



CARBON – CA6 🕅

6mm carbon potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials can be self-extinguishable according to UL 94 V-0 under request.

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

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

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

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

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

Applications

6mm potentiometers are mainly used in trimming applications, in different markets:

- Industrial: Timers and relays, dimmers, adjustment of output.
- Electronic appliances: volume regulation, temperature controls and function selection.
- Automotive: Lighting regulation, dimmers.
- Measurement and test equipment.
- Telecommunication equipment (antenna amplifiers and receivers, videocomm, intercomm).
- Alarm systems.

CA6 🖪 HOW TO ORDER

CA6XV2 5-10KA2020 SNP PI WT-6030-BA

Standard feat	ures						Extra feat	ures				Assemb	led acce	essory	
Series Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Snap in	Housing	Rotor	Wiper	Assembly	Ref #	Color	Flam.
1 2	3	4	5	6	7	8	9	10	11	12	13		14		
CA6 X	V2,5		- 10K	A	2020			SNP			PI	WT	-6030	-BA	
andard configu	ration:			(CA6 Thi	rough-h	ole				C.	A6 SMD			
mensions:									6mm						
otection:							On reque		54 (dust-proof) tinguishable, to		. V-0				
ibstrate:					Carbon	technolo					echnology, s	special for h	nigh temp	perature	
olor:				Blue	e housin	g + whit	e rotor				Brown hou	using + grey	y rotor		
ickaging:								Bulk	or Tape & Re	el					
iper position:								é	at 50% ±15°						
rminals:				Snap in	P (exce	pt mode	I CA6VS5)								
arking:							Resistive v	alue marke	d on housing.	Others on re	quest.				
Series								SNAF	Terminals P IN P er tip of termina	al, TPXX, whe	ere XX is tip le	ength (under r	request)		SNP , ex: TP2
Rotors								_							
		M			Ν				Housing						
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			S5 VSN	(Under			ble)	- <u>12 - I</u> Color * Selt	Rotor : For colors othe	er than standa ble propert	rd: -See color 1, V0, for ho	chart below using and	- RT-	-color; ex	., blue: R1
2,5 HSMD V		Tre		(Under		readily availa	^{ble)}	- <u>12 - I</u> Color * Self - By de For ca	Rotor For colors othe f-extinguishal fault, carbon is r arbon: self-exting	er than standa ble propert non self-exting guishable prop	rd: -See color /, V0, for ho uishable, cern erty can be ac	chart below using and net is Self-ex dded. V0 me	- RT- rotor: (tinguishal	-color; ex	., blue: Rī (blank) V0
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 Packaging Packaging Packaging Ilk IR (Tape and 13' IR (Tape and 15' If blank, bulk packaging Resistance value 200 2000 2200 2 Resistance la Linear Logarithmic Lipecial tapers ha 	2,5 V reel) reel) is implied. (2) 100 500 4700 550 470 w / taper hmic ve codes	Trα (1 Ν.Α., Νοτ Α 500Ω 1 500Ω 1	blank) ⁽¹⁾ (N.A.) ⁽²⁾ (N.A.) ⁽²⁾ pplicable: Tap KΩ 2KΩ IK 2K d:	(Under e and Reel 500ΚΩ	equest. not 1 MΩ 1 MΩ 1 M (CODE	SMD n (blan) T& T&F s only availa 2MΩ 2M 2MΩ 2M	bile nodels R 115 Rate for SMD terminal 120 4M70 M2 4M7 5N	12 - Ι Color * Seli By de For cas and rc If only is I3 - 1 Wipe Initial Cother Wipe Low 1 Accee Accee See ii Color Color	Rotor For colors othe f-extinguishal fault, carbon is r f-extinguishal fault, carbon is r f-extinguishal for are V0. If on rotor: RT-V0 Wiper or CCW or CCW	er than standa ble property non self-exting juishable prop ly the housing andard: 509 ck positions ndard: 509 ck positions ndard: 22Ncr cm rs with asse minal side llector side re d thumbwheel le.	rd: -See color , V0, for ho uishable, cern rety can be ac needs to be v $6 \pm 15^{\circ}$) at 3 hours: n) embled acc els available	chart below using and net is Self-ex dided. V0 me (70, then CJ ⁻² P3H	- RT- rotor: titinguishal eans housi V0.	color; ex ole: (leave PXH, (leave P \ \ V Examp (leave	(blank) V0 :J-V0, RT e blank) PI ex: P3H e blank) GB VT VTI XXX e: 6030 e, white: e blank)
 Packaging Packaging Ik IR (Tape and 13' IR (Tape and 15' IF blank, bulk packaging Resistance va 200 200 220 2 Resistance la 1 - Linear g - Logarithmic titilog - Antilogariti Special tapers ha Tolerance 	2,5 V reel) reel) is implied. (2) IUE 50Ω 470Ω v50 470 w / taper hmic ve codes	Tra ((Ν.Α., Νοτ Α 500Ω 1 500 -	blank) ⁽¹⁾ (N.A.) ⁽²⁾ (N.A.) ⁽²⁾ pplicable: Tap KΩ 2KΩ IK 2K d:	Under (Under / Under /	equest. not 1 MΩ 1 MΩ 1 M (CODE	SMD n (blan) (blan) T&F 3 only availa 2MΩ 2N 2MΩ 2N 2MΩ 2N 2MΩ 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N 2N	ble) nodels () ⁽¹⁾ R 115 120 for SMD terminal 120 4M70 5M 12 4M7 5M 12 4M7 5M		Rotor For colors other f-extinguishal fault, carbon is r arbon: self-exting- tor are V0. If on rotor: RT-V0 Wiper wiper r position (Sta- or CCW or CCW or CCW rs: following clc r torque (Star torque, < 1.5N Potentiomete mbled from ter mbled from col ssory Reference ist of shafts and or of shaft or thu	er than standa ble property non self-exting guishable prop ly the housing andard: 509 andard: 509 andard: 200 cck positions ndard: <2Nor cm rs with asse minal side llector side se d thumbwheel le. cording to sta	rd: -See color 7, V0, for ho uishable, cerrr erty can be au needs to be V 6 ± 15°) at 3 hours: n) embled acc els available ndard UL 94	chart below using and net is Self-ex- dided. V0 men CJ-1 P3H P3H essories	- RT- rotor: titinguishal eans housi V0.	color; ex ole: (leave PXH, (leave P \ \ V Examp (leave	(blank) V0 V0 :J-V0, RT blank) PI ex: P3H blank) GB VT VTI XXX vII XXX vie: 6030 ole, white:
Packaging • Packaging · Ik · R (Tape and 13' · R (Tape and 15' · Resistance va · 00 2000 2200 2 · Resistance la · - Linear · - Logarithmic tilog - Antilogari · - Dierance · · Tolerance · · 0% · · 252	2,5 V reel) reel) is implied. (2) 100 500 4700 470 470 470 470 470 470 470 470 470	Tra ((Ν.Α., Not A 500Ω 1 500 - - - - - - - - - - - - - - - - - - -	blank) ⁽¹⁾ (N.A.) ⁽²⁾ (N.A.) ⁽²⁾ pplicable: Tap KΩ 2KΩ IK 2K d:	(Under / Under / Unde	equest. not 1 MΩ 1 MΩ 1 M (CODE	SMD n (blan) (blan) T&F s only availa 2MΩ 2M 2MΩ 2M 2M 2M A 3 C YXXXXXX ±10% ±10%	ble) nodels () ⁽¹⁾ R 115 120 for SMD terminal 120 4M70 5M 12 4M7 5M 12 4M7 5M		Rotor For colors other f-extinguishal fault, carbon is r arbon: self-exting tor are V0. If on rotor: RT-V0 Wiper r position (Sta or CCW or CCW or CCW rs: following clc r torque (Star torque, < 1.5N Potentiomete mbled from ter mbled from col ssory Reference st of shafts an of shaft or thu elf-extinguishable ac n box 17 modifie prdering spare	er than standa ble property on self-exting guishable prop ly the housing andard: 509 andard: 509 andard: 200 cm rs with asse minal side llector side ce d thumbwheel le. cording to sta s only the accessori	rd: -See color 7, V0, for ho uishable, cern erty can be ac needs to be V $6 \pm 15^\circ$) at 3 hours: m) embled acc els available ndard UL 94 essory, please ess:	chart below using and net is Self-ex- dided. V0 men CJ-1 P3H P3H essories	- RT- rotor: titinguishal eans housi V0.	color; ex ole: ing C (leave P XH, (leave P V V V V V V V V V V V V V V V V V V	(blank) V0 :J-V0, RT e blank) PI ex: P3H e blank) GB VTI VTI XXX ble: 6030 ble, white e blank)
 Packaging Packaging Ik R (Tape and 13' R (Tape and 13' R (Tape and 15' If blank, bulk packaging Resistance va 200 200 220 2 Resistance la a - Linear g - Logarithmic titlog - Antilogarit Special tapers ha Tolerance 20% ±25 	2,5 V reel) reel) is implied. (2) is implied. (3) is	Tra ((Ν.Α., Not A 500Ω 1 500 - - - - - - - - - - - - - - - - - - -	blank) ⁽¹⁾ (N.A.) ⁽²⁾ (N.A.) ⁽²⁾ pplicable: Tap KΩ 2KΩ IK 2K d:	(Under / Under / Unde	equest. not 1 MΩ 1 MΩ 1 M (CODE	SMD n (blan) (blan) T&F s only availa 2MΩ 2M 2MΩ 2M 2M 2M A 3 C YXXXXXX ±10% ±10%	ble) nodels () ⁽¹⁾ R 115 120 for SMD terminal 120 4M70 5M 12 4M7 5M 12 4M7 5M		Rotor For colors othe f-extinguishal fault, carbon is r arbon: self-exting- tor are V0. If on rotor: RT-V0 Wiper r position (Sta or CCW or CW r torque (Star torque, < 1.5N Potentiomete mbled from ter mbled from col ssory Reference st of shafts am elf-extinguishable ac n box 17 modifie	er than standa ble property on self-exting guishable prop ly the housing andard: 509 bck positions idard: <2Ncr cm rs with asse minal side llector side se d thumbwheel le. cording to sta s only the acc e accessori e - color- flar	rd: -See color 7, V0, for ho uishable, cern erty can be at needs to be V $6 \pm 15^\circ$) at 3 hours: n) embled acc els available ndard UL 94 essory, please es: rmability.	chart below using and net is Self-ex- ided. V0 me /0, then CJ- P3H P3H essories a, note.)	- RT- rotor: ttinguishal sans hous V0.	color; ex ole: ing C (leave P XH, (leave P V V V V V V V V V V V V V V V V V V	(blank V0 SJ-V0, R blank) Pl ex: P3H blank) GB VTT VTT QXX ble: 603C blank) V0

