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 H5MD  CA6 VSMD

Rotors

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

Shas

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.

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.

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).
### 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

### 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.

#### CCW: Off-On

#### CW: On-Off

### Packaging

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

<table>
<thead>
<tr>
<th>Potentiometer model</th>
<th>+ Shaft or thumbwheel inserted</th>
<th>Pieces per box (130 x 60 x 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2,5 - V2,5 - V5 - VS5 - HSMD - VSMD</td>
<td>- (only potentiometers)</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>6001, 6030, 6032</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>6022, 6023, 6024, 6031</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>6025, 6028</td>
<td>300</td>
</tr>
</tbody>
</table>

**Tape and reel (T&R) packaging:**

<table>
<thead>
<tr>
<th>Potentiometer model</th>
<th>+ Shaft or thumbwheel reference</th>
<th>Pieces per reel</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSMD</td>
<td>- (only potentiometers)</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>6030</td>
<td>750</td>
</tr>
</tbody>
</table>

Dimensions: Reel Ø: 330mm, Tape width: 24mm
### Electric Specifications

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

<table>
<thead>
<tr>
<th>Through-Hole</th>
<th>SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of resistance values</strong></td>
<td><strong>Range of resistance values</strong></td>
</tr>
<tr>
<td>Lin (A)</td>
<td>100Ω … 5MΩ</td>
</tr>
<tr>
<td>Log (B) Antilog (C)</td>
<td>1KΩ … 2.2 MΩ</td>
</tr>
<tr>
<td>10Ω … 1MΩ</td>
<td>100Ω – 1MΩ</td>
</tr>
<tr>
<td>1Ω … 5MΩ</td>
<td>1KΩ – 1MΩ</td>
</tr>
<tr>
<td><strong>Tolerance</strong></td>
<td><strong>Tolerance</strong></td>
</tr>
<tr>
<td>100Ω … 1MΩ</td>
<td>±20%</td>
</tr>
<tr>
<td>&gt;1MΩ … 5MΩ</td>
<td>±30%</td>
</tr>
<tr>
<td>Out of range: Rn&gt; 5MΩ:</td>
<td>±50% -30%</td>
</tr>
<tr>
<td>&lt; 1MΩ</td>
<td>± 25%</td>
</tr>
<tr>
<td><strong>Special tolerances available on request</strong></td>
<td><strong>Special tolerances available on request</strong></td>
</tr>
<tr>
<td>Variation laws</td>
<td>Lin (A), Log (B), Antilog (C) Other tapers available on request</td>
</tr>
<tr>
<td>Residual resistance</td>
<td>Lin (A), Log (B), Antilog (C) ≤ 5*10^-5Rn</td>
</tr>
<tr>
<td>CRV - Contact Resistance Variation (Dynamic)</td>
<td>≤3%Rn</td>
</tr>
<tr>
<td>CRV - Contact Resistance Variation (Static)</td>
<td>≤5%Rn</td>
</tr>
<tr>
<td>Maximum power dissipation at 40°C</td>
<td>Lin (A)</td>
</tr>
<tr>
<td>No Lin (B, C)</td>
<td>0.10W</td>
</tr>
<tr>
<td>Maximum voltage at 40°C</td>
<td>100 VDC</td>
</tr>
<tr>
<td>Lin (A)</td>
<td>60VDC</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-25°C … +70°C</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>100Ω - 10KΩ → +200/-300 ppm.</td>
</tr>
<tr>
<td>&gt;10KΩ - 5MΩ</td>
<td>+200/-500 ppm</td>
</tr>
<tr>
<td>&gt;100KΩ - 1MΩ</td>
<td>+200/-1000 ppm</td>
</tr>
</tbody>
</table>

### Mechanical Specifications

<table>
<thead>
<tr>
<th>Through-Hole and SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resistive element</strong></td>
</tr>
<tr>
<td><strong>Angle of rotation (mechanical)</strong></td>
</tr>
<tr>
<td><strong>Wiper position</strong></td>
</tr>
<tr>
<td><strong>Angle of rotation (electrical)</strong></td>
</tr>
<tr>
<td><strong>Max. stop torque</strong></td>
</tr>
<tr>
<td><strong>Max. push/pull on rotor</strong></td>
</tr>
<tr>
<td><strong>Wiper torque</strong></td>
</tr>
<tr>
<td><strong>Mechanical life</strong></td>
</tr>
</tbody>
</table>

