

## MCA14

Carbon Potentiometers CA

## MCE14

Cermet Potentiometers CE



## CARBON – MCA14

14mm carbon potentiometers with plastic enclosure and shaft.

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

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

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

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

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (standard is at 50% rotation).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 38 detents available).
- Self-extinguishable plastic parts according to UL 94 V-0.

### Applications

14mm potentiometers are mainly used in control applications, in different markets:

- Electronic household appliances, heating, ventilation and air conditioning (HVAC) equipment, thermostats.

## CERMET – MCE14

14mm cermet potentiometers with plastic enclosure and shaft. Cermet potentiometers have better thermal stability, allow for higher thermal dissipation and withstand higher temperatures than carbon potentiometers.

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

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

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

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

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 38 detents available).

### Applications

14mm cermet potentiometers are used in applications where either the operating temperature is high, or where the applications requires product with excellent ohmic value stability:

- Electronic appliances: boilers, water heaters.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

# MCA14 MCE14 HOW TO ORDER

EXAMPLE: **MCA14NH2,5-10KA2020 SNP PI WT-14187-BA**

EXAMPLE: **MCE14NH2,5-10KA2020 SNP PI WT-14187-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                  |        |       |       |
| MCA14             |       |       |        |           |       |      |      |                |         |         |         |       |       |      |                     |        |       |       |
| MCE14             | N     | H2,5  |        | - 10K     | A     | 2020 |      | SNP            |         |         |         |       | PI    |      | WT                  | -14187 | -BA   |       |

| Standard configuration: | MCA14 Through-hole   | MCE14 Through-hole          |
|-------------------------|--|-----------------------------|
| Dimensions:             | 14mm   |                             |
| Protection:             | IP 54 (dust-proof)<br>On request: Self-extinguishable, to meet UL 94 V-0 |                             |
| Substrate:              | Carbon technology  | Cermet                      |
| Color:                  | Blue housing + white rotor   | Brown housing + white rotor |
| Packaging:              | Bulk   |                             |
| Wiper position:         | at 50% ±15°  |                             |
| Terminals:              | Straight, without crimping.  |                             |
| Marking:                | Resistive value marked on housing. Others on request.                    |                             |

**Customized products:** A drawing is requested when ordering a customized product. Series, rotor, model and total resistive value are indicated before the code that includes all special specifications. Example: MCA14PH2,5-10K CODE C00111. Other features could be available on request, please, ask.

## 1 - Series

■ MCA14 ■ MCE14

## 2 - Rotors

N Z

## 3 - Model and pitch

|        |        |        |     |      |       |       |       |
|--------|--------|--------|-----|------|-------|-------|-------|
| H0     | HC0    | H2,5   | H4  | H5   | HA5   | HL5   | V12,5 |
| VA12,5 | VL12,5 | VR12,5 | V15 | VJ15 | V17,5 | VD7,5 | VD11  |

## 4 - Packaging

### Trough-hole

|      |                           |
|------|---------------------------|
| Bulk | (blank)... <sup>(1)</sup> |
|------|---------------------------|

## 5 - Resistance value

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

## 6 - Resistance law / taper

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

## 7 - Tolerance

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

## 8 - Operating Life (Cycles)

|   |                |
|---|----------------|
| Standard (1.000 cycles)   | (leave blank)  |
| Long life: LV + the number of cycles. ex: LV45 for 45.000 cycles. (others on request) | LVXX: ex: LV45 |

## 9 - Cut Track – Open circuit.

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

## 10 - Detents (DT)

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

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

## 11 - Terminals

|   |                |
|---|----------------|
| SNAP IN P   | SNP            |
| SNAP IN R   | SNR            |
| Shorter tip of terminal, TPXX, where XX is tip length (under request) | TPXX, ex: TP30 |