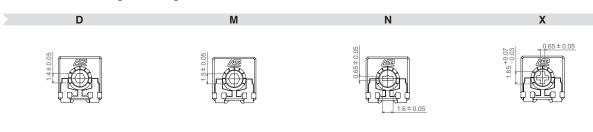
Color d	nart for	rotor, n	ousing a	nu acc	essories				
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR

black is not an option for housings.

9 - Cut Track – Open circuit.								
Open circuit at beginning of track, fully CCW	PCI							
Open circuit at end of track, fully CW	PCF							

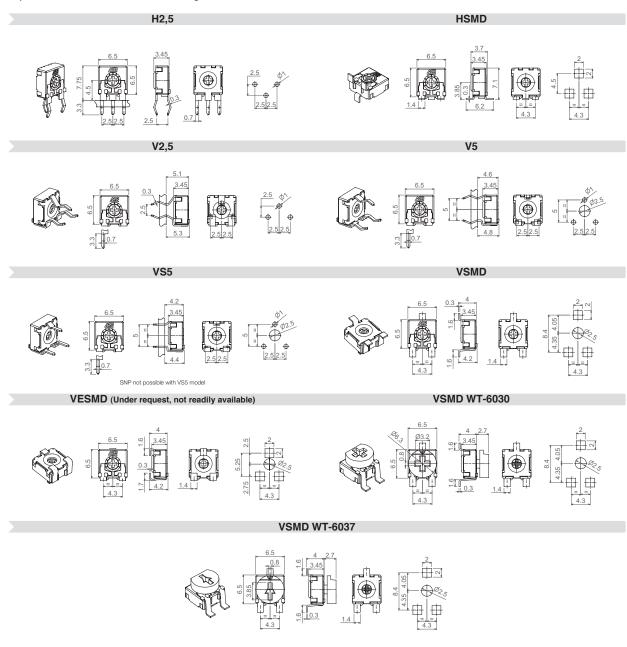
Rotors

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



Models

All models shown here have the most common rotor for 6mm potentiometers: the X rotor, which can be paired with any shaft or thumbwheel from this catalogue. Different rotors are available from the menu above.

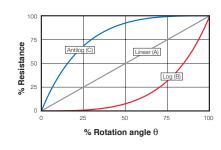


Tapers

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.

REGULAR 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. 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.



Terminals

By default, terminals are always crimped (with snap in, "SNP") to better hold the component to the PCB during the soldering operation, except for VS5, with short terminals that do not allow for SNP.

ACP can provide straight terminals if needed.