### 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.

*All specifications are given at 23°C ± 2°C and 50% ± 25% RH.*
## HOW TO ORDER

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

<table>
<thead>
<tr>
<th>Standard features</th>
<th>Extra features</th>
<th>Assembled accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series</strong></td>
<td><strong>Track</strong></td>
<td><strong>Assembly</strong></td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>CA6</td>
<td>SNP</td>
<td>WT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rotor</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Ref #</strong></th>
<th><strong>Color</strong></th>
<th><strong>Flam.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>X (Standard)</td>
<td>M</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Model and pitch</strong></th>
<th><strong>Housing</strong></th>
<th><strong>Rotor</strong></th>
<th><strong>Wiper position</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>V2,5</td>
<td>V5</td>
<td>VSS</td>
</tr>
<tr>
<td>2</td>
<td>HSMD</td>
<td>VSMD</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Resistance law / taper</strong></th>
<th><strong>Through-hole</strong></th>
<th><strong>SMD</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Taper</strong></td>
<td><strong>Lin (A)</strong></td>
<td><strong>Log (B), Antilog (C)</strong></td>
</tr>
<tr>
<td><strong>Value Rn</strong></td>
<td>100 Ω / 100</td>
<td>1KΩ / 1K</td>
</tr>
<tr>
<td></td>
<td>1KΩ / 1K</td>
<td>100Ω / 100</td>
</tr>
<tr>
<td></td>
<td>1MΩ / 1K</td>
<td>1KΩ / 1K</td>
</tr>
<tr>
<td></td>
<td>5 MΩ / 5M</td>
<td>2,2 MΩ / 2M2</td>
</tr>
<tr>
<td></td>
<td>1 MΩ / 1 MΩ</td>
<td>1 MΩ / 1 MΩ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Resistance value</strong></th>
<th><strong>Tolerance</strong></th>
<th><strong>SMD models</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Ω ≤ Rn ≤ 1 MΩ: ±20%</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>1 MΩ ≤ Rn ≤ 5 MΩ: ±30%</td>
<td>3030</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Packaging</strong></th>
<th><strong>Through-hole</strong></th>
<th><strong>SMD models</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>(blank)</td>
<td>(N.A.)</td>
</tr>
<tr>
<td>T&amp;R (Tape and reel)</td>
<td>(N.A.)/1</td>
<td></td>
</tr>
</tbody>
</table>

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

### Standard configuration
- **Dimensions:** 6mm
- **Protection:** IP 5 (dust proof)
- **Resistance:** Carbon technology
- **Color:** Blue housing with white rotor
- **Packaging:** Bulk
- **Wiper position:** at 50% ± 15º
- **Terminals:** Snap in P strongly recommended
- **Marking:** Resistive value marked on housing; others on request.

### Customized products
- A drawing is requested to order a customized product. The code assigned will include all specific specifications.
- **CA6XV5-10K CODE C00111**

### Extra features
- **Track**
- **Terminals**
- **Housing**
- **Rotor**
- **Wiper position**

### Assembled accessory
- **Assembly**
- **Ref #**
- **Color**
- **Flam.**

<table>
<thead>
<tr>
<th><strong>Track</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Housing</strong></th>
<th><strong>Rotor</strong></th>
<th><strong>Wiper position</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SNP</td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Assembly</strong></th>
<th><strong>Ref #</strong></th>
<th><strong>Color</strong></th>
<th><strong>Flam.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>WT 6030</td>
<td>-BA</td>
<td>-V0</td>
<td></td>
</tr>
</tbody>
</table>

### Through-hole SMD models
- **Through-hole**
- **SMD models**

<table>
<thead>
<tr>
<th><strong>Through-hole</strong></th>
<th><strong>SMD models</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(blank)</td>
<td>(blank)</td>
</tr>
<tr>
<td>(N.A.)/1</td>
<td>-T&amp;R</td>
</tr>
</tbody>
</table>

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

### Resistance law / taper
- **Lin - Linear**
- **Log - Logarithmic**
- **Antilog - Antilogarithmic**

- Special tapers have codes assigned: CODE YXXXXX

Please, indicate terminal position when ordering a special taper.

### Operating life (cycles)
- **Standard (1000cycles)**
- **Long life:** LV + the number of cycles, ex: LV06 for 6000 cycles

<table>
<thead>
<tr>
<th><strong>Standard</strong></th>
<th><strong>Long life</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(leave blank)</td>
<td>LV06 + 6000</td>
</tr>
</tbody>
</table>

(1) Others on request.

### Cut track
- **At beginning of track, CCW:** Off - On
- **At end of track, CW:** On - Off

<table>
<thead>
<tr>
<th><strong>Cut track</strong></th>
<th><strong>Terminals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI</td>
<td>PCF</td>
</tr>
</tbody>
</table>

### Housing color
- **Standard is blue**
- **With other colors:** -See color chart below-, for example, red CJ-color; ex: CJ-RO

<table>
<thead>
<tr>
<th><strong>Housing color</strong></th>
<th><strong>Terminals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(leave blank)</td>
<td></td>
</tr>
</tbody>
</table>

### Rotor color
- **Standard is white**
- **With other colors:** -See color chart below-, for example, red RT-color; ex: RT-RO

<table>
<thead>
<tr>
<th><strong>Rotor color</strong></th>
<th><strong>Terminals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(leave blank)</td>
<td></td>
</tr>
</tbody>
</table>
13 - Wiper position
(Standard: at 50% ± 15°) (leave blank)
Initial or CCW PI
Final or CW PF

14 - Potentiometers with assembled accessories
Assembled from front side WT
Assembled from collector side WTI
Accessory Reference XXXX
See list of shafts and thumbwheels available Example: 6030
Color of shaft or thumbwheel -YY
Example, white: -BA

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 (1) 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.

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

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 cramped (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 cramped (with “snap in”), recommended to hold the potentiometer to the board prior to the soldering operation. SMD configuration can be available on request.

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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.

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- 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.

Rotors

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

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.
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.

![Thumbwheels](image)

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.

![Terminals](image)

Adjustment possibilities

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

![Adjustment possibilities](image)

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–.

![Potentiometers with detents](image)

Complete drawings can be found on pages 78-80

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For R rotor

9002

9041

9060
For R rotor

9061

9002 9041

9060 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.

![Terminals](image)

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![Adjustment possibilities](image)

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![Potentiometers with detents](image)

Complete drawings can be found on pages 78-80
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.