## 12 - Housing

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

## 13 - Rotor

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

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

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

## 14 - Wiper

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

## 15 - Linearity

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

## 16 - Potentiometers with assembled accessories

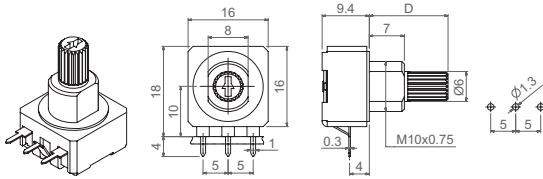
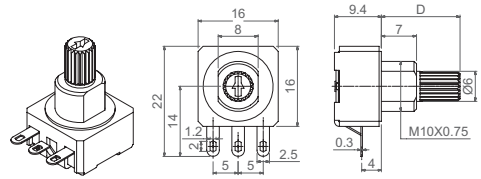
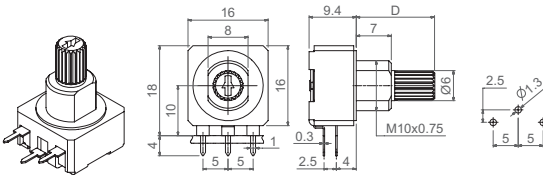
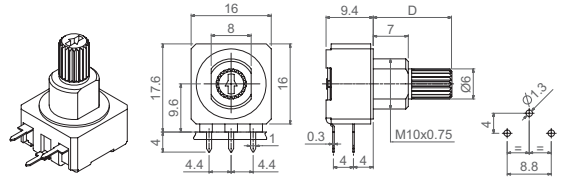
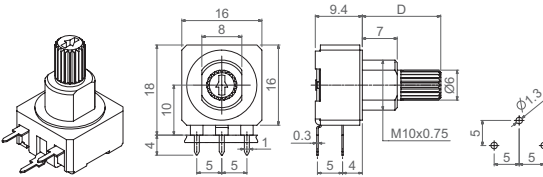
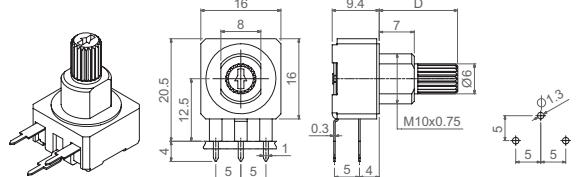
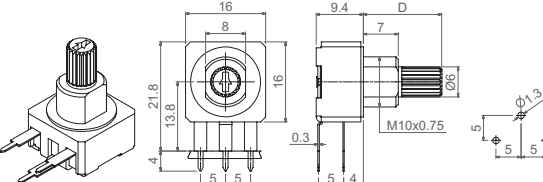
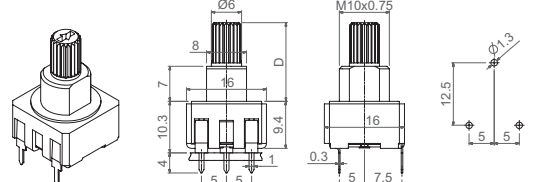
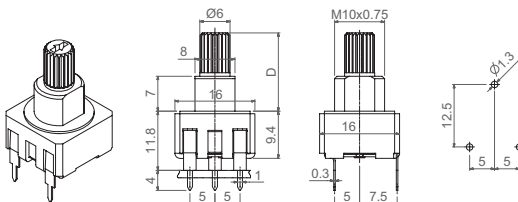
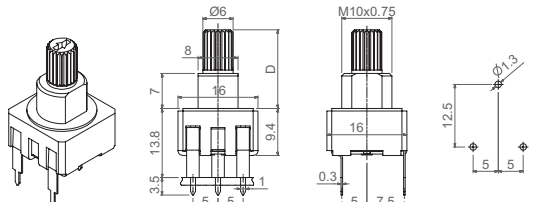
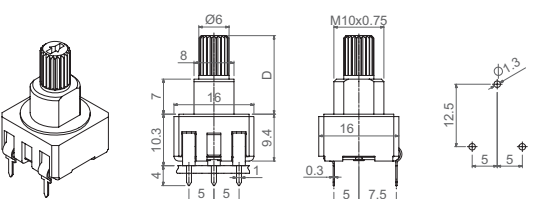
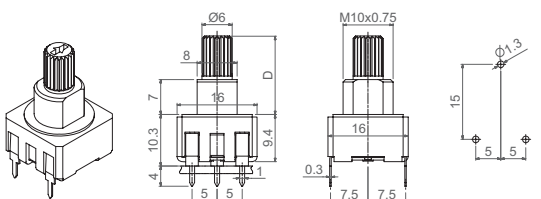
|  |                        |
|--|------------------------|
| Assembled from terminal side                                       | WT                     |
| Accessory Reference  | -XXXXX                 |
| See list of shafts and thumbwheels available                       | Example: 14187         |
| Color of shaft or thumbwheel                                       | -YY Example, white: BA |
| Non self-extinguishable. Self-extinguishable according to standard | (leave blank)          |
| UL 94 (-V0 in box 17 modifies only the accessory, please, note.)   | -V0                    |

