:</b> Carbon technology</li><li>• <b>MCE14:</b> Cermet</li></ul>                                                               | Series, rotor, model and total resistive value are given before the special code:<br>MCA14PH2,5 10K CODE C00111. |  |
| Color:                 | <ul style="list-style-type: none"><li>• <b>MCA14:</b> Blue housing with white rotor, black shaft</li><li>• <b>MCE14:</b> Brown housing with white rotor, black shaft</li></ul> |                                                                                                                  |  |
| Packaging:             | Blister                                                                                                                                                                        |                                                                                                                  |  |
| Wiper position:        | at 50% ±15°                                                                                                                                                                    |                                                                                                                  |  |
| Mech. life:            | 10.000cycles                                                                                                                                                                   |                                                                                                                  |  |
| Terminals:             | Straight, without SNAP IN.                                                                                                                                                     |                                                                                                                  |  |
| Marking:               | Resistive value marked on housing. Others on request.                                                                                                                          |                                                                                                                  |  |

## 1 - Series

- MCA14
- MCE14

## 3 - Model and pitch

| H0    | HC0    | H2,5   | H4  | H5    | HA5   | HL5  |
|-------|--------|--------|-----|-------|-------|------|
| V12,5 | VA12,5 | VL12,5 | V15 | V17,5 | VD7,5 | VD11 |

## 5 - Resistance value

| Taper:   | Lin (A)                               | Log (B), Antilog (C)                  |
|----------|---------------------------------------|---------------------------------------|
| Value Rn | 100 Ω / 100<br>... / ...<br>5 MΩ / 5M | 1KΩ / 1K<br>... / ...<br>2,2 MΩ / 2M2 |

Other resistive values available on request.

## 7 - Tolerance

|                                                     |      |
|-----------------------------------------------------|------|
| 100 Ω ≤ Rn ≤ 1MΩ: ±20%                              | 2020 |
| 1 MΩ ≤ Rn ≤ 5MΩ: ±30%                               | 3030 |
| For out of range values: Rn > 5MΩ, tol : +50% - 30% | 5030 |
| Special tolerances available: <5% ... 10%, etc.     |      |

## 9 - Cut track

|                                      |     |
|--------------------------------------|-----|
| At beginning of track, CCW: Off - On | PCI |
| At end of track, CW: On - Off        | PCF |

## 11 - Crimped terminals (SNAP IN)

|           |     |
|-----------|-----|
| SNAP IN P | SNP |
| SNAP IN R | SNR |

## 2 - Rotors

|   |
|---|
| N |
|---|

## 4 - Packaging

|         |                                      |
|---------|--------------------------------------|
| Blister | 84 units per blister                 |
|         | 420 units per box of 430 x 270 x 120 |

## 6 - Resistance law / taper

|                                                                   |                       |
|-------------------------------------------------------------------|-----------------------|
| Lin - Linear                                                      | A                     |
| Log - Logarithmic                                                 | B (on request for CE) |
| Antilog - Antilogarithmic                                         | C (on request for CE) |
| - Special tapers have codes assigned:                             | CODE YXXXXX           |
| Please, indicate terminal position when ordering a special taper. |                       |

## 8 - Operating life (cycles)

|                                                                                |                |
|--------------------------------------------------------------------------------|----------------|
| Standard (10.000cycles)                                                        | (leave blank)  |
| Long life: LV + the number of cycles. ex: LV45 for 45000 cycles <sup>(1)</sup> | LVXX: ex: LV45 |
| <sup>(1)</sup> Others on request.                                              |                |

## 10 - Detents (DT)

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

Detents readily available: 1, 2, 3, 4, 5, 6, 8, 9, 17, 22, 27, up to 38 –evenly distributed along 260°±3°–. Others on request.

## 12 - Housing color

|                                                             |                     |
|-------------------------------------------------------------|---------------------|
| • <b>MCA14:</b> standard is blue                            |                     |
| • <b>MCE14:</b> standard is brown                           |                     |
| With other colors -see color chart below-, for example, red | CJ-color, ex: CJ-RO |

13 - Rotor color

|                                                             |                     |
|-------------------------------------------------------------|---------------------|
| Standard is white                                           |                     |
| With other colors -see color chart below-, for example, red | RT-color; ex: RT-RO |

15 - Linearity

|                                                                    |                |
|--------------------------------------------------------------------|----------------|
| Independent linearity controlled & below x%, for example, 3%: LN3% | LNx%; ex: LN3% |
| Absolute linearity controlled & below x%                           | LAx%           |

17 - Flammability (according to UL 94 V-0)

|                                                                                                                                                                                      |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| • <b>MCA14:</b> Not self-extinguishable                                                                                                                                              | (leave blank) |
| Self-extinguishable according to standard UL 94<br>(including all plastic parts of the potentiometer: rotor, housing and accessory. If only one part needs to be V0, please, inform) | -V0           |
| • <b>MCE14:</b> All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94                                          | -V0           |

14 - Wiper position

|                                                   |               |
|---------------------------------------------------|---------------|
| Standard is at 50% ± 15°                          | (leave blank) |
| Initial or CCW                                    | PI            |
| Final or CW                                       | PF            |
| Others: following clock positions; at 3hours: P3H | PXH, ex: P3H  |

16 - Assembled accessories

|                                    |                           |
|------------------------------------|---------------------------|
| Assembled                          | WT                        |
| Shaft reference                    | 14XXX<br>Example: 14187   |
| Color of shaft (standard is black) | -YY<br>Example, white: BA |

Color chart for rotor, housing and accessories

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

(1) Black is not an option for housings.

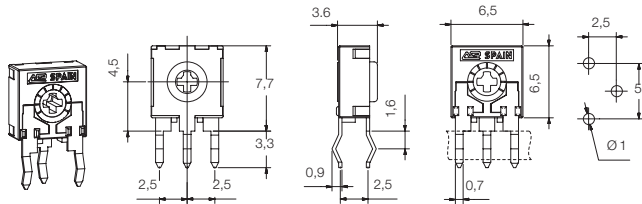
# DRAWINGS CA6

## Tolerances 6 mm (in mm.):

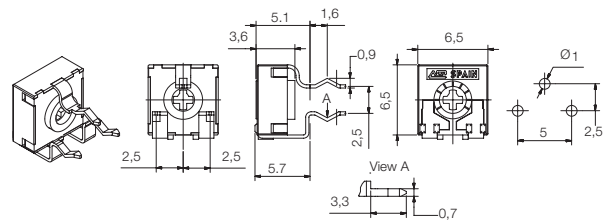
|        |      |
|--------|------|
| <1     | ±0,1 |
| 1...<5 | ±0,3 |
| 5...   | ±0,5 |