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:

<table>
<thead>
<tr>
<th>Potentiometer model</th>
<th>+ Shaft or thumbwheel inserted</th>
<th>Pieces per box (130 x 60 x 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2,5 - H3,8 - H5 - HS3,8 - V7,5 - V10 - VR10 MAV10&quot; - MTV10&quot;</td>
<td>- (only potentiometers)</td>
<td>500 (models with * : 450)</td>
</tr>
<tr>
<td></td>
<td>9002</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>9004, 9005, 9006, 9009, 9010, 9018, 9039, 9041, 9047, 9048, 9051, 9066, 9059, 9063, 9064, 9055, 9060, 9061, 9063, 9064, 9067</td>
<td>200</td>
</tr>
<tr>
<td>MTX2</td>
<td>9048</td>
<td>150</td>
</tr>
<tr>
<td>MTX4</td>
<td>9039, 9051</td>
<td>75</td>
</tr>
<tr>
<td>MTX6</td>
<td>9018</td>
<td>50</td>
</tr>
<tr>
<td>MTX8</td>
<td>9056</td>
<td>40</td>
</tr>
<tr>
<td>STACKING</td>
<td>-</td>
<td>50</td>
</tr>
</tbody>
</table>

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
Lin (A) 100Ω ≤ Rn ≤ 5 MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance
Lin (A) ±20%
Log (B) Antilog (C) ±30%

Special tolerances available on request
Out of range: Rn > 5 MΩ: +50%, -30%
Out of range: Rn > 5 MΩ: +50%, -30%

Variation laws
Lin (A), Log (B), Antilog (C) and other tapers available on request

Residual resistance
Lin (A), Log (B), Antilog (C) ≤ 5*10^-3*Rn
Minimum value 2 Ω

CRV - Contact Resistance Variation (dynamic)
≤ 3% Rn

CRV - Contact Resistance Variation (static)
≤ 5% Rn

Maximum power dissipation at 40°C
Lin (A) 0.15 W
Non Lin (B, C) 0.10 W

Maximum voltage at 40°C
Lin (A) 200 V DC
Non Lin (B, C) 150 V DC

Operating temperature
-25°C ... +70°C

Temperature coefficient
100 Ω - 10 KΩ → -200' - 300 ppm.
>10 KΩ - 5 MΩ → +200' - 500 ppm

CA9. Mechanical Specifications

Resistive element
Carbon technology

Angle of rotation (mechanical)
240° ± 5°

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
220° ± 20°

Max. stop torque
5 N cm

Max. push/pull on rotor
40 N

Wiper torque
< 2 N cm
(0.4 ... 3.5 N cm for pots. with detents)

Mechanical life
1000 cycles (more available on request)
(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 // 16 h at 85°C, plus 2 h at -25°C // ±2.5%

Load life // 1,000 h. at 50°C // ±2% ... -8%

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.

CA9. Test

Test // Conditions // Typical variation of Nominal Resistance

Damp heat // 500 h. at 40°C and 95% RH // ±2%

Thermal cycles // 16 h at 90°C, plus 2 h 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 // ±3%

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

CE9. Electric Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 5 MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance
Lin (A) ±20%
Log (B) Antilog (C) ±30%

Special tolerances available on request
Out of range: Rn > 5 MΩ: +50%, -30%
Out of range: Rn > 5 MΩ: +50%, -30%

Variation laws
Lin (A), Log (B), Antilog (C) and other tapers available on request

Residual resistance
Lin (A), Log (B), Antilog (C) ≤ 5*10^-3*Rn
Minimum value 2 Ω

CRV - Contact Resistance Variation (dynamic)
≤ 3% Rn

CRV - Contact Resistance Variation (static)
≤ 5% Rn

Maximum power dissipation at 70°C
Lin (A) 0.5W
Non Lin (B, C) See note 1

Maximum voltage at 70°C
Lin (A) 200 V DC
Non Lin (B, C) See note 1

Operating temperature
-40°C ... +125°C

Temperature coefficient
±100 ppm.

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

CE9. Mechanical Specifications

Resistive element
Cermet technology

Angle of rotation (mechanical)
240° ± 5°

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
220° ± 20°

Max. stop torque
5 N cm

Max. push/pull on rotor
40 N

Wiper torque
< 2 N cm
(0.4 ... 3.5 N cm for pots. with detents)

Mechanical life
1000 cycles (more available on request)
(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 // ±2%

Thermal cycles // 16 h at 90°C, plus 2 h 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 // ±3%

For further information on tests, go to TESTS AND RELIABILITY on pages 10-11.
### Standard features

<table>
<thead>
<tr>
<th>Series</th>
<th>Rotor</th>
<th>Model</th>
<th>Packg.</th>
<th>Ohm value</th>
<th>Taper</th>
<th>Tol.</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA9/CE9</td>
<td>M</td>
<td>H2.5</td>
<td>-10K</td>
<td>A</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra features

<table>
<thead>
<tr>
<th>Track</th>
<th>Detents</th>
<th>Snap in</th>
<th>Housing</th>
<th>Rotor</th>
<th>Wiper</th>
<th>Lin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>10</td>
<td>SNP</td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assembled accessory

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Ref #</th>
<th>Color</th>
<th>Flam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT</td>
<td>9005</td>
<td>-BA</td>
<td>-V0</td>
</tr>
</tbody>
</table>

### Standard configuration

- Dimensions: 9mm
- Protection: CA9: IP 5 (dust-proof), CE9: IP 5 (dust-proof) Self-extinguishable, to meet UL 94 V-0
- Substrate: CA9: Carbon technology, CE9: Cermet
- Color: CA9: Blue housing with white rotor, CE9: Brown housing with white rotor
- Packaging: Bulk
- Wiper position: at 50% ± 15º
- Terminals: Straight, without SNAP IN
- Marking: Resistive value marked on housing. Others on request

### Customized products

A drawing is requested to order a customized product. The code assigned will include all special specifications.