## Color chart for rotor, housing and accessories

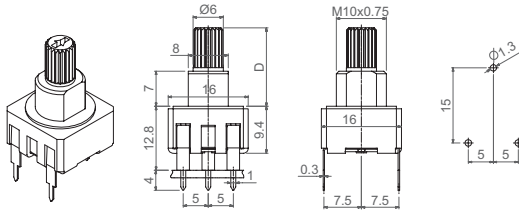
|                      |       |         |         |     |       |        |      |      |       |
|----------------------|-------|---------|---------|-----|-------|--------|------|------|-------|
| Black <sup>(1)</sup> | White | Neutral | Transp. | Red | Green | Yellow | Blue | Grey | Brown |
| NE  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

(1) black is not an option for housings.

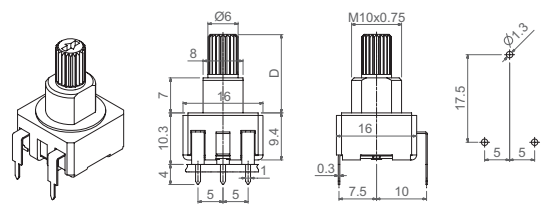
All models shown here have shaft 14187, but other shafts can be chosen from the list below. The D dimension indicated on the drawings refers to the possible length of the shaft, to be chosen at "shafts" section. Potentiometers are sold separately from the nuts and washers.