## Model types. CA6

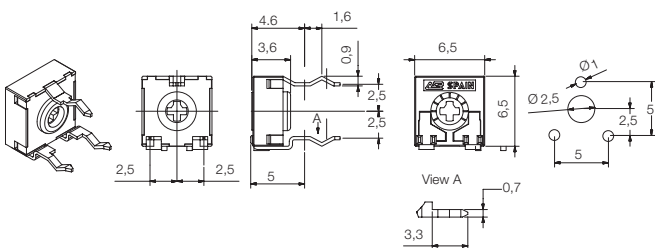
### CA6 H2,5



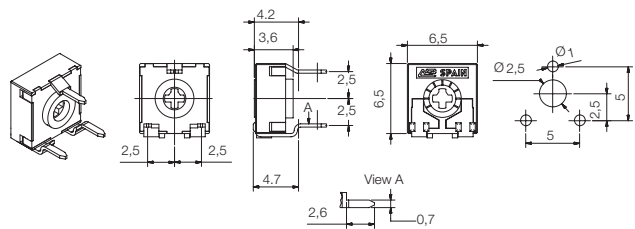
### CA6 V2,5



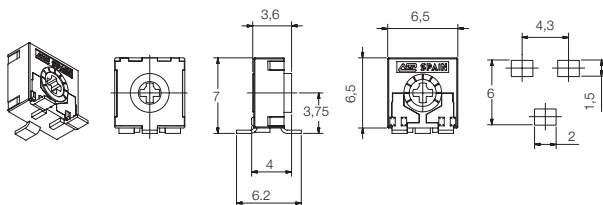
### CA6 V5



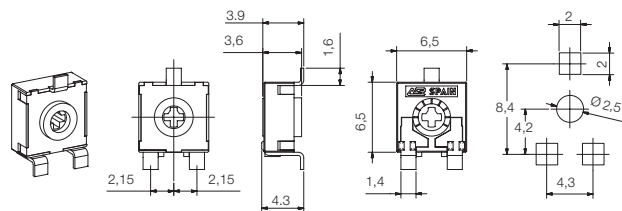
### CA6 VS5



### CA6 HSMD

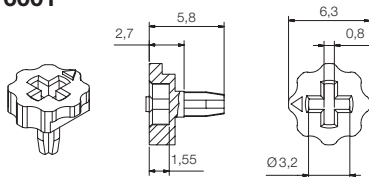


### CA6 VSMD

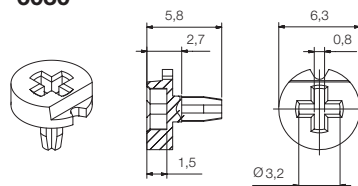


## Thumbwheels CA6

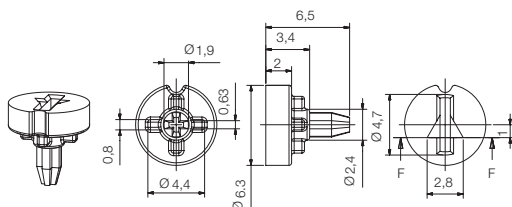
### 6001



### 6030



### 6032



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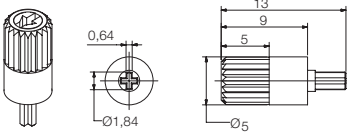
# DRAWINGS CA6

## Tolerances 6 mm (in mm.):

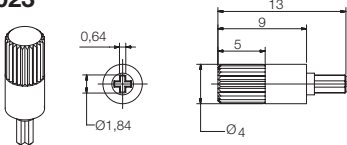
|        |      |
|--------|------|
| <1     | ±0,1 |
| 1...<5 | ±0,3 |
| 5...   | ±0,5 |

## Shafts. CA6

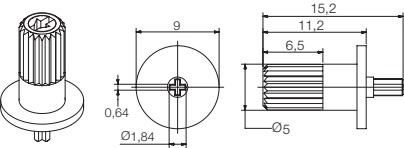
**6022**



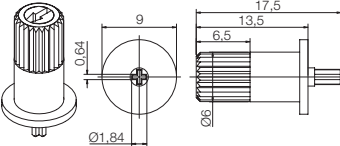
**6023**



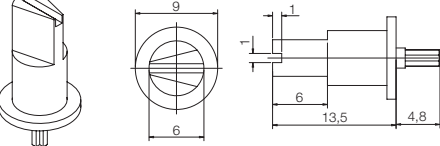
**6024**



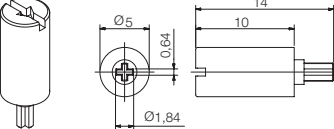
**6025**



**6028**



**6031**



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# DRAWINGS CA9 // CE9

Tolerances 9 mm (in mm.):