- Series, rotor, model and total resistive value are given before the special code: CA9PH2,5 10K CODE C00111.

### 1 - Series

- CA9
- CE9

### 2 - Rotors

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

### 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

<table>
<thead>
<tr>
<th>Taper:</th>
<th>Lin (A)</th>
<th>Log (B), Antilog (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Rn</td>
<td>100 Ω / 100</td>
<td>1kΩ / 1K</td>
</tr>
<tr>
<td></td>
<td>5 MΩ / 5M</td>
<td>2.2 MΩ / 2M2</td>
</tr>
</tbody>
</table>

- Other resistive values available on request.

### 7 - Tolerance

- 100 Ω ≤ Rn ≤ 1 MΩ: ±20%
- 2020
- 1 MΩ ≤ Rn ≤ 5 MΩ: ±30%
- 3030

- For out of range values: Rn > 5 MΩ, tol : ±60% - 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
- SNAP
- SNAP IN J
- SNU

### 4 - Packaging

- Through-hole
- SMD models
- Bulk
- (blank),... (1)
- On request
- T/R (Tape and reel) (N.A.) (2)
- 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(1) 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 240º ±5º. 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-RD
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%; ex: LN3%
Absolute linearity controlled & below x% LAx%

17 - Flammability (according to UL 94 V-0)
- CA9: 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
- CE9: 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
<table>
<thead>
<tr>
<th>STACKING</th>
<th>STK + ... (POTENTIOMETER CODE)</th>
<th>Example: STK+CA9MH2,5-10KA2020 (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GANGED</td>
<td>MTX + [number of potentiometers: 2, 4, 6, 8] + ... (POT. CODE + ASSEMBLED SHAFT CODE)</td>
<td>Example: MTX4+CA9PH2,5-10KA2020 WT9051-BA (1)</td>
</tr>
</tbody>
</table>

(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 (1) 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.

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

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.
Thumbswheels

- **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.

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 position available on request.

Packaging

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

<table>
<thead>
<tr>
<th>Potentiometer model</th>
<th>+ Shaft or thumbwheel inserted (only potentiometers)</th>
<th>Pieces per box (130 x 60 x 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2,5 - H4 - H5 - HA6 - HL5 - HC0 - H0</td>
<td>14003, 14117, 14042</td>
<td>200 (models with * : 150)</td>
</tr>
<tr>
<td>V12,5 - VA12,5 - VL12,5 - V15 - V17,5 - VD11*</td>
<td>14008, 14015, 14250, 14187, 14056, 14065</td>
<td>100</td>
</tr>
<tr>
<td>VD7,5 - VR12,5</td>
<td>14066, 14067, 14072, 14073, 14081, 14084</td>
<td>75</td>
</tr>
</tbody>
</table>

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

Complete drawings can be found on pages 81-83
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 always be studied on request.

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 5 MΩ
Log (B) and Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance
100Ω : ±20%
>1 MΩ : ±30%
Out of range: Rn > 5 MΩ: +50%, -30%

Special tolerances available on request
Lin (A), Log (B), Antilog (C)
Other tapers available on request
Residual resistance < 2.5Ω
CRV - Contact Resistance Variation (dynamic) ≤3%Rn
CRV - Contact Resistance Variation (static) ≤5%Rn
Maximum power dissipation at 40°C.
Lin (A) 0.25W
Non Lin (B, C) See note 1
Maximum voltage at 40°C
Lin (A) 250VDC
Non Lin (B, C) See note 1
Operating temperature -25°C ... +70°C
Temperature coefficient ±100ppm.

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
Mechanical life 1000 cycles (more available on request)
(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
Lin (A) 100Ω ≤ Rn ≤ 5 MΩ
Log (B) and Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance
100Ω : ±20%
>1 MΩ : ±30%
Out of range: Rn > 5 MΩ: +50%, -30%

Special tolerances available on request
Lin (A), Log (B), Antilog (C)
Other tapers available on request
Residual resistance < 2.5Ω
CRV - Contact Resistance Variation (dynamic) ≤3%Rn
CRV - Contact Resistance Variation (static) ≤5%Rn
Maximum power dissipation at 40°C.
Lin (A) 0.25W
Non Lin (B, C) See note 1
Maximum voltage at 40°C
Lin (A) 250VDC
Non Lin (B, C) See note 1
Operating temperature -40°C ... +125°C
Temperature coefficient ±100ppm.

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
Mechanical life 1000 cycles (more available on request)
(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.
### Standard features

<table>
<thead>
<tr>
<th>Series</th>
<th>Rotor</th>
<th>Model</th>
<th>Packg</th>
<th>Ohm value</th>
<th>Taper</th>
<th>Tol</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>CA14/CE14</td>
<td>N</td>
<td>H2,5</td>
<td>-10K</td>
<td>A</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra features

<table>
<thead>
<tr>
<th>Track</th>
<th>Detents</th>
<th>Snap in</th>
<th>Housing</th>
<th>Rotor</th>
<th>Wiper</th>
<th>Lin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10DT</td>
<td>SNP</td>
<td>PI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assembled accessory

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Ref #</th>
<th>Color</th>
<th>Flam.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WT</td>
<td>14117</td>
<td>-BA</td>
</tr>
</tbody>
</table>

### Customized products

A drawing is requested to order a customized product. The code assigned will include all special specifications.