**H0**

**HC0**

**H2,5**

**H4**

**H5**

**HA5**

**HL5**

**V12,5**

**VA12,5**

**VL12,5**

**VR12,5**

**V15**


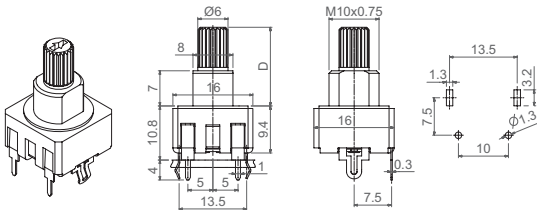
VJ15



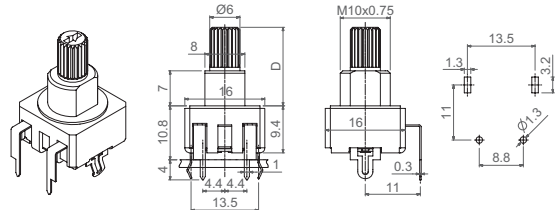
V17,5



VD7,5



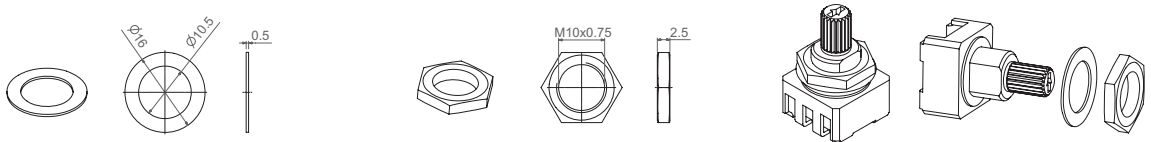
VD11



Nut

Washer

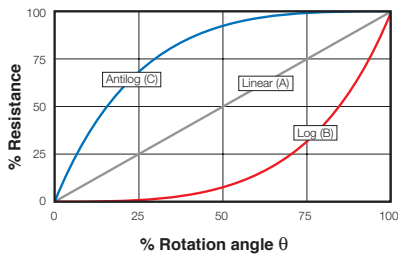
Nut and washer assembly indication



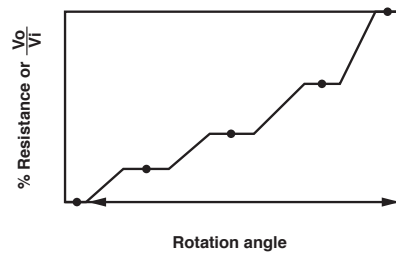
## Tapers

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

REGULAR TAPERS



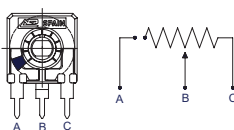
SPECIAL TAPERS



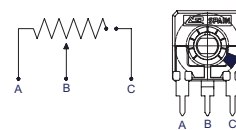
## Potentiometers with cut track

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

PCI



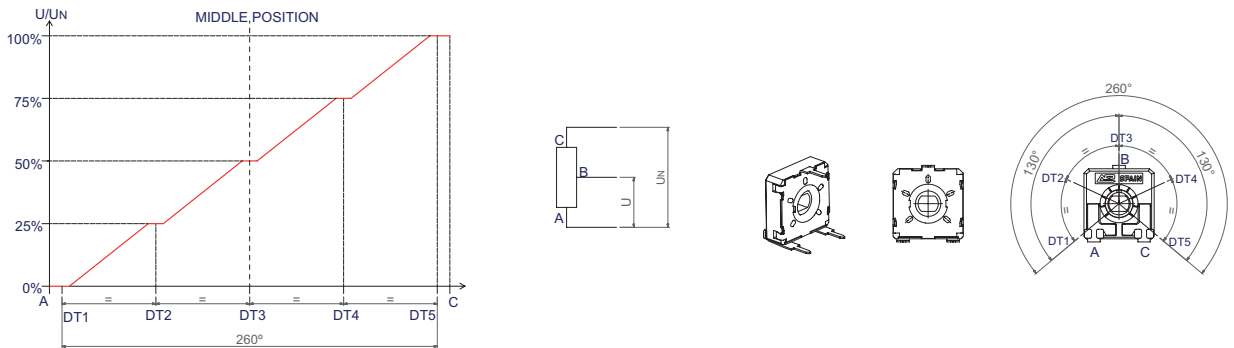
PCF



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

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

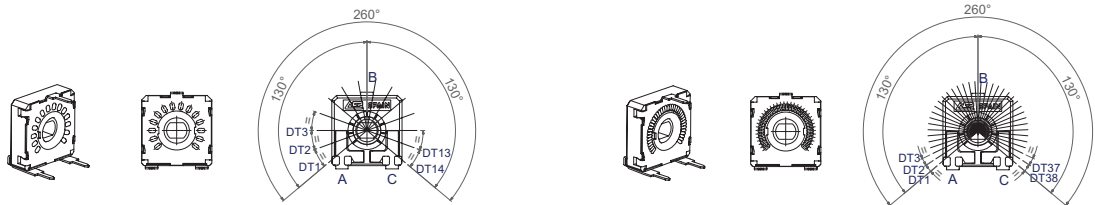
**Example of 5DT with control of value in each DT.**



Examples of some potentiometers with detents:

**14DT**

**38DT**



|  |   |
|--|---|
| Number of standard detents (evenly distributed) already available.                                 | 1 (Initial, final or central), 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 17, 22, 27, 38. |
| Maximum number of detents for feeling only   | 38  |
| Maximum number of detents when the voltage value in each detent is controlled and non-overlapping. | 14  |

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

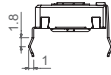
For potentiometers with detents, mechanical life is also 1.000 cycles if no additional cycles are mentioned. Up to 10.000 cycles are available. Please, indicate the number of cycles needed with LV (number of cycles), for example: LV10, for 10.000 cycles.

When needing a special number of detents or matching taper, a drawing is kindly requested.

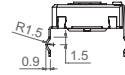
## Terminals

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

### SNP



### SNR



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

### Standard Terminal

### Shorter terminal, for V12,5 TP30

### Shorter terminal, TPXX (under request)



## Adjustment and orientation

Should the shaft need to be positioned differently than shown on the “models” section on this catalogue, a drawing with the exact position is kindly requested.