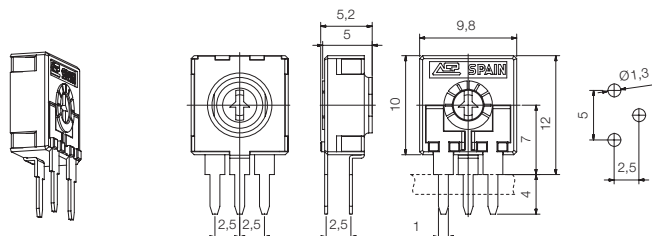
<1 ±0,1

1...<5 ±0,3

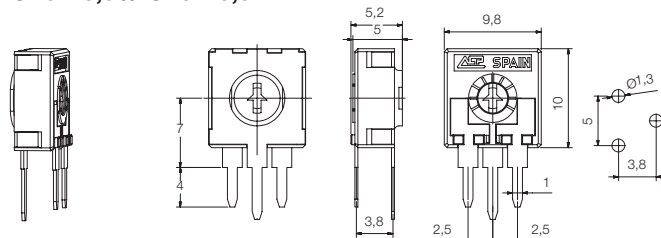
5... ±0,5

Model types. CA9 // CE9

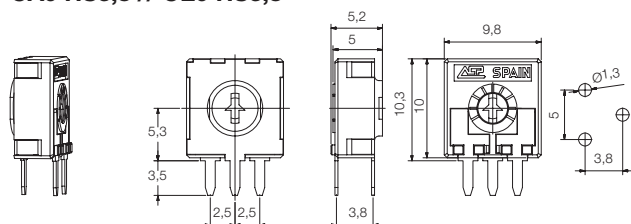
CA9 H2,5 // CE9 H2,5



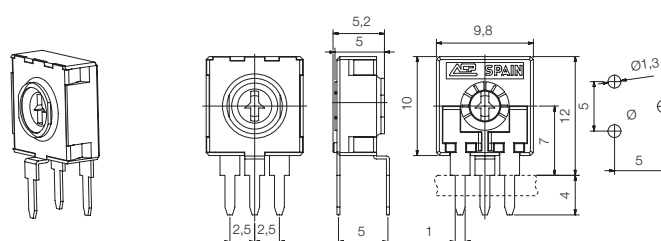
CA9 H3,8 // CE9 H3,8



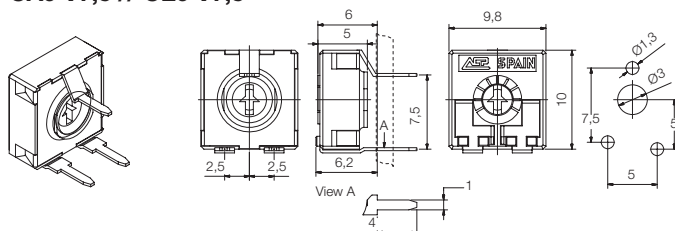
CA9 HS3,8 // CE9 HS3,8



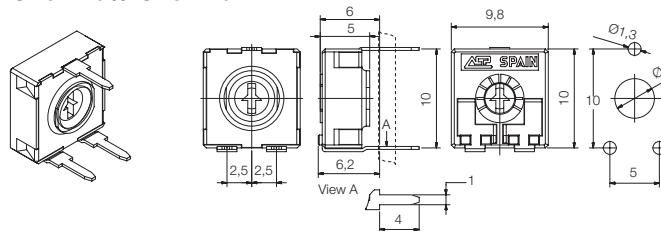
CA9 H5 // CE9 H5



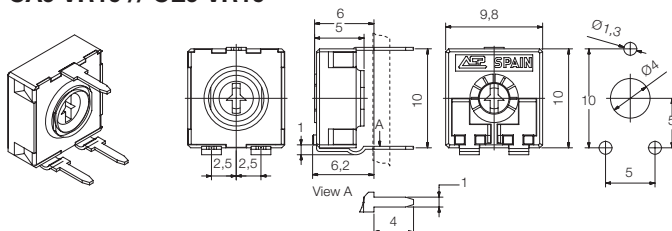
CA9 V7,5 // CE9 V7,5



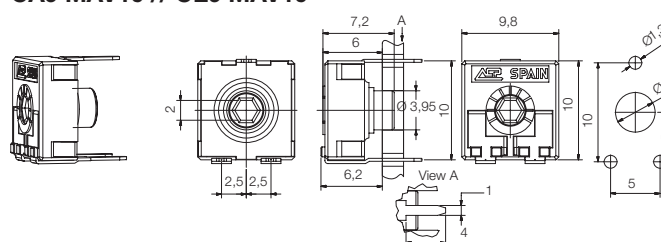
CA9 V10 // CE9 V10



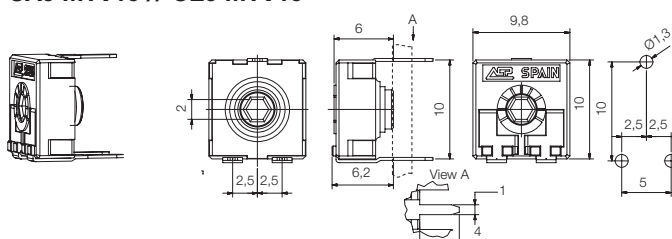
CA9 VR10 // CE9 VR10



CA9 MAV10 // CE9 MAV10



CA9 MTV10 // CE9 MTV10



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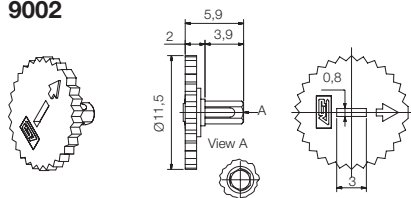
# DRAWINGS CA9 // CE9

## Tolerances 9 mm (in mm.):

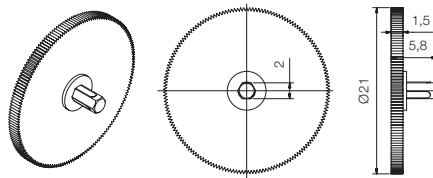
|        |      |
|--------|------|
| <1     | ±0,1 |
| 1...<5 | ±0,3 |
| 5...   | ±0,5 |

## Thumbwheels. CA9 // CE9

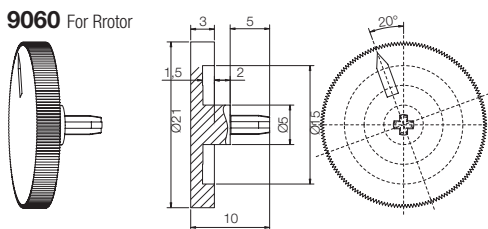
### 9002



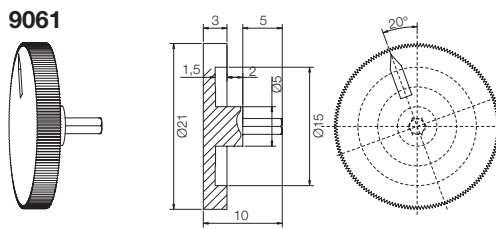
### 9041



### 9060 For Rrotor

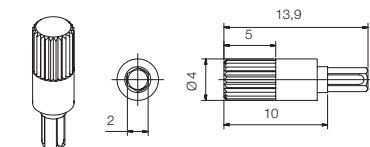


### 9061

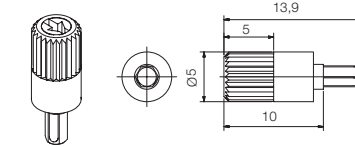


## Shafts. CA9 // CE9

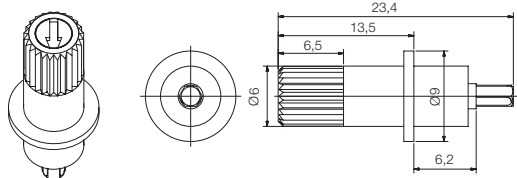
### 9004



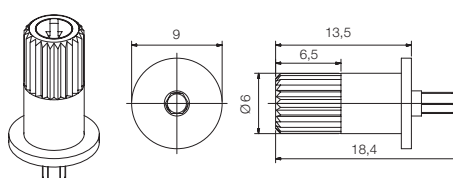
### 9005



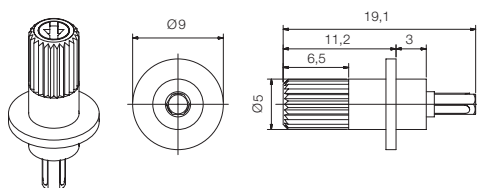
### 9006



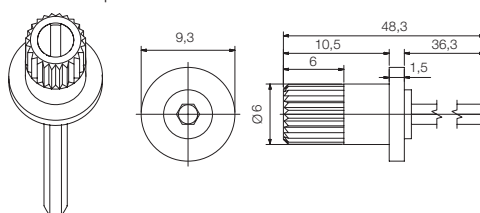
### 9009



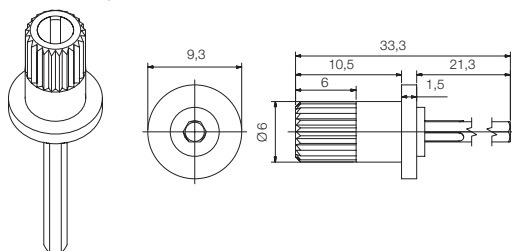
### 9010



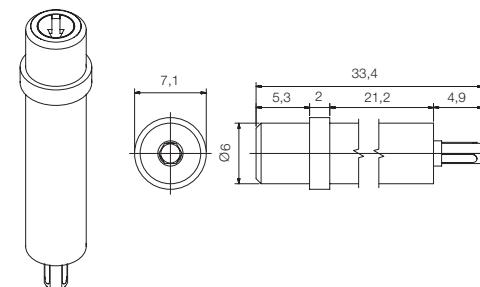
### 9018 For 6 potentiometers



### 9039 For 4 potentiometers



### 9047



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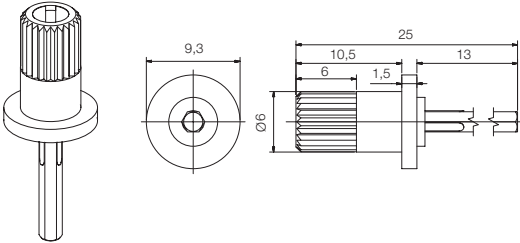
# DRAWINGS CA9 // CE9