Series, rotor, model and total resistive value are given before the special code: CA14PH2,5 10K CODE C00111.

### Standard configuration

- **Dimensions:** 14mm
- **Protection:**
  - CA14: IP 5 (dust-proof)
  - CE14: IP 5 (dust-proof), Self-extinguishable, to meet UL 94 V-0
- **Substrate:**
  - CA14: Carbon technology
  - CE14: Cermet
- **Color:**
  - CA14: Blue housing with white rotor
  - CE14: Brown housing with white rotor
- **Packaging:**
  - Bulk
  - Wiper position: at 50% ± 15°
- **Terminals:** Straight, without SNAP IN.
- **Marking:** Resistive value marked on housing. Others on request

### Resistance value

<table>
<thead>
<tr>
<th>Taper:</th>
<th>Lin (A)</th>
<th>Log (B), Antilog (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Rn</td>
<td>100 Ω / 100</td>
<td>1KΩ / 1K</td>
</tr>
<tr>
<td></td>
<td>5 MΩ / 5M</td>
<td>2.2 MΩ / 2M2</td>
</tr>
</tbody>
</table>

Other resistive values available on request.

### Tolerance

- 100 Ω ≤ Rn ≤ 1 MΩ ± 20%
- 1 MΩ ≤ Rn ≤ 5 MΩ ± 30%

For out of range values: Rn > 5 MΩ, tol.: +50% - 30%

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

### Cut track

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

### Crimped terminals (SNAP IN)

<table>
<thead>
<tr>
<th>SNAP IN P</th>
<th>SNAP IN R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Taper law / taper

- Lin - Linear
- Log - Logarithmic
- Antilog - Antilogarithmic

Other special tapers have codes assigned: CODE YXXXXX

Please indicate terminal position when ordering a special taper.

### Operating life (cycles)

- Standard (1000 cycles): - (leave blank)
- Long life: LV + the number of cycles, ex: LV10 for 10,000 cycles

(1) Others on request.

### Detents (DT)

- One detent at the beginning: DTI
- One detent at the end: DTF

### 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

14 - Wiper

<table>
<thead>
<tr>
<th>Wiper position</th>
<th>(Standard: 50% ± 15º)</th>
<th>(leave blank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial or CCW</td>
<td>FI</td>
<td></td>
</tr>
<tr>
<td>Final or CW</td>
<td>PF</td>
<td></td>
</tr>
<tr>
<td>Others: following clock positions; at 3hours: P3H</td>
<td>PXH, ex: P3H</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wiper torque</th>
<th>(Standard: &lt;2,5Ncm)</th>
<th>(leave blank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low torque (&lt;1,5Ncm)</td>
<td>PGB</td>
<td></td>
</tr>
</tbody>
</table>

15 - Linearity

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

Absolute linearity controlled & below x% LAr%

16 - Potentiometers with assembled accessories

<table>
<thead>
<tr>
<th>Assembled from terminal side</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembled from collector side</td>
<td>WTI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessory Reference</th>
<th>XXXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>See list of shafts and thumbwheels available</td>
<td>Example: 14117</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color of shaft or thumbwheel</th>
<th>-YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example, white: BA</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>CA14:</th>
<th>Not self-extinguishable (leave blank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
<td>-V0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CE14:</th>
<th>All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-V0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black (1)</td>
<td>NE</td>
</tr>
<tr>
<td>White</td>
<td>BA</td>
</tr>
<tr>
<td>Neutral</td>
<td>IN</td>
</tr>
<tr>
<td>Transparent</td>
<td>TA</td>
</tr>
<tr>
<td>Red</td>
<td>RO</td>
</tr>
<tr>
<td>Green</td>
<td>VE</td>
</tr>
<tr>
<td>Yellow</td>
<td>AM</td>
</tr>
<tr>
<td>Blue</td>
<td>AZ</td>
</tr>
<tr>
<td>Grey</td>
<td>GS</td>
</tr>
<tr>
<td>Brown</td>
<td>MR</td>
</tr>
</tbody>
</table>

(1) Black is not an option for housings.

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

![Models](image)

<table>
<thead>
<tr>
<th>Models</th>
<th>MCA9 H2,5</th>
<th>MCE9 H2,5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MCA9 H3,8</td>
<td>MCE9 H3,8</td>
</tr>
<tr>
<td></td>
<td>MCA9 H5</td>
<td>MCE9 H5</td>
</tr>
<tr>
<td></td>
<td>MCA9 V7,5</td>
<td>MCE9 V7,5</td>
</tr>
<tr>
<td></td>
<td>MCA9 V10</td>
<td>MCE9 V10</td>
</tr>
<tr>
<td></td>
<td>MCA9 VR10</td>
<td>MCE9 VR10</td>
</tr>
</tbody>
</table>

Shafts

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

<table>
<thead>
<tr>
<th>Shafts</th>
<th>D (±0,5 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9006</td>
<td>23.3</td>
</tr>
<tr>
<td>9019</td>
<td>17.2</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>SNP</th>
<th>SNJ</th>
</tr>
</thead>
</table>

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: >10,000 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—.
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. Mechanical Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 3MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance 100Ω ... 1MΩ ±20%
>1MΩ ... 3MΩ ±30%
Out of range: Rn= ±50%, -30%

Wiper position Middle position: 50% ± 15°

Angle of rotation (electrical) 220° ± 20°

Wiper torque < 2 Ncm
(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. Mechanical Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 3MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance 100Ω ... 1MΩ ±20%
>1MΩ ... 3MΩ ±30%
Out of range: Rn= ±50%, -30%