SNP

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



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

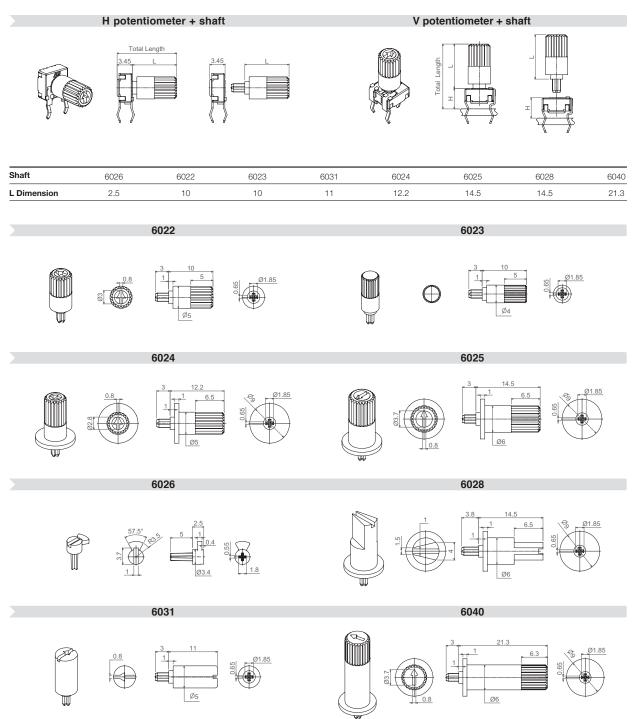
 WT Front side
 WTI Collector side
 WT Front side
 WTI Collector side

 Image: WTI Collector side
 Image: WTI Collector side
 Image: WTI Collector side
 Image: WTI Collector side

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

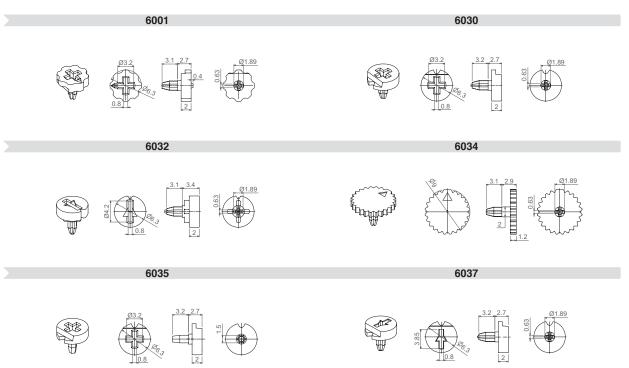
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

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



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

Thumbwheels can be mounted on the potentiometers at ACP (see models with WT-6030 or WT-6037) or sold separately. ACP can study special thumbwheel designs.

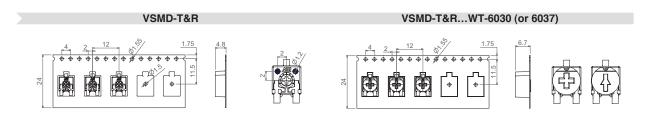


Bulk packaging:

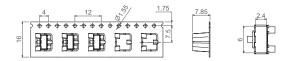
Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	1.000	4.000
H2,5 - V2,5 - V5	6001, 6030, 6032, 6037	1.000	3.000
VS5 - HSMD - VSMD	6024, 6025, 6028	300	To be determined.
	6022, 6023, 6031	500	To be determined.

Tape & Reel packaging:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
VSMD	None, only potentiometers.	1.200 pcs per reel, 12mm step between cavities.	1.700 pcs per reel, 12mm step between cavities.
UIVICV	6030 or 6037	750 pcs per reel, 12mm step between cavities.	1.100 pcs per reel, 12mm step between cavities.
HSMD	None, only potentiometers.	750 pcs per reel, 12mm step between cavities.	1.000 pcs per reel, 12mm step between cavities.
SWD	With specific thumbwheel.	Under request.	Under request.

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



HSMD-T&R





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

	CA6 Through-hole	CA6 SMD						
Range of resistance values* Lin (A) Log (B) Antilog (C)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	$\begin{array}{l} 100\Omega \leq Rn \leq 1M\Omega \\ 1 \ K\Omega \leq Rn \leq 1 \ M\Omega \end{array}$						
$\label{eq:constraint} \begin{array}{l} \text{Tolerance}^{\star} \\ & \text{Rn} < 100\Omega : \\ & 100\Omega \leq \text{Rn} \leq 100\text{K}\Omega \\ & 100\text{K} < \text{Rn} \leq 1\text{M}\Omega : \\ & 1\text{M}\Omega < \text{Rn} \leq 5\text{M}\Omega : \\ & \text{Rn} > 5\text{M}\Omega : \end{array}$	+50%, -30% (out of range)	±25% ±25% ±50%						
Variation laws	Lin (A), Log (B), Antilog (C). Oth	her tapers available on request						
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5	Lin (A), Log (B), Antilog (C) \leq 5*10-3*Rn. Minimum value 2 Ω						
CRV - Contact Resistance Variation (dynamic)	<u><</u> 39	6Rn						
CRV - Contact Resistance Variation (static)	≤5%	%Rn						
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 5 0.1 0.0							
Maximum voltage Lin (A) Log (B), Antilog (C)	100 60V							
Operating temperature	-25°C +70°C (-	+85°C on request)						
$\begin{array}{l} \text{Temperature coefficient} \\ 100\Omega \leq \text{Rn} \leq 10 \text{K}\Omega \\ 10 \text{K}\Omega < \text{Rn} \leq 5 \text{M}\Omega \end{array}$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm						

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

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

	CA6 Through-hole	CA6 SMD				
Resistive element	Carbon technology	Carbon technology				
Angle of rotation (mechanical)	235° ±	± 10°				
Angle of rotation (electrical)	$215^{\circ} \pm 20^{\circ}$					
Wiper standard delivery position	50% ±	± 15°				
Max. stop torque	4 No	cm				
Max. push/pull on rotor	9.8	N				
Wiper torque*	<2 N	lcm				
Mechanical life	1.000 cycles (others a	available on request)				

* Stronger or softer torque feeling is available on request.

lest	
resu	lts

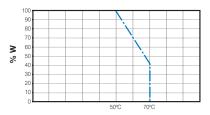
The following typical test results are given at 23°C \pm 2°C and 50% \pm 25% RH.

CA6 Through-hole and SMD

	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	+0%; -6%				
Mechanical life	1.000 cycles at 10 c.p.m. and at $23^{\circ}C \pm 2^{\circ}C$	±4%				
Soldering effect	2 seconds at 350°C	±1%				
Storage (3 years)	3 years at 23°C ± 2°C	±3%				

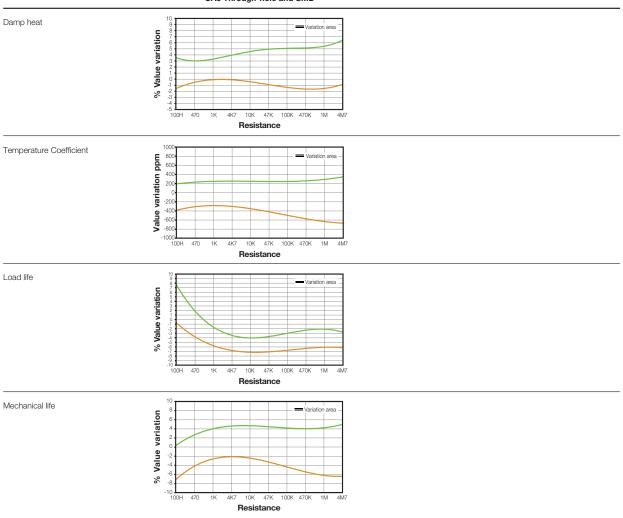
CA6 Through-hole and SMD

Power derating curve:



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

CA6 Through-hole and SMD









CARBON – CA9

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

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

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

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

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

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

Applications

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

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

CERMET – CE9 🖗

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

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

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

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

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

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

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

Applications

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

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

CA9 A CE9 A HOW TO ORDER

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

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

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

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

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

2 - Ro	otors													
С	D		J	К	K	A	М	MA	MT		P	R	Y	
3 - Mo	odel	and r	oitch											
H2,5			H3,8		HS	\$3,8		H5	(Linder re		MD ot readily a	available)	V7,5	
V10		VK1	C	VR	10	MA	V10	MTV1		VSM		MD W1	-9002	
4 - Pa	ckag	ging			-	Troug	h-hole	,		SMI	D moc	lels		
Bulk						(blar	nk) ⁽¹⁾			(b	lank) ⁽	1)		
T&R (Гаре	and 1	3" ree	el)		(N.	A.) ⁽²⁾				T&R			
T&R (1	ape	and 1	5" ree	:I)		(N.	A.) ⁽²⁾			-	F&R15			
(1) If blar	nk, bulk	packag	ing is imp	olied. (2)	N.A., No	ot Applic	able: Tape	and Reel p	ackaging	is only a	vailable fo	or SMD te	rminals	
5 - Re	sista	ance	value											
100Ω 2	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 - Re	sista	ance	law /	taper										
Lin - L	inear									A				
Log -	Loga	rithmi	с					В						
Antilog	g - Ar	ntiloga	arithmi	с				С						
- Spec	cial ta	pers	have c	codes	assigr	ned:			CODE	YXXX	XX			
7 - To	lerar	nce												
±20%			±30)%		+50%	6,-30%		±10	%		±5°	%	
2020			303	30		5	030		101		0505			
8 - Op	perat	ina L	ife (C	vcles)									
Stand		-			,						(eave b	lank)	
Long lif	e: LV	+ the I	numbe	r of cy	cles. e>	<: LV10) for 10.0	000 cycle	S. (other	s on requ	est) L\	/XX: ex	: LV10	
9 - Cı	ıt Tra	nck –	Open	circu	uit.									
						fully C	CCW			PCI				
Open	Open circuit at end of track, fully CW							PCF						
			т											
Open	eter	nts (D								DTI				
				nning										
Open 10 - D	etent	at the	e begi	nning					[DTF				

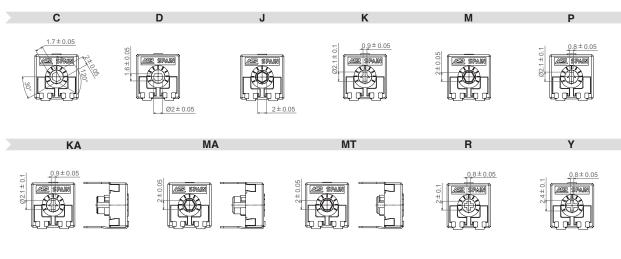
11 - Terminals				
SNAP IN P			SNF)
SNAP IN J			SNJ	
Shorter tip of terminal, TPXX, where XX is tip length (unde	er request)	TI	PXX, ex:	TP25
12 - Housing				
Color: For colors other than standard: -See color chart belo	W- (CJ-colo	or, ex., re	d: CJ-RO
13 - Rotor				
Color: For colors other than standard: -See color chart below	w- F	RT-colo	r; ex., blu	ue: RT-AZ
* Self-extinguishable property, V0, for housing an By default, carbon is non self-extinguishable, cermet is self-€ For carbon: self-extinguishable property can be added. V0 m and rotor are V0 if only the housing needs to be V0, then CJ If only rotor: RT-V0	extinguish neans hoi	nable:		lank) V0), RT-V0
14 - Wiper				
Wiper position (Standard: 50% ± 15°)			(leave bl	ank)
Initial or CCW			PI	
Final or CW			PF	
Others: following clock positions; at 3 hours: P3H		F	PXH, ex:	РЗН
Wiper torque (Standard: <2.5Ncm, for detents: <3.5)			(leave bl	ank)
Low torque, < 1.5Ncm			PGE	3
15 - Linearity				
Not controlled			(leave bl	ank)
Independent linearity controlled & below x%, for example, 39	%: LN3%	LN	lx%; ex:	LN3%
Absolute linearity controlled & below x%			LAx9	6
16 - Potentiometers with assembled accessories	;			
Assembled from terminal side			WT	
Assembled from collector side			WTI	
Accessory Reference		_	-XXXXX	
See list of shafts and thumbwheels available			ample: 9	/hite: BA
Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)	- 1		eave bla -V0	
For ordering spare accessories: Accessory reference - color- flammability. Ex. 9010-AZ-V0 is a blue self-extinguishable 9010 thur	mbwhee		XXX-YY	-V0
Color chart for rotor, housing and accessories				
Black ⁽¹⁾ White Neutral Transp. Red Green Ye	ellow	Blue	Grey	Brown
NE BA IN TA RO VE	AM	AZ	GS	MR

(1) black is not an option for housings.

Specifications on this catalog are for reference only, as they are subject to change without notice.

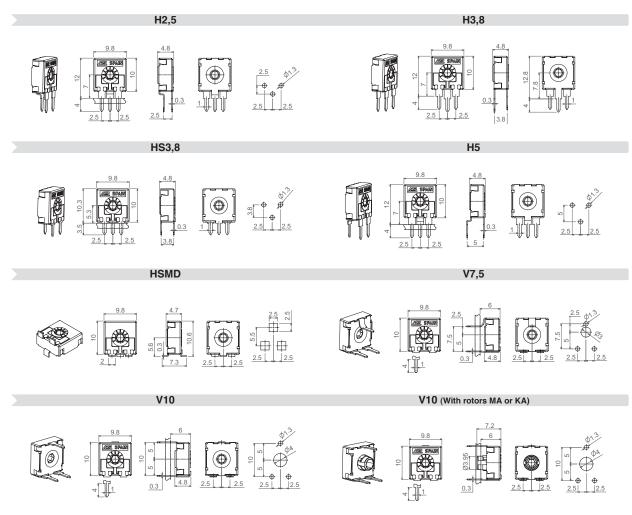
Rotors

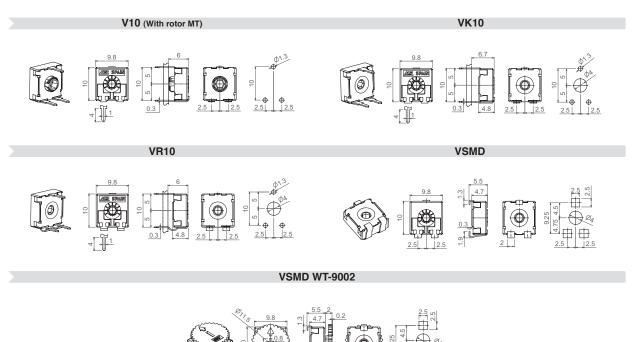
Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.



Models

All models shown here have the most common rotor for 9mm potentiometers: the M rotor, which can be paired with any shaft or thumbwheel from this catalogue. Different rotors are available from the menu above.





