







CARBON - MCA9

9mm 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.
- Positioning of the wiper (standard is at 50% rotation).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 20 detents available).
- Self-extinguishable plastic parts, according to UL 94 V-0.

Applications

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

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

CERMET - MCE9

9mm 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 20 detents available).

Applications

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

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

MCA9 ▲ MCE9 ▲ HOW TO ORDER

EXAMPLE: MCA9DH5-10KA2020 SNP PI WT-9020-NE

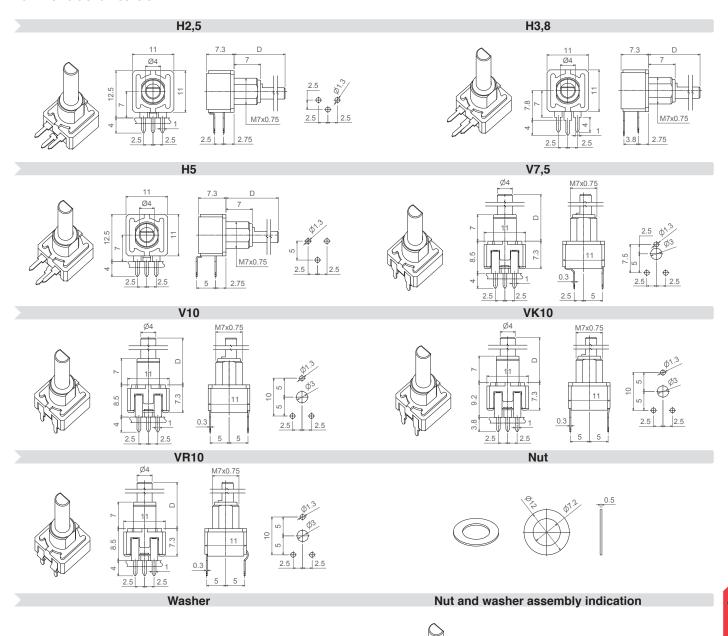
EXAMPLE: MCE9DH5-10KA2020 SNP PI WT-9020-NE-V0

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

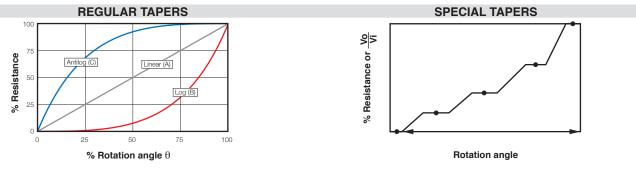
(1) black is not an option for housings.

All models shown here have shaft 9020, but other shafts can be chosen from the list below (Page 71). 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.



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.-





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.

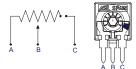
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

Other positions are available on request.

PCF PCI





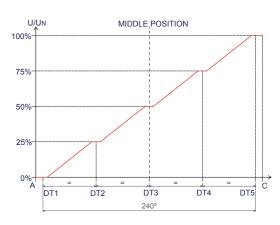




ACP's patented detent (DT) feature is especially suitable for control applications where the end user will turn a knob inserted in the potentiometer. Detents can be used to add a click feeling to the turning of the potentiometer or to control the position in which the wiper is placed, assuring a particular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

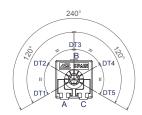
Example of 5DT with control of value in each DT.









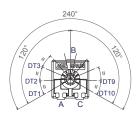


Other examples of potentiometers with detents:

10DT **20DT**













Number of standard detents (evenly distributed) already available.	1 (initial or final), 2 DT (initial and final),
	3, 4, 5, 6, 7, 8,10, 20.
Maximum number of detents for feeling only	20
Maximum number of detents when the voltage value in each detent is controlled and non-overlapping.	10

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

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

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 "SNJ"), to better hold the component to the PCB during the soldering operation.

SNP SNJ





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

Standard Terminal

Shorter terminal, for H5 TP25

Shorter terminal, TPXX (under request)







Possibilities for insertion of accessories

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.

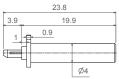
D dimension is the distance from the housing to the top of the shaft, as shown in the different models.

Shaft	9019	9020
D Dimension	17.5	23.5

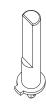
9019 9020



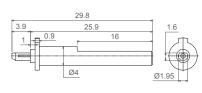












Packaging

Potentiometer model	With shaft or thumbwheel inserted?	Pieces per bigger box (250 x 150 x 70, CG on description)
H2,5 - H3,8 - H5 V7,5 - V10 - VK10 - VR10	9019, 9020	500



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

MCA9 Through-hole

MCE9 Through-hole

Range of resistance values* Lin (A) Log (B) Antilog (C)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω			
Tolerance* $ \begin{array}{l} Rn < 100\Omega : \\ 100\Omega \leq Rn \leq 100K\Omega \\ 100K < Rn \leq 1M\Omega : \\ 1M\Omega < Rn \leq 5M\Omega : \\ Rn > 5M\Omega : \\ \end{array} $	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±20% ±20% ±30%			
Variation laws	Lin (A), Log (B), Antilog (C). Oth	ner tapers available on request			
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5*10-3*Rn. Minimum value 2Ω	≤2Ω			
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle Other tapers, p				
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 220°±20° ≤ 5%Rn. Other tapers, please inquire				
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.15W 0.10W	at 70° C. 0.5W 0.20W			
Maximum voltage Lin (A) Log (B), Antilog (C)	150VDC 200VDC	200VDC			
Operating temperature	-25°C +70°C (+85°C on request)	-40°C +90°C (+125°C on request)			
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm			

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

Mechanical Specifications

Орестичной	MCA9 Through-hole	MCE9 Through-hole		
Resistive element	Carbon technology	Cermet		
Angle of rotation (mechanical)	240°	± 5°		
Angle of rotation (electrical)	220°	± 20°		
Wiper standard delivery position	50% ± 15°			
Max. stop torque	5 Ncm			
Max. push/pull on rotor	40 N			
Wiper torque*	<2 Ncm Potentiometers with detents: <2.5 Ncm			
Mechanical life	1.000 cycles (many more availa	able on request, please, inquire)		

^{*} Stronger or softer torque feeling is available on request.



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

MCA9 Through-hole

MCE9 Through-hole

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

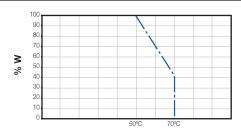
^{**} Dissipation of special tapers will vary, please, inquire.

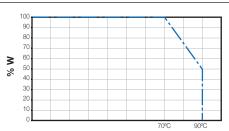


MCA9 Through-hole

MCE9 Through-hole

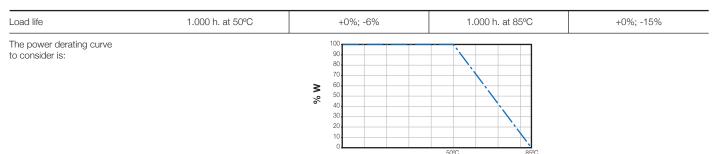






For temperatures out of range

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



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