Wiper position Middle position: 50% ± 15°

Angle of rotation (electrical) 220° ± 20°

Wiper torque < 2 Ncm
(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. Electric Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 5MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance 100Ω ... 1MΩ ±20%
>1MΩ ... 3MΩ ±30%
Out of range: Rn= ±50%, -30%

Variation laws Lin (A), Log (B), Antilog (C) Other tapers available on request

Residual resistance Lin (A), Log (B), Antilog (C) ≤ 5*10⁻³ Rn
Minimum value 2Ω

CRV - Contact Resistance Variation (dynamic) ≤3% Rn
CRV - Contact Resistance Variation (static) ≤5% Rn

Maximum power dissipation at 40° C.
Lin (A) 0.15W
Non Lin (B, C) 0.10W

Maximum voltage at 40° C.
Lin (A) 200VDC
Non Lin (B, C) 150VDC

Operating temperature -25°C ... +70°C

Temperature coefficient 100Ω - 10KΩ: -200/ +300 ppm.
>10KΩ - 5MΩ: ±200/ -500 ppm

MCE9. Electric Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 5MΩ
Log (B) Antilog (C) 1 kΩ ... 2.2 MΩ

Tolerance 100Ω ... 1MΩ ±20%
>1MΩ ... 3MΩ ±30%
Out of range: Rn= ±50%, -30%

Variation laws Lin (A), Log (B), Antilog (C) Other tapers available on request

Residual resistance Lin (A), Log (B), Antilog (C) ≤ 5*10⁻³ Rn
Minimum value 2Ω

CRV - Contact Resistance Variation (dynamic) ≤3% Rn
CRV - Contact Resistance Variation (static) ≤5% Rn

Maximum power dissipation at 40° C.
Lin (A) 0.5W
Non Lin (B, C) See note 1

Maximum voltage at 40° C.
Lin (A) 200VDC
Non Lin (B, C) See note 1

Operating temperature -40°C ... +125°C

Temperature coefficient ±100ppm.

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

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 // ±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.

MCE9. Test

Test // Conditions // Typical variation of Nominal Resistance

Damp heat // 500 h. at 40°C and 95% RH // ±2%

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

Load life // 1,000 h. at 40°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 // ±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

<table>
<thead>
<tr>
<th>Series</th>
<th>Rotor</th>
<th>Model</th>
<th>Pacq</th>
<th>Ohm value</th>
<th>Taper</th>
<th>Tol</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA9/MCE9</td>
<td>D</td>
<td>H5</td>
<td>-10K</td>
<td>A</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra features

<table>
<thead>
<tr>
<th>Track</th>
<th>Detents</th>
<th>Snap in</th>
<th>Housing</th>
<th>Rotor</th>
<th>Wiper</th>
<th>Lin</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNP</td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assembled accessory

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Ref #</th>
<th>Color</th>
<th>Flam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT</td>
<td>9006</td>
<td>-BA</td>
<td></td>
</tr>
</tbody>
</table>

### Standard configuration

- **Dimensions:** 9mm
- **Protection:**
  - MCA9: IP 5 (dust-proof)
  - MCE9: IP 5 (dust-proof) Self-extinguishable, to meet UL 94 V-0
- **Substrate:**
  - MCA9: Carbon technology
  - MCE9: Cermet
- **Color:**
  - MCA9: Blue housing with white rotor
  - MCE9: Brown housing with white rotor
- **Packaging:** Blister
- **Wiper position:** at 50% ±15°
- **Terminals:** Straight, without SNAP IN.
- **Marking:** Resitive value marked on housing. Others on request.

### Customized products

A drawing is requested to order a customized product. The code assigned will include all special specifications.

- **Series, rotor, model and total resistive value are given before the special code:** MCA9DH2,5 10K CODE C00111.

### 1 - Series

- **MCA9**
- **MCE9**

### 2 - Rotors

| D |

### 3 - Model and pitch

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

### 4 - Packaging

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

### 5 - Resistance value

<table>
<thead>
<tr>
<th>Taper:</th>
<th>Lin (A)</th>
<th>Log (B), Antilog (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Rn</td>
<td>100 Ω / 100</td>
<td>1KΩ / 1K</td>
</tr>
<tr>
<td></td>
<td>... / ...</td>
<td>... / ...</td>
</tr>
<tr>
<td></td>
<td>5 MΩ / 5M</td>
<td>2,2 MΩ / 2M2</td>
</tr>
</tbody>
</table>

*Other resistive values available on request.*

### 6 - Resistance law / taper

<table>
<thead>
<tr>
<th>Lin</th>
<th>Log - Logarithmic</th>
<th>Antilog - Antilogarithmic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B (on request for CE)</td>
<td>C (on request for CE)</td>
</tr>
</tbody>
</table>

- **Special tapers have codes assigned:** CODE Y0000X

*Please, indicate terminal position when ordering a special taper.*

### 7 - Tolerance

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

### 8 - Operating life (cycles)

<table>
<thead>
<tr>
<th>Standard (10,000cycles)</th>
<th>Long life: LV + the number of cycles, ex: LV45 for 45000 cycles[1]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LVXX: ex: LV45</th>
</tr>
</thead>
</table>

*(1) Others on request.*

### 9 - Cut track

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

### 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° or 5°. Others on request.*

### 11 - Crimped terminals (SNAP IN)

<table>
<thead>
<tr>
<th>SNAP IN P</th>
<th>SNAP IN J</th>
</tr>
</thead>
</table>

### 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-RD*
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% LAr%

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

- MCA9: 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
- MCE9: 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 3 hours: P3H PXH, ex: P3H

16 - Assembled accessories

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

Color chart for rotor, housing and accessories

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>NE</td>
</tr>
<tr>
<td>White</td>
<td>BA</td>
</tr>
<tr>
<td>Neutral</td>
<td>IN</td>
</tr>
<tr>
<td>Transparent</td>
<td>TA</td>
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<td>Red</td>
<td>RO</td>
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<td>MR</td>
</tr>
</tbody>
</table>

(1) Black is not an option for housings.