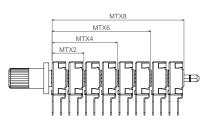
GANGED

2.5

2.5

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

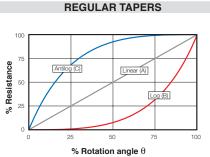
Model	MTX2	MTX4	MTX6	MTX8
Shaft	9048	9039, 9051	9018	9056



Tapers

28

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.-



SPECIAL TAPERS



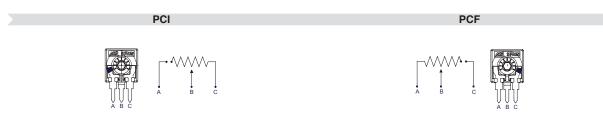
Potentiometers with cut track

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.

 $\mathsf{PCF} = \mathsf{Cut}$ at final position, when the potentiometer is turned fully clockwise.

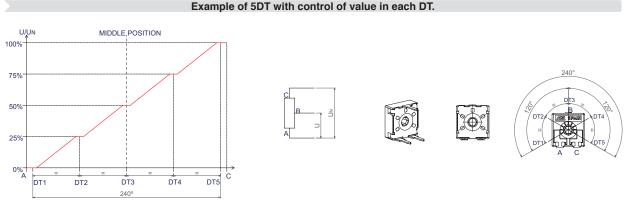
Other positions are available on request.



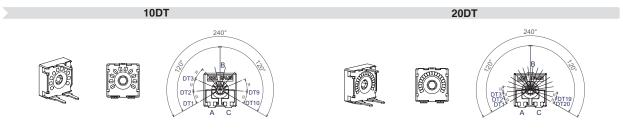
Potentiometers with detents

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

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



Other examples of potentiometers with detents:



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

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

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

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

 Image: standard Terminal
 Image: standard Terminal

 Standard Terminal
 Shorter terminal, for H5 TP25
 Shorter terminal, TPXX (under request)

 Image: standard Terminal
 Image: standard Terminal
 Image: standard Terminal

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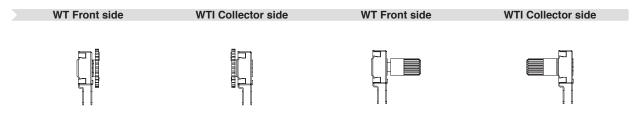
 Image: standard Terminal
 Image: standard Terminal
 Image: standard Terminal

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 Image: standard Terminal
 Image: standard Terminal

 Image: standard Terminal
 Image: standard Terminal

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

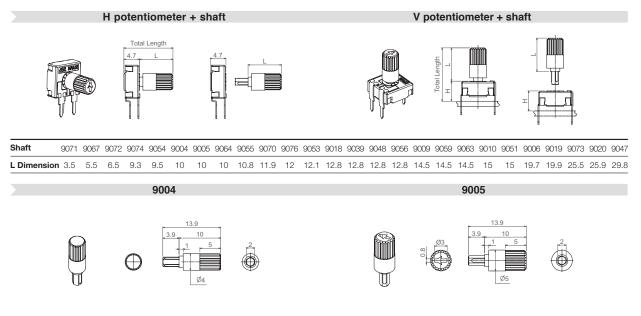


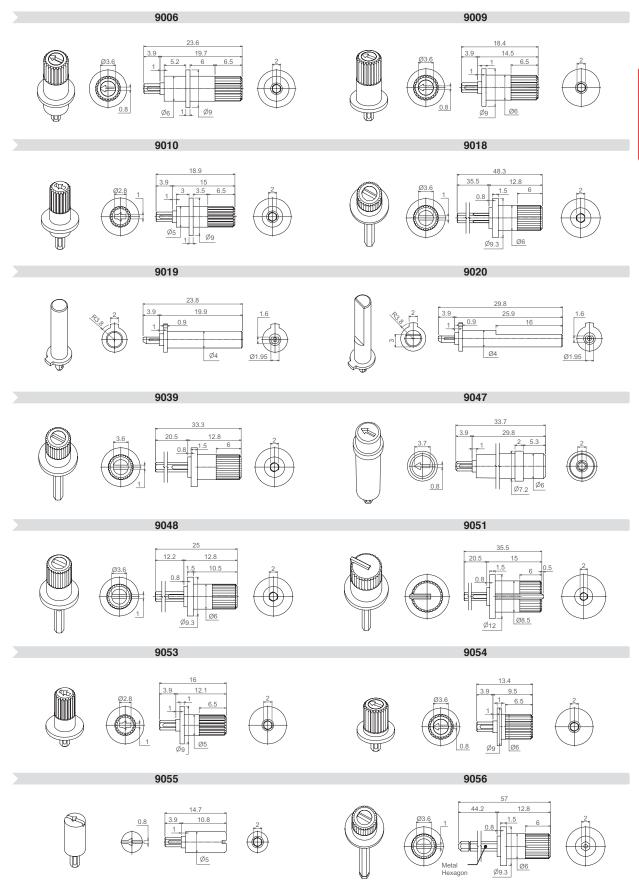
Shafts

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

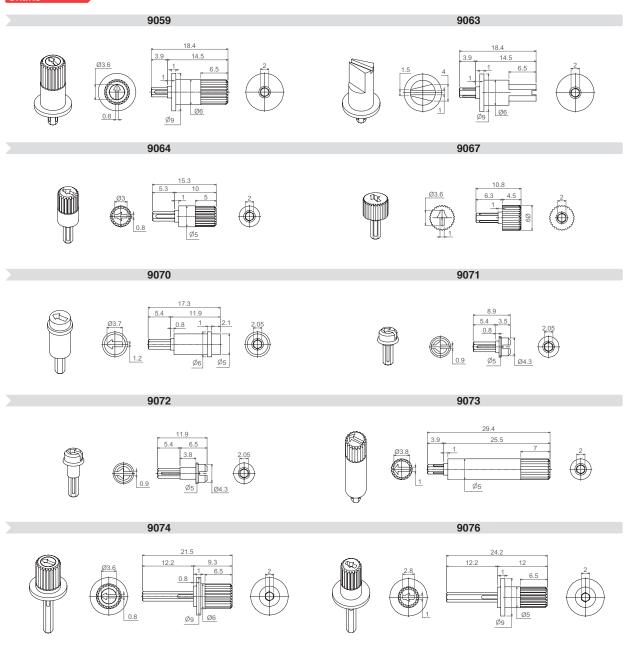
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

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





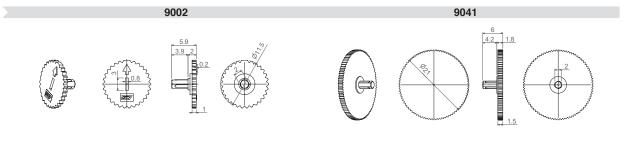
CA9 🐕 CE9

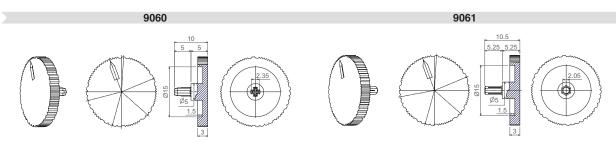


Thumbwheel

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

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





Packaging

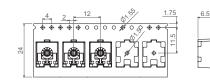
Bulk packaging:

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

Tape & Reel p	ackaging:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
	/SMD	None, only potentiometers.	900 pcs per reel, 12mm step between cavities.	1.250 pcs per reel, 12mm step between cavities.
Ň	UND	9002	700 pcs per reel, 12mm step between cavities.	To be determined.
F	ISMD		To be determined.	To be determined.