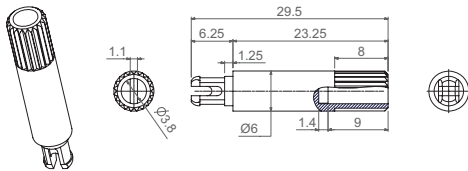
## Shafts

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

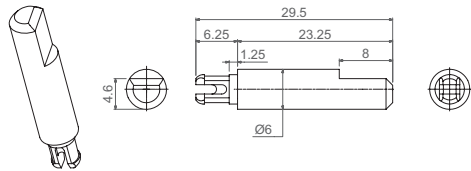
D dimension is the distance from the housing to the top of the shaft, as shown in the different models.

| Shaft       | 14081 | 14187 | 14067 | 14008 | 14015 | 14066 | 14084 | 14250 | 14072 | 14073 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| D Dimension | 15.2  | 15.7  | 24.7  | 20.2  | 20.2  | 20.45 | 20.45 | 21.95 | 28.7  | 35.45 |

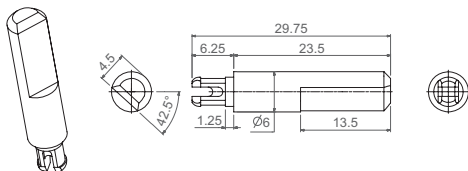
### 14008



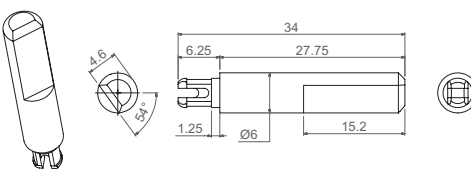
### 14015



### 14066

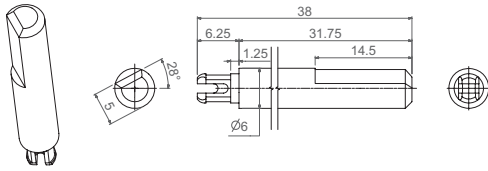


### 14067

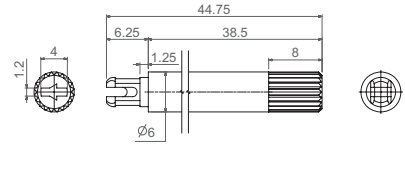


## Shafts

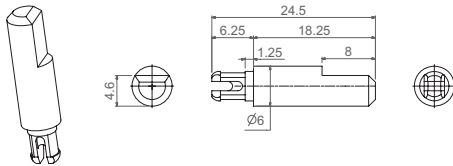
14072



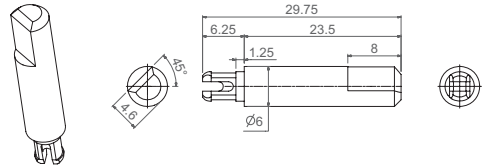
14073



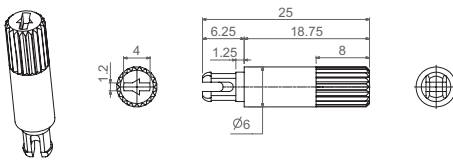
14081



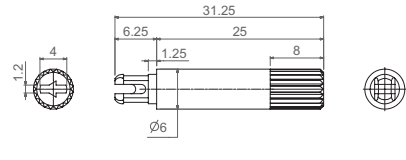
14084



14187



14250



## Packaging

| Potentiometer model  | With shaft or thumbwheel inserted? | Pieces per bigger box (250 x 150 x 70, CG on description) |
|--|------------------------------------|---|
| H0 - HC0 - H2,5 - H4 - H5 - HA5 - HL5<br>V12,5 - V15 - VA12,5 - VL12,5 - VR12,5<br>VJ15 - V17,5 - VD11 - VD7,5 | With any shaft.                    | 150   |