Tolerances 9 mm (in mm.):

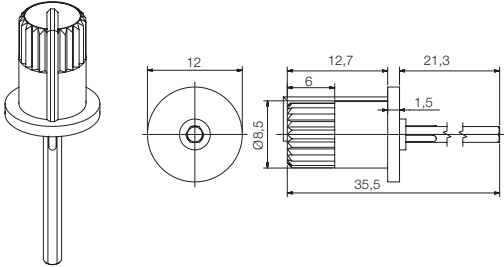
|        |      |
|--------|------|
| <1     | ±0,1 |
| 1...<5 | ±0,3 |
| 5...   | ±0,5 |

## Shafts. CA9 // CE9

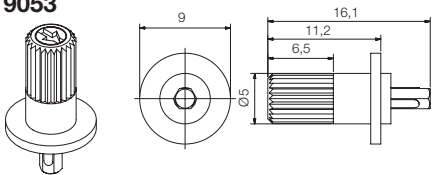
9048 For 2 potentiometers



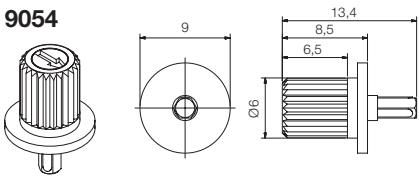
9051 For 4 potentiometers



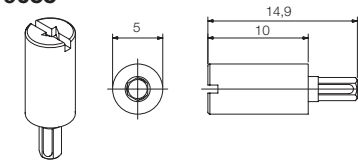
9053



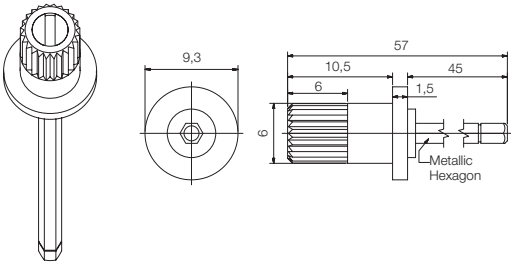
9054



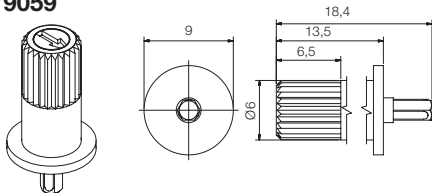
9055



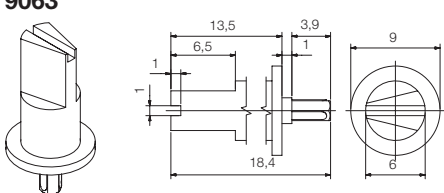
9056 For 8 potentiometers



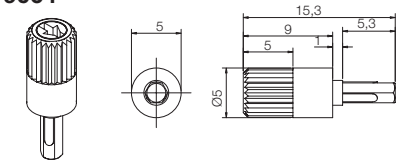
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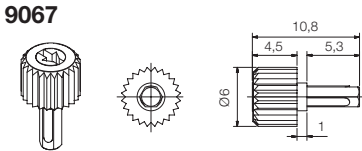
9063



9064



9067



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# DRAWINGS CA14 // CE14

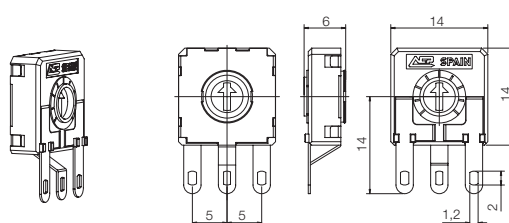
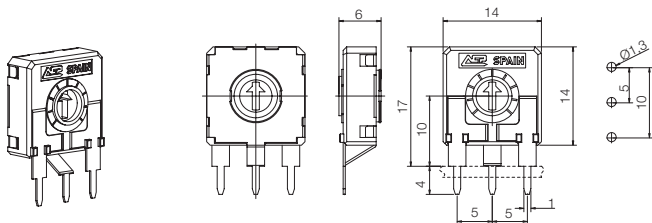
Tolerances 14 mm (in mm.):

|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

Model types. CA14 // CE14

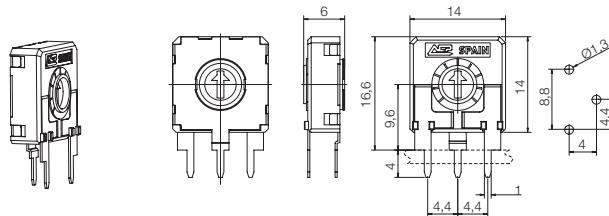
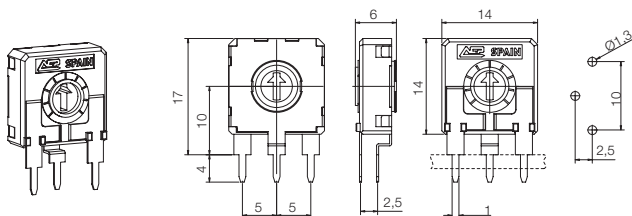
CA14 H0 // CE14 H0

CA14 HC0 // CE14 HC0



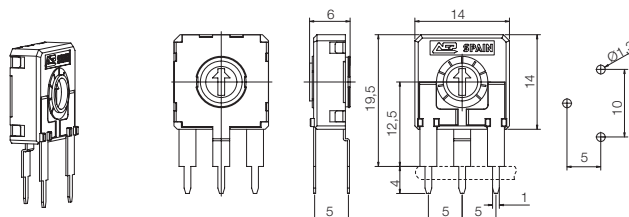
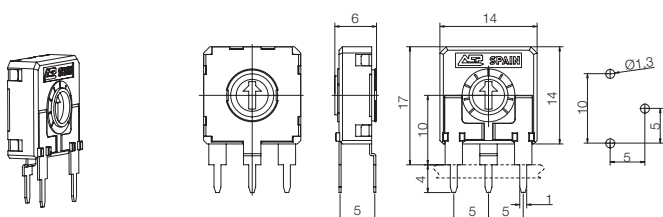
CA14 H2,5 // CE14 H2,5