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MCA14
Control
Carbon
Potentiometers
CA

MCE14
Control
Cermet
Potentiometers
CE

www.acptechnologies.com
**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.

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- 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.
Models

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

Shafts

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

<table>
<thead>
<tr>
<th>Shafts</th>
<th>D (±0,5mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14008</td>
<td>20,6</td>
</tr>
<tr>
<td>14015</td>
<td>20</td>
</tr>
<tr>
<td>14066</td>
<td>20,6</td>
</tr>
<tr>
<td>14067</td>
<td>24,8</td>
</tr>
<tr>
<td>14072</td>
<td>28,8</td>
</tr>
<tr>
<td>14073</td>
<td>35,5</td>
</tr>
<tr>
<td>14081</td>
<td>15,2</td>
</tr>
<tr>
<td>14084</td>
<td>20,2</td>
</tr>
<tr>
<td>14187</td>
<td>15,6</td>
</tr>
<tr>
<td>14250</td>
<td>22</td>
</tr>
</tbody>
</table>

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.
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: >10,000 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:

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
Lin (A) 100Ω ≤ Rn ≤ 5MΩ
Log (B) Antilog (C) 1 KΩ ... 2,2 MΩ

Tolerance
100Ω ... 1MΩ ±20%
>1MΩ ... 5MΩ ±30%

Special tolerances on request
Out of range: Rn> 5MΩ: +50%, -30%

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
245° ± 20°

Wiper torque
< 2 Ncm (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. Mechanical Specifications

Resistive element
Carbon technology

Angle of rotation (mechanical)
265° ± 5°

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
245° ± 20°

Wiper torque
< 2 Ncm (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. Electric Specifications

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

Range of resistance values
Lin (A) 100Ω ≤ Rn ≤ 5MΩ
Log (B) Antilog (C) 1 KΩ ... 2,2 MΩ

Tolerance
100Ω ... 1MΩ ±20%
>1MΩ ... 5MΩ ±30%

Special tolerances on request
Out of range: Rn> 5MΩ: +50%, -30%

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
245° ± 20°

Wiper torque
< 2 Ncm (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. Mechanical Specifications

Resistive element
Cermet

Angle of rotation (mechanical)
265° ± 5°

Wiper position
Middle position: 50% ± 15°

Angle of rotation (electrical)
245° ± 20°

Wiper torque
< 2 Ncm (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

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.

Note 1: Value depends on taper, please, inquire.
### HOW TO ORDER

**EXAMPLE:** MCA14NH2,5-10K2020 SNP PI WT14187-BA

**EXAMPLE:** MCE14NH2,5-10K2020 SNP PI WT14187-BA-V0

### Standard features

<table>
<thead>
<tr>
<th>Series</th>
<th>Rotor</th>
<th>Model</th>
<th>Pacg</th>
<th>Ohm value</th>
<th>Taper</th>
<th>Tol</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA14/MCE14</td>
<td>N</td>
<td>H2,5</td>
<td>10K</td>
<td>A</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra features

<table>
<thead>
<tr>
<th>Track</th>
<th>Detents</th>
<th>Snap in</th>
<th>Housing</th>
<th>Rotor</th>
<th>Wiper</th>
<th>Lin</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>SNP</td>
<td>PI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assembled accessory

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Ref #</th>
<th>Color</th>
<th>Flam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT</td>
<td>14187</td>
<td>-BA</td>
<td></td>
</tr>
</tbody>
</table>

### Standard configuration

- **Dimensions:** 14mm
- **Protection:**
  - MCA14: IP 5 (dust-proof)
  - MCE14: IP 5 (dust-proof) Self-extinguishable, to meet UL 94 V-0
- **Substrate:**
  - MCA14: Carbon technology
  - MCE14: Cermet
- **Color:**
  - MCA14: Blue housing with white rotor, black shaft
  - MCE14: Brown housing with white rotor, black shaft
- **Packaging:** Blister
- **Wiper position:** at 50% ±15°
- **Mech. life:** 10,000cycles
- **Terminals:** Straight, without SNAP IN.
- **Marking:** Resisting value marked on housing. Others on request.

### 1 - Series

- MCA14
- MCE14

### 2 - Rotors

| N |

### 3 - Model and pitch

<table>
<thead>
<tr>
<th>H0</th>
<th>HC0</th>
<th>H2,5</th>
<th>H4</th>
<th>H5</th>
<th>HA5</th>
<th>HL5</th>
</tr>
</thead>
<tbody>
<tr>
<td>V12,5</td>
<td>VA12,5</td>
<td>VL12,5</td>
<td>V15</td>
<td>V17,5</td>
<td>VD7,5</td>
<td>VD11</td>
</tr>
</tbody>
</table>

### 4 - Packaging

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

### 5 - Resistance value

<table>
<thead>
<tr>
<th>Taper:</th>
<th>Lin (A)</th>
<th>Log (B), Antilog (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Rn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100Ω / 100</td>
<td>1KΩ / 1K</td>
<td></td>
</tr>
<tr>
<td>... / ...</td>
<td>... / ...</td>
<td></td>
</tr>
<tr>
<td>5MΩ / 2MΩ</td>
<td>2,2MΩ / 2MΩ</td>
<td></td>
</tr>
</tbody>
</table>

- Other resistive values available on request.