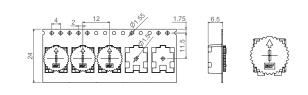
The 13" reel is the standard. For the 15" reel, T&R15 is added to the description.



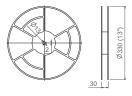




VSMD-T&R...WT-9002



13"Reel



15"Reel

lectric pecifications

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

	CA9 Through-hole	CA9 SMD	CE9 Through-hole and SMD					
Range of resistance values* Lin (A) Log (B) Antilog (C)	$100\Omega \leq Rn \leq 5M\Omega \\ 1 \ K\Omega \leq Rn \leq 2M2\Omega$	$\begin{array}{l} 100\Omega \leq Rn \leq 1M\Omega \\ 1 \ K\Omega \leq Rn \leq 1 \ M\Omega \end{array}$	$100\Omega \leq Rn \leq 5M\Omega$ 1 K $\Omega \leq Rn \leq 2M2\Omega$					
$\label{eq:constraints} \begin{array}{l} \mbox{Tolerance}^* & \mbox{Rn} < 100 \Omega; \\ 100 \Omega \leq \mbox{Rn} \leq 100 \mbox{K} \Omega & \\ 100 \mbox{K} < \mbox{Rn} \leq 10 \mbox{M} \Omega; \\ 1 \mbox{M} \Omega < \mbox{Rn} \leq 5 \mbox{M} \Omega; \\ \mbox{Rn} > 5 \mbox{M} \Omega; \end{array}$	+50%, -30% (out of range) +20% +20% +30% +50%, -30% (out of range)	±20% ±20% ±30%						
Variation laws	Lin (A), Log (B), Antilog (C). Other tapers available on request							
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5	≤2Ω						
CRV - Contact Resistance Variation (dynamic)	≤3%Rn							
CRV - Contact Resistance Variation (static)	≤5%Rn							
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 5 0.1 0.1	at 70° C. 0.5W 0.20W						
Maximum voltage Lin (A) Log (B), Antilog (C)	150V 200V	200VDC						
Operating temperature	-25°C +70°C (+	-85°C on request)	-40°C +90°C (+125°C on request)					
$\begin{array}{l} \text{Temperature coefficient} \\ 100\Omega \leq \text{Rn} \leq 10 \text{K}\Omega \\ 10 \text{K}\Omega < \text{Rn} \leq 5 \text{M}\Omega \end{array}$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	±100 ppm ±100 ppm					

* Out of range ohm values and tolerances are available on request, please, inquire. ** Dissipation of special tapers will vary, please, inquire.

	CA9 Through-hole	CA9 SMD	CE9 Through-hole and SMD						
Resistive element	Carbon technology	Carbon technology	Cermet						
Angle of rotation (mechanical)		240° ± 5°							
Angle of rotation (electrical)	$220^{\circ} \pm 20^{\circ}$								
Wiper standard delivery position		$50\% \pm 15^{\circ}$							
Max. stop torque		5 Ncm							
Max. push/pull on rotor		40 N							
Wiper torque*		<2 Ncm Potentiometers with detents: <2.5 Ncr	n						
Mechanical life	1.000 cycl	es (many more available on request, ple	ease, inquire)						

* Stronger or softer torque feeling is available on request.

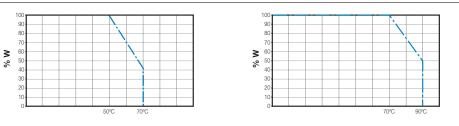
Test results

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

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

Power derating curve:

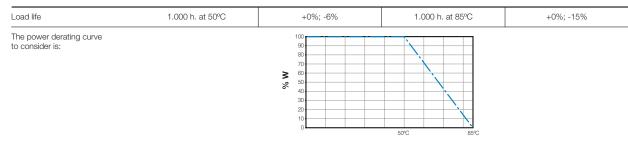
CA9 Through-hole and SMD



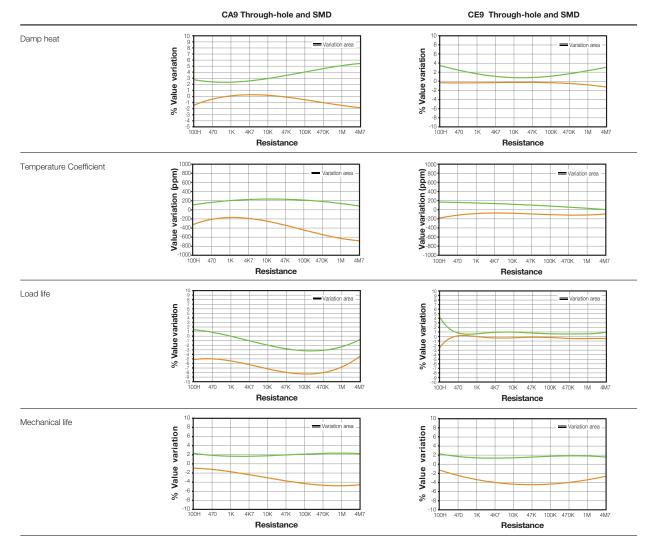
CE9 Through-hole and SMD

For temperatures out of range

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



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



Specifications on this catalog are for reference only, as they are subject to change without notice.







CARBON - CA14

CERMET – CE14 🖷

14mm carbon potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials can be self-extinguishable according to UL 94 V-0 under request.

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

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

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

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

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (standard is at 50% rotation).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 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.
- Automotive: HVAC controls, lighting regulation (position adjustment and sensing), dimmers, seat heating controls.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

14mm cermet potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials (housing and rotor) are self-extinguishable according to UL 94 V-0. ACP's cermet potentiometers have better thermal stability, allow for higher thermal dissipation and withstand higher temperatures than carbon potentiometers.

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

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

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

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

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Click effect (up to 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.
- Automotive: climate controls, position sensors.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

EXAMPLE: CA14NV12,5-10KA2020 10DT SNP PI WT-14117-BA

EXAMPLE: CE14NV12,5-10KA2020 10DT SNP PI WT-14117-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		
CA14/CE14	N	H2,5		- 10K	А	2020			10DT	SNP			PI		WT	14117	-BA	-V0

Standard configuration:	CA14 Through-hole	CA14 SMD	CE14 Through-hole and SMD
Dimensions:		14mm	
Protection:		IP 54 (dust-proof) On request: Self-extinguishable, to meet UL 94 V-0	
Substrate:	Carbon technology	Carbon technology, special for high temperature	Cermet
Color:	Blue housing + white rotor	Brown housing + grey rotor	Brown housing + white rotor
Packaging:		Bulk	
Wiper position:		at 50% ±15°	
Terminals:		Straight, without crimping.	
Marking:		Resistive value marked on housing. Others on request.	