CA14 H4 // CE14 H4



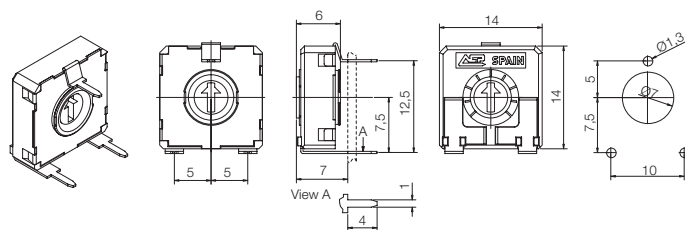
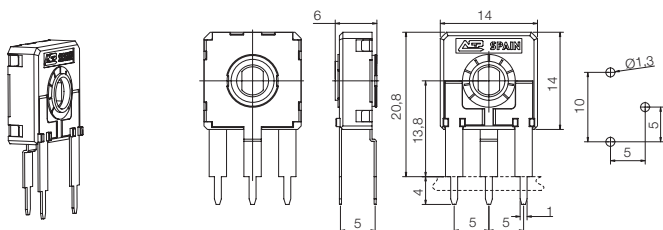
CA14 H5 // CE14 H5

CA14 HA5 // CE14 HA5



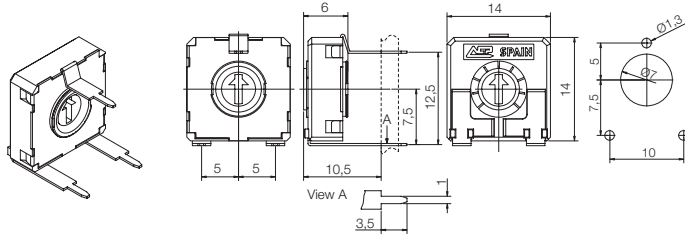
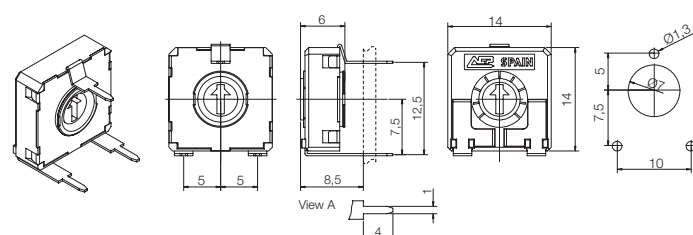
CA14 HL5 // CE14 HL5

CA14 V12,5 // CE14 V12,5



CA14 VA12,5 // CE14 VA12,5

CA14 VL12,5 // CE14 VL12,5



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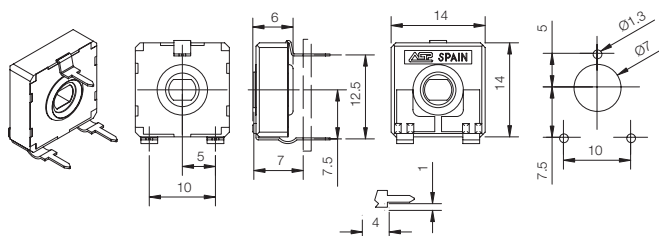
# DRAWINGS CA14 // CE14

## Tolerances 14 mm (in mm.):

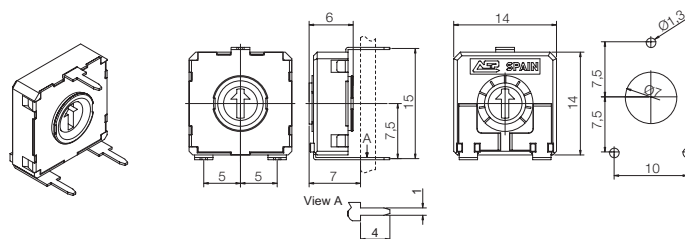
|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

## Model types. CA14 // CE14

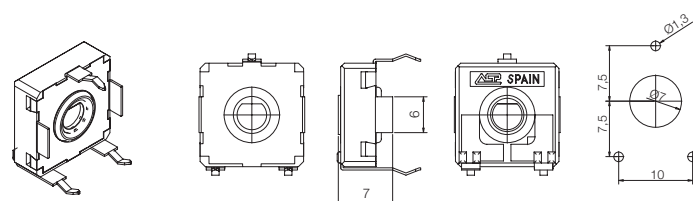
### CA14 VR12,5 // CE14 VR12,5



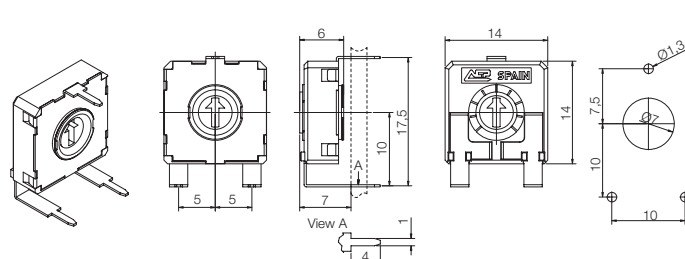
### CA14 V15 // CE14 V15



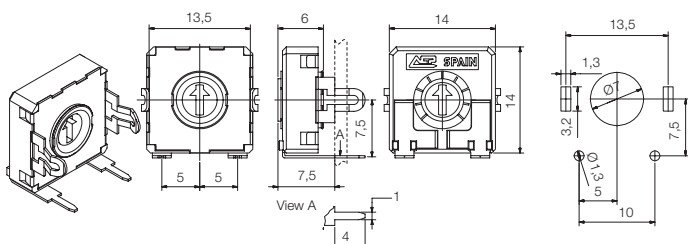
### CA14 V15...CFF // CE14 V15...CFF



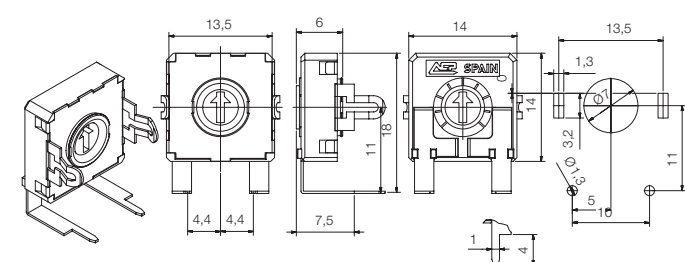
### CA14 V17,5 // CE14 V17,5



### CA14 VD7,5 // CE14 VD7,5

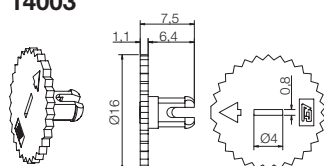


### CA14 VD11 // CE14 VD11



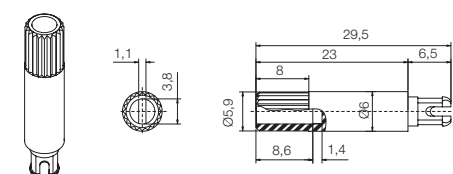
## Thumbwheels. CA14 // CE14

### 14003

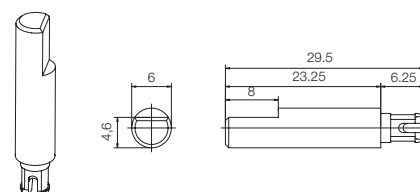


## Shafts. CA14 // CE14

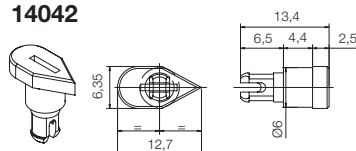
### 14008



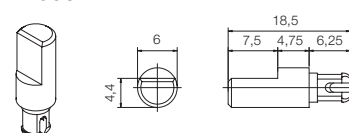
### 14015



### 14042



### 14056



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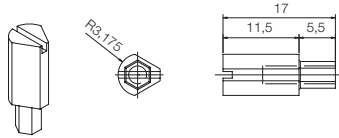
# DRAWINGS CA14 // CE14