## Electric Specifications

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

|  | MCA14 Through-hole   | MCE14 Through-hole  |
|--|--|---|
| Range of resistance values*<br>Lin (A)<br>Log (B) Antilog (C)                                      | $100\Omega \leq R_n \leq 5M\Omega$<br>$1 K\Omega \leq R_n \leq 2M2\Omega$      | $100\Omega \leq R_n \leq 5M\Omega$<br>$1 K\Omega \leq R_n \leq 2M2\Omega$ |
| Tolerance*<br>Rn < 100Ω:<br>100Ω ≤ Rn ≤ 100KΩ:<br>100K < Rn ≤ 1MΩ:<br>1MΩ < Rn ≤ 5MΩ:<br>Rn > 5MΩ: | +50%, -30% (out of range)<br>±20%<br>±20%<br>±30%<br>+50%, -30% (out of range) | -<br>±20%<br>±20%<br>±30%<br>-  |
| Variation laws   | Lin (A), Log (B), Antilog (C). Other tapers available on request               |   |
| Residual resistance  | Lin (A), Log (B), Antilog (C) ≤ 5*10 <sup>-3</sup> *Rn. Minimum value 2Ω       | ≤2Ω   |
| CRV - Contact Resistance<br>Variation (dynamic)  | ≤3%Rn  |   |
| CRV - Contact Resistance Variation (static)  | ≤5%Rn  |   |
| Maximum power dissipation**<br>Lin (A)<br>Log (B), Antilog (C)                                     | at 50°C<br>0.25W<br>0.13W  | at 70°C.<br>0.7W<br>0.30W   |
| Maximum voltage<br>Lin (A)<br>Log (B), Antilog (C)   | 250VDC<br>200VDC   |   |
| Operating temperature  | -25°C ... +70°C (+85°C on request)   | -40°C ... +90°C (+125°C on request)                                       |
| Temperature coefficient<br>100Ω ≤ Rn ≤ 10KΩ<br>10KΩ < Rn ≤ 5MΩ                                     | +200/-300 ppm<br>+200/-500 ppm   | ±100 ppm<br>±100 ppm  |

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

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

## Mechanical Specifications

|                                  | MCA14 Through-hole   | MCE14 Through-hole |
|----------------------------------|--|--------------------|
| Resistive element                | Carbon technology  | Cermet             |
| Angle of rotation (mechanical)   | 265° ± 5°  |                    |
| Angle of rotation (electrical)   | 245° ± 20°   |                    |
| Wiper standard delivery position | 50% ± 15°  |                    |
| Max. stop torque                 | 10 Ncm   |                    |
| Max. push/pull on rotor          | 50 N   |                    |
| Wiper torque*                    | <2.5 Ncm<br>Potentiometers with detents: <3.5 Ncm              |                    |
| Mechanical life                  | 1.000 cycles (many more available on request, please, inquire) |                    |

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

## Test results

The following typical test results (with 95% confidence) are given at 23°C ±2°C and 50% ±25% RH.

|                   | MCA14 Through-hole                             |                         | MCE14 Through-hole                             |                         |
|-------------------|--|-------------------------|--|-------------------------|
|                   | Test conditions                                | Typical variation of Rn | Test conditions                                | Typical variation of Rn |
| Damp heat         | 500 h. at 40°C and 95% RH                      | +5%, -2%                | 500 h. at 40°C and 95% RH                      | ±2%                     |
| Thermal cycles    | 16 h at 85°C, plus 2 h at -25°C                | ±2.5%                   | 16 h at 90°C, plus 2 h at -40°C                | ±2%                     |
| Load life         | 1.000 h. at 50°C                               | +0%; -5%                | 1.000 h. at 70°C                               | ±2%                     |
| Mechanical life   | 1.000 cycles at 10 c.p.m.<br>and at 23°C ± 2°C | ±3%                     | 1.000 cycles at 10 c.p.m.<br>and at 23°C ± 2°C | ±2%                     |
| Soldering effect  | 2 seconds at 350°C                             | ±1%                     | 2 seconds at 350°C                             | ±1%                     |
| Storage (3 years) | 3 years at 23°C ± 2°C                          | ±3%                     | 3 years at 23°C ± 2°C                          | ±1%                     |