Customized products: A drawing is requested when ordering a customized product. Series, rotor, model and total resistive value are indicated before the code that includes all special specifications. Example: CA14PH2,5-10K CODE C00111.

1 - S	erie	es										
CA	14	CE1	14									
2 - R	oto	ors										
В	0)	E	F	G	К	М	Ν	Ρ	Т	Х	Z
<u>3 - N</u>	lod	el anc	l pitch									
H0	Н	IC0	H2,5	H4	H5	HA5	Н	L5	V12,5	VA12,	5 Vl	12,5
VR12	2,5	V15	VJ15	(V15)	CFF	V17,5	VE	07,5	VD11	VSMD	VSMD	CY
			HS	MD (L	Inder rea	quest, n	ot rea	adily a	available))		

4 - P	acka	ging				Troug	gh-hole	e	SMD models						
Bulk						(blar	nk) ⁽¹⁾			(b	lank)	1)			
T&R	(Tape	and 1	3" ree	el)		(N.	A.) ⁽²⁾		T&R						
T&R (Таре	and 1	5" ree	el)		(N.A.) ⁽²⁾					T&R15				
(1) If bla	ank, bull	k packag	ing is im	plied. (2)	N.A., No	ot Applic	able: Tape	and Reel p	ackagin	g is only a	available fo	or SMD te	rminals		
5 - R	esist	ance	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		
Other re	esistive	values a	vailable	on reque	ist.										
6 - R	esist	ance	law /	taper											
Lin - Linear										А					
Log - Logarithmic								В							
Antilog - Antilogarithmic										С					
- Spe	ecial ta	apers	have o	codes	assigr	ned:			CODE	E YXXX	XX				
7 - To	olera	nce													
±20%	6		±30)%		+50%	%,-30%)	±10)%		±59	%		
2020)		30	30		5	030		1010				0505		
8 - 0	pera	ting L	ife (C	vcles)										
	-	-	cycle								(eave b	lank)		
Long I	life: LV	+ the	numbe	r of cy	cles. ex	k: LV10) for 10.	000 cycle	es. (othe	rs on requ	uest) L\	/XX: ex:	LV10		
9 - C	ut Tra	ack -	Open	circu	uit.										
-					track,	fully (CCW			PCI					
Open	i circu	iit at e	nd of	track,	fully C	W			PCF						
10 - 1	Deter	nts (D	т)		-										
		<u>.</u>	e begi	inning						DTI					
		t at th								DTF					
		of dete							XI	DT: 10	DT				
										0	- ·				

SNAP IN R Shorter tip of terminal, TPXX, where XX is tip length (under request 12 - Housing Color: For colors other than standard: -See color chart below- 13 - Rotor Color: For colors other than standard: -See color chart below- * Self-extinguishable property, V0, for housing and rotor By default, carbon is non self-extinguishable, cormet is Self-extingu for carbon: self-extinguishable property can be added. V0 means f and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	CJ-color, ex., red: CJ-RC RT-color; ex., blue: RT-AZ yr: ishable: (blank)
12 - Housing Color: For colors other than standard: -See color chart below- 13 - Rotor Color: For colors other than standard: -See color chart below- * Self-extinguishable property, V0, for housing and rotor By default, carbon is non self-extinguishable, cermet is Self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	CJ-color, ex., red: CJ-RC RT-color; ex., blue: RT-AZ rr: ishable: (blank) ousling V0
Color: For colors other than standard: -See color chart below- 13 - Rotor Color: For colors other than standard: -See color chart below- * Self-extinguishable property, V0, for housing and rotor By default, carbon is non self-extinguishable, cermet is Self-extingu For carbon: self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	RT-color; ex., blue: RT-Az rr: ishable: (blank) nousing V0
13 - Rotor Color: For colors other than standard: -See color chart below- * Self-extinguishable property, V0, for housing and rotor By default, carbon is non self-extinguishable, cermet is Self-extingu For carbon: self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	RT-color; ex., blue: RT-Az rr: ishable: (blank) nousing V0
Color: For colors other than standard: -See color chart below- * Self-extinguishable property, V0, for housing and roto By default, carbon is non self-extinguishable, cermet is Self-extingu For carbon: self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	or: ishable: (blank) nousing V0
 * Self-extinguishable property, V0, for housing and roto By default, carbon is non self-extinguishable, cermet is Self-extingu For carbon: self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H 	or: ishable: (blank) nousing V0
By default, carbon is non self-extinguishable, cermet is Self-extingu For carbon: self-extinguishable property can be added. V0 means h and rotor are V0. If only the housing needs to be V0, then CJ-V0. If only rotor: RT-V0 14 - Wiper Wiper position (Standard: 50% ± 15%) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	ishable: (blank) nousing V0
Wiper position (Standard: 50% ± 15°) Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	
Initial or CCW Final or CW Others: following clock positions; at 3 hours: P3H	(leave blank)
Final or CW	PI
Others: following clock positions; at 3 hours: P3H	PF
	PXH, ex: P3H
	(leave blank)
Wiper torque (Standard: <2.5Ncm, for detents: <3.5)	PGB
Low torque, < 1.5Ncm	FGB
15 - Linearity	
Not controlled	(leave blank)
Independent linearity controlled & below x%, for example, 3%: LN3	
Absolute linearity controlled & below x%	LAx%
Other features could be available on request, please, ask.	
16 - Potentiometers with assembled accessories Assembled from terminal side	WT
Assembled from collector side	WTI
Accessory Reference See list of shafts and thumbwheels available	-XXXXX Example: 14117
Color of shaft or thumbwheel Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)	-YY Example, white: BA (leave blank) -V0
For ordering spare accessories: Accessory reference - color- flammability. Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumby	XXXX-YY-V0

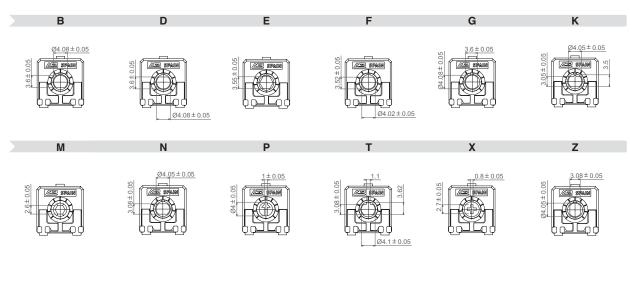
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR

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

Specifications on this catalog are for reference only, as they are subject to change without notice.

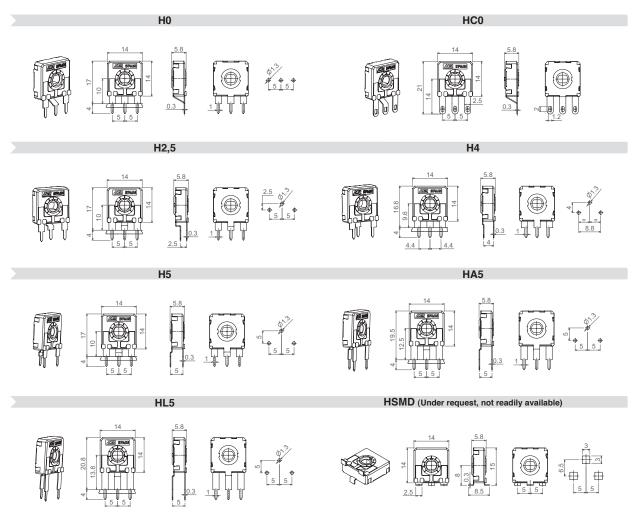
Rotors

Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated.