## Tolerances 14 mm (in mm.):

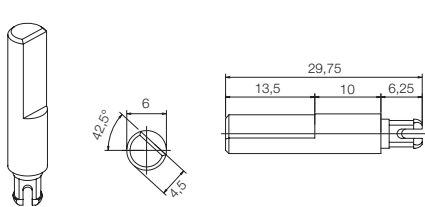
|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

## Shafts. CA14 // CE14

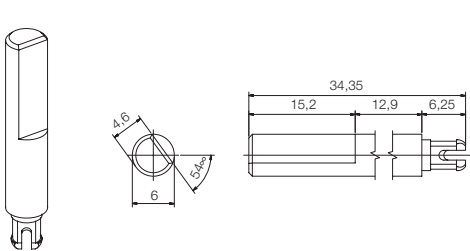
14065



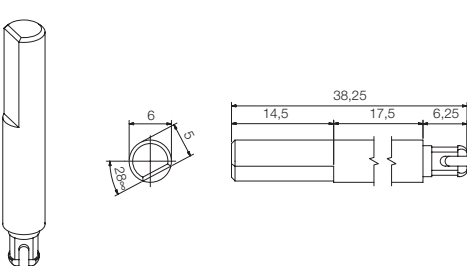
14066



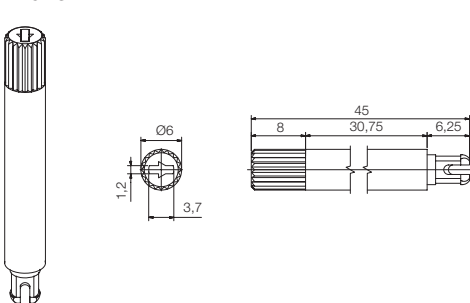
14067



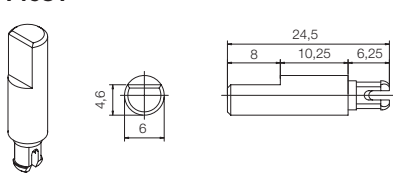
14072



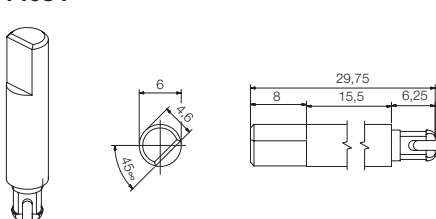
14073



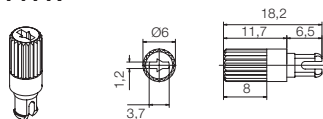
14081



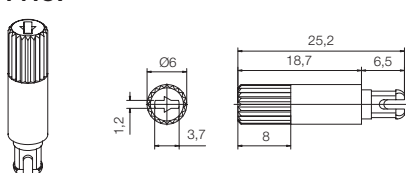
14084



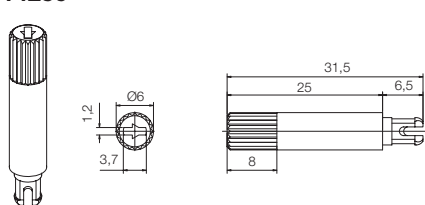
14117



14187



14250



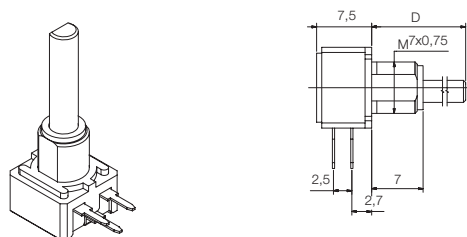
# DRAWINGS MCA9 // MCE9

## Tolerances 9 mm (in mm.):

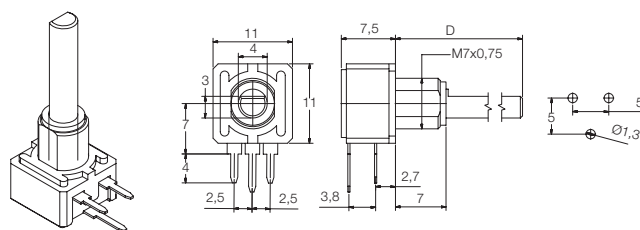
|        |      |
|--------|------|
| <1     | ±0,1 |
| 1...<5 | ±0,3 |
| 5...   | ±0,5 |