### 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.

### 7 - Tolerance

- 100Ω ≤ Rn ≤ 1MΩ: ±20%
- 1 MΩ ≤ Rn ≤ 5MΩ: ±30%

- For out of range values: Rn > 5MΩ, tol: +50% - 30%

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

### 8 - Operating life (cycles)

- Standard (10,000cycles) [leave blank]
- Long life: LV + the number of cycles, ex: LV45 for 45000 cycles(1)
- LVXX: ex: LV45

(1) Others on request.

### 9 - Cut track

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

### 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.

### 11 - Crimped terminals (SNAP IN)

- SNAP IN P
- SNAP IN R

### 12 - Housing color

- MCA14: standard is blue
- MCE14: standard is brown

With other colors -see color chart below-, for example, red CJ-color, ex: CJ-RD
### 13 - Rotor color

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

### 15 - Linearity

<table>
<thead>
<tr>
<th>Independent linearity controlled &amp; below x%, for example, 3%: LN3%</th>
<th>LNx%; ex: LN3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute linearity controlled &amp; below x%</td>
<td>LAx%</td>
</tr>
</tbody>
</table>

### 16 - Assembled accessories

<table>
<thead>
<tr>
<th>Assembled</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft reference</td>
<td>14XXX Example: 14187</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color of shaft (standard is black)</th>
<th>-YY Example: BA</th>
</tr>
</thead>
</table>

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

- **MCA14:** 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
- **MCE14:** All accessories assembled with cermet potentiometers will have the self-extinguishable property according to standard UL 94 -V0

### Color chart for rotor, housing and accessories

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>NE</td>
</tr>
<tr>
<td>White</td>
<td>BA</td>
</tr>
<tr>
<td>Neutral</td>
<td>IN</td>
</tr>
<tr>
<td>Transparent</td>
<td>TA</td>
</tr>
<tr>
<td>Red</td>
<td>RO</td>
</tr>
<tr>
<td>Green</td>
<td>VE</td>
</tr>
<tr>
<td>Yellow</td>
<td>AM</td>
</tr>
<tr>
<td>Blue</td>
<td>AZ</td>
</tr>
<tr>
<td>Grey</td>
<td>GS</td>
</tr>
<tr>
<td>Brown</td>
<td>MR</td>
</tr>
</tbody>
</table>

(1) Black is not an option for housings.

Specifications on this catalogue are for reference only; they are subject to change without notice.
Specifications on this catalogue are for reference only; they are subject to change without notice.
Tolerances 6 mm (in mm.):

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>Tolerance Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0.1</td>
</tr>
<tr>
<td>1...&lt;5</td>
<td>±0.3</td>
</tr>
<tr>
<td>5...</td>
<td>±0.5</td>
</tr>
</tbody>
</table>

Shafts. CA6

6022

6024

6028

6023

6025

6031

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Specifications on this catalogue are for reference only; they are subject to change without notice.
**DRAWINGS CA9 // CE9**

**Tolerances 9 mm (in mm.):**

<table>
<thead>
<tr>
<th>Range</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0,1</td>
</tr>
<tr>
<td>1...&lt;5</td>
<td>±0,3</td>
</tr>
<tr>
<td>5...</td>
<td>±0,5</td>
</tr>
</tbody>
</table>

**Thumbwheels. CA9 // CE9**

**View A**

**Shafts. CA9 // CE9**

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Tolerances 14 mm (in mm.):

<table>
<thead>
<tr>
<th>Range</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0,1</td>
</tr>
<tr>
<td>1...&lt;10</td>
<td>±0,3</td>
</tr>
<tr>
<td>10...</td>
<td>±0,5</td>
</tr>
</tbody>
</table>

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.):

<table>
<thead>
<tr>
<th></th>
<th>±0.1</th>
<th>±0.3</th>
<th>±0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1...10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model types. CA14 // CE14

CA14 VR12,5 // CE14 VR12,5

CA14 VR15 // CE14 VR15

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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Tolerances 9 mm (in mm.):

<table>
<thead>
<tr>
<th>Range</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0,1</td>
</tr>
<tr>
<td>1...&lt;5</td>
<td>±0,3</td>
</tr>
<tr>
<td>5...</td>
<td>±0,5</td>
</tr>
</tbody>
</table>

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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Tolerances 14 mm (in mm.):

<table>
<thead>
<tr>
<th>Range</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0.1</td>
</tr>
<tr>
<td>1...&lt;10</td>
<td>±0.3</td>
</tr>
<tr>
<td>10...</td>
<td>±0.5</td>
</tr>
</tbody>
</table>

Model types. MCA14 // MCE14

MCA14 H0 // MCE14 H0

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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Tolerances 14 mm (in mm.):

<table>
<thead>
<tr>
<th>Value</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>±0.1</td>
</tr>
<tr>
<td>1...&lt;10</td>
<td>±0.3</td>
</tr>
<tr>
<td>10...</td>
<td>±0.5</td>
</tr>
</tbody>
</table>

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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Tolerances 14 mm (in mm.):

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

Shafts. MCA14 // MCE14

14081

14084

14187

14250

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