## Model types. MCA9 // MCE9

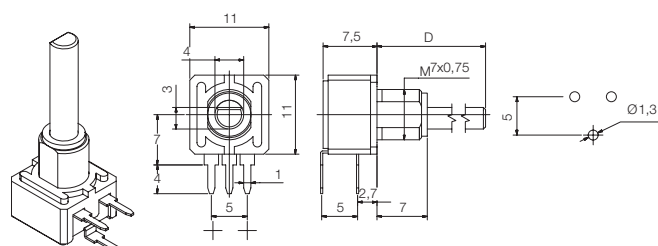
### MCA9 H2,5 // MCE9 H2,5



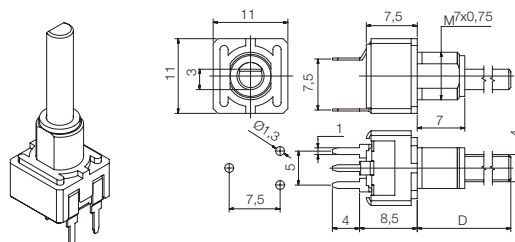
### MC9 H3,8 // MCE9 H3,8



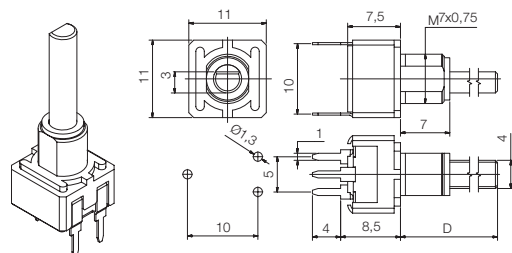
### MCA9 H5 // MCE9 H5



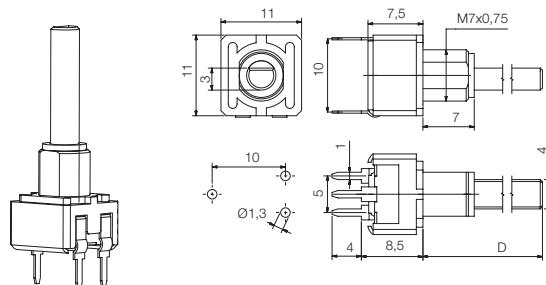
### MCA9 V7,5 // MCE9 V7,5



### MCA9 V10 // MCE9 V10

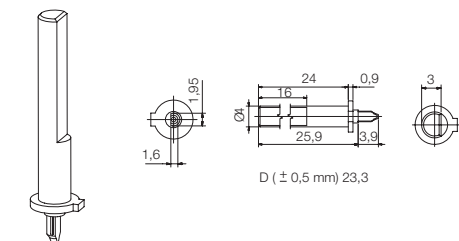


### MCA9 VR10 // MCE9 VR10

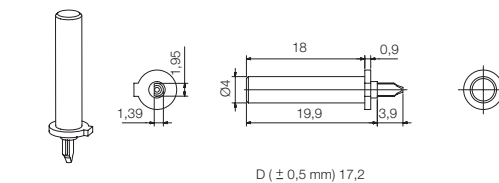


## Shafts. MCA9 // MCE9

### 9006

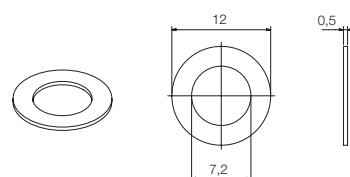


### 9019

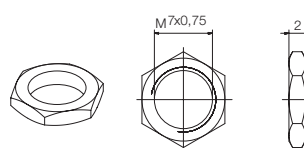


## Washer and nut. MCA9 // MCE9

### WASHER



### NUT



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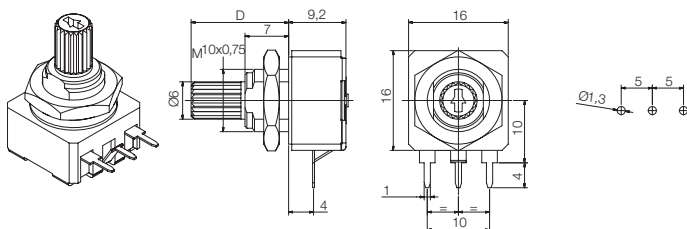
# DRAWINGS MCA14 // MCE14

Tolerances 14 mm (in mm.):

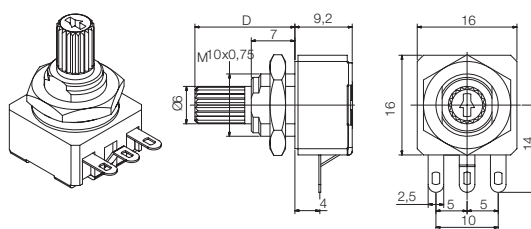
|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

Model types. MCA14 // MCE14

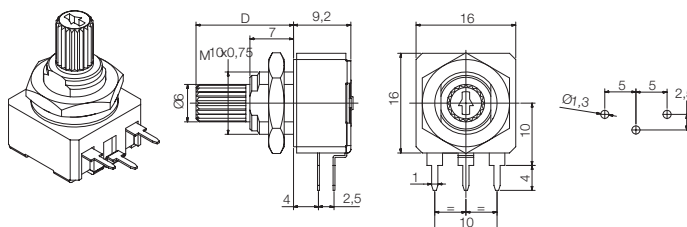
MCA14 H0 // MCE14 H0



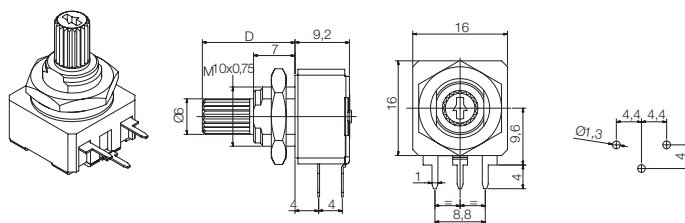
MCA14 HC0 // MCE14 HC0



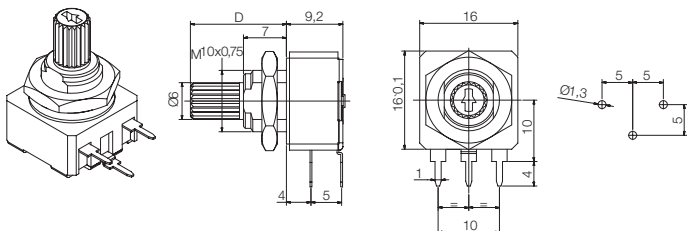
MCA14 H2,5 // MCE14 H2,5



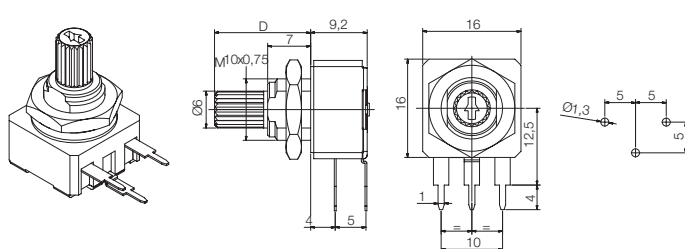
MCA14 H4 // MCE14 H4



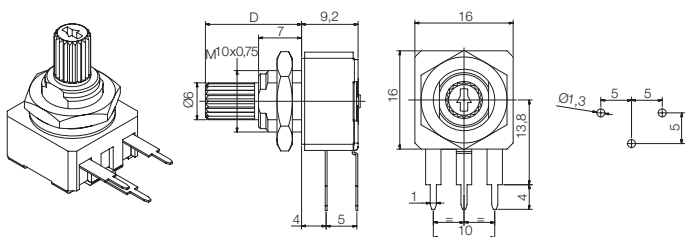
MCA14 H5 // MCE14 H5



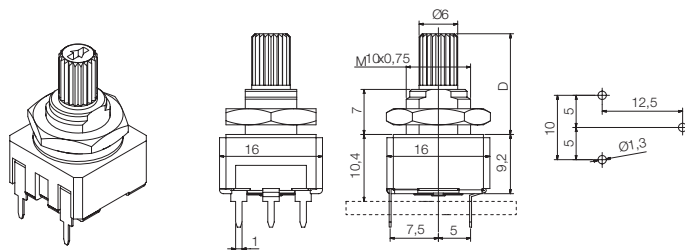
MCA14 HA5 // MCE14 HA5



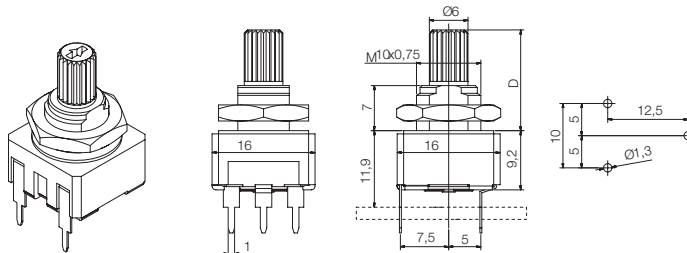
MCA14 HL5 // MCE14 HL5



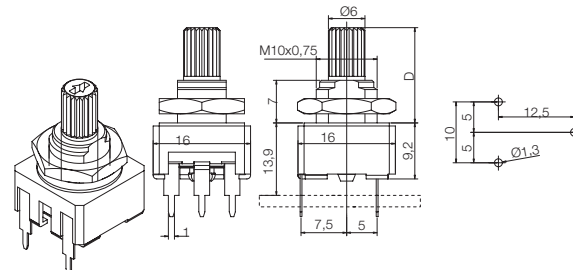
MCA14 V12,5 // MCE14 V12,5



MCA14 VA12,5 // MCE14 VA12,5



MCA14 VL12,5 // MCE14 VL12,5



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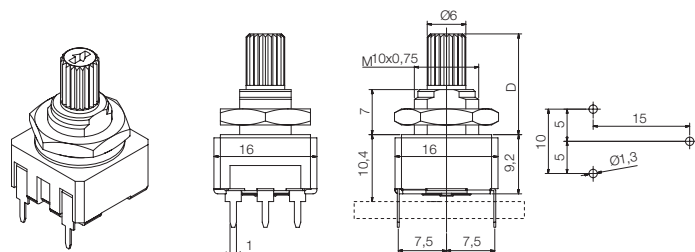
# DRAWINGS MCA14 // MCE14

## Tolerances 14 mm (in mm.):

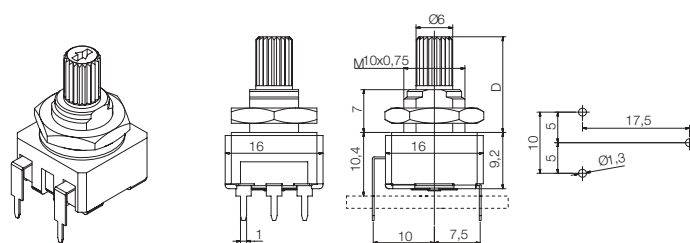
|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

## Model types. MCA14 // MCE14

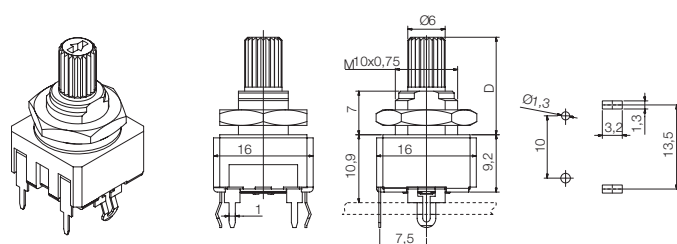
### MCA14 V15 // MCE14 V15



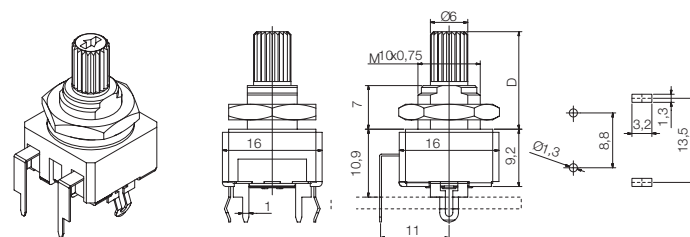
### MCA14 V17,5 // MCE14 V17,5



### MCA14 VD7,5 // MCE14 VD7,5

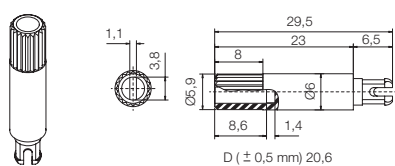


### MCA14 VD11 // MCE14 VD11

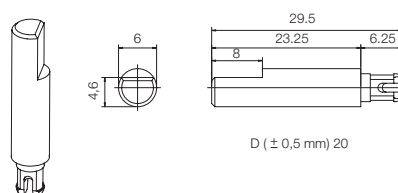


## Shafts. MCA14 // MCE14

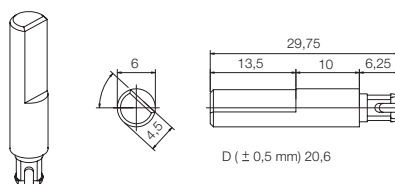
### 14008



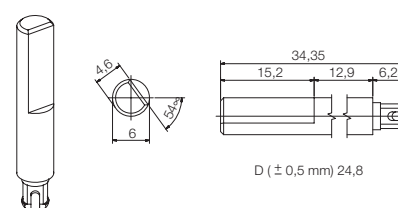
### 14015



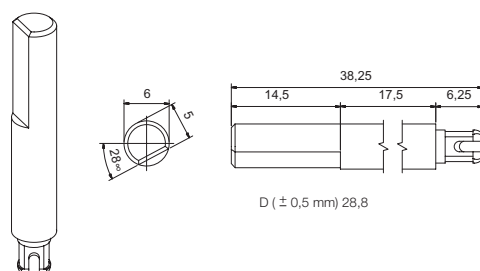
### 14066



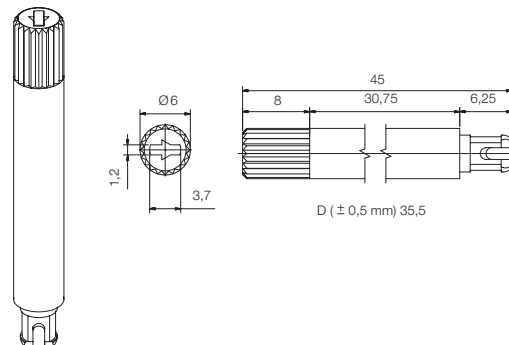
### 14067



### 14072



### 14073



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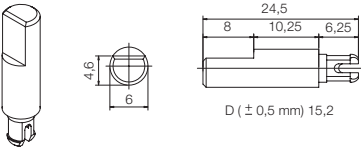
# DRAWINGS MCA14 // MCE14

## Tolerances 14 mm (in mm.):

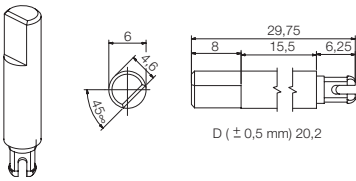
|         |      |
|---------|------|
| <1      | ±0,1 |
| 1...<10 | ±0,3 |
| 10...   | ±0,5 |

## Shafts. MCA14 // MCE14

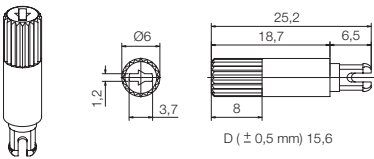
### 14081



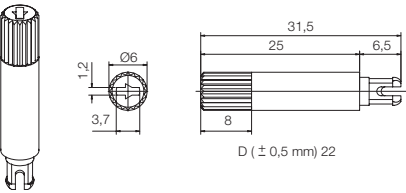
### 14084



### 14187

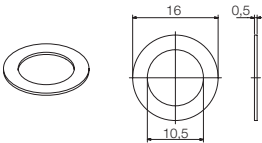


### 14250

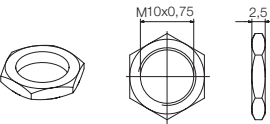


## Washer and nut. MCA-14 // MCE-14 // COM MCA-14

### WASHER



### NUT



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