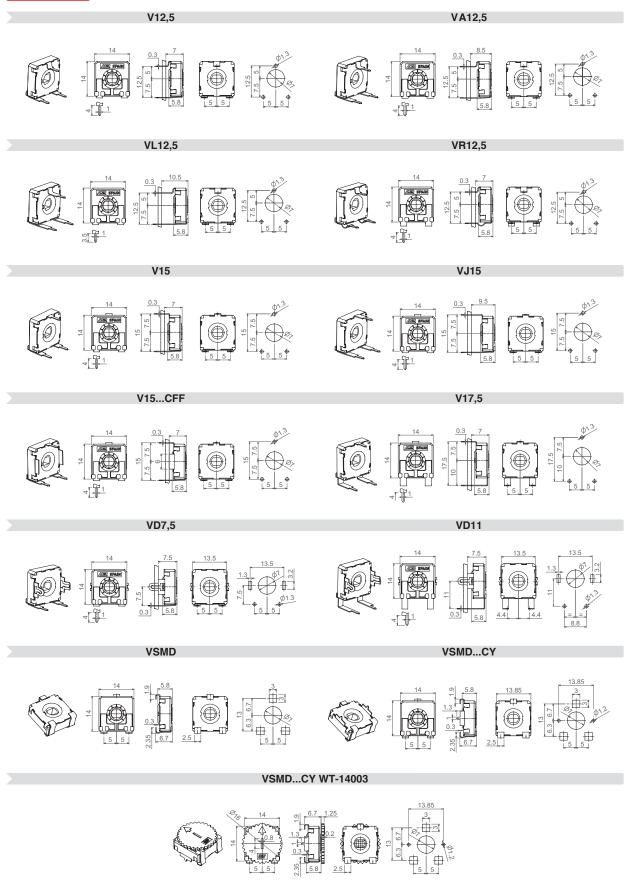
Models

All models shown here have the most common rotor for 14mm potentiometers: the N rotor, which can be paired with any shaft or thumbwheel from this catalogue. Different rotors are available from the menu above.

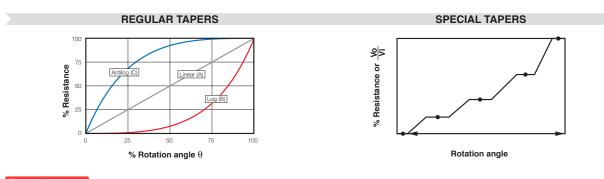


Specifications on this catalog are for reference only, as they are subject to change without notice.

CA14 👷 CE14 🖗



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.-



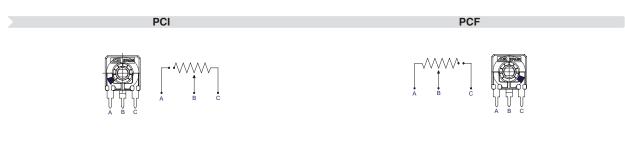
Potentiometers with cut track

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.

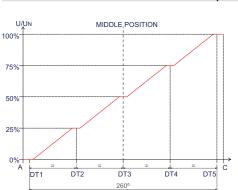
Other positions are available on request.



Potentiometers with detents

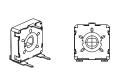
ACP's patented detent (DT) feature is especially suitable for control applications where the end user will turn a knob inserted in the potentiometer. Detents can be used to add a click feeling to the turning of the potentiometer or to control the position in which the wiper is placed, assuring a particular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

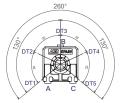
Detents can be light or strong, or even a combination of different feelings. They can be evenly distributed along the angle (standard) or tailored to match customers' request. They can also be combined with special tapers: constant value areas, open circuit zone, different slopes, etc. One common example 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.

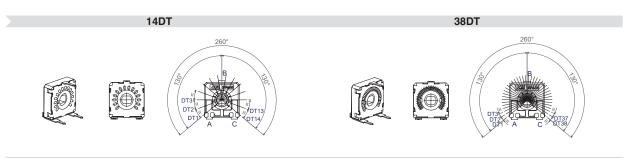






Potentiometers with detents

Examples of some potentiometers with detents:



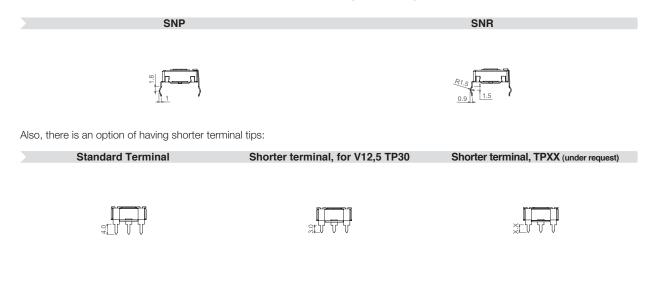
Number of standard detents (evenly distributed) already available. Other configurations are available under request.	1 (Initial, final or central), 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 17, 22, 27, 38.
Maximum number of detents for feeling only	38
Maximum number of detents when the voltage value in each detent 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.

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.



Possibilities for insertion of accessories

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

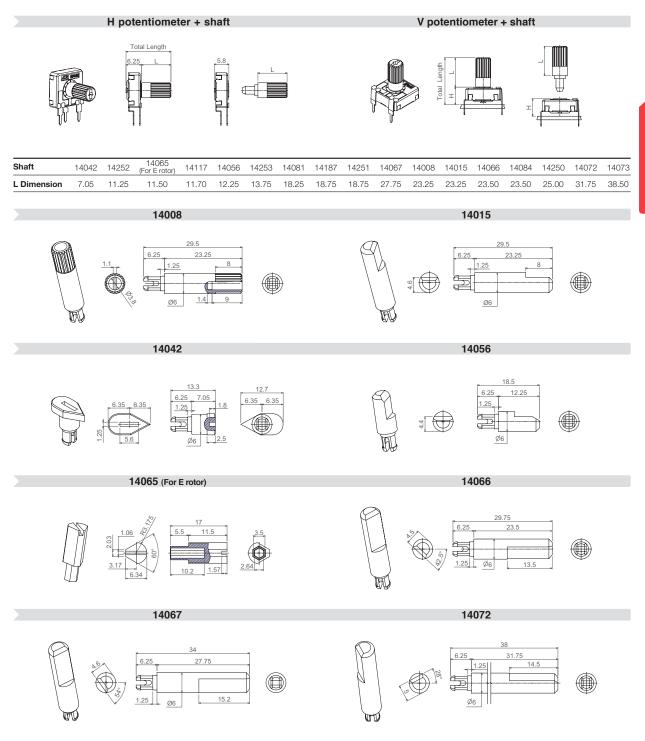
WT Front side	WTI Collector side	WT Front side	WTI Collector side
	R		
	<u> </u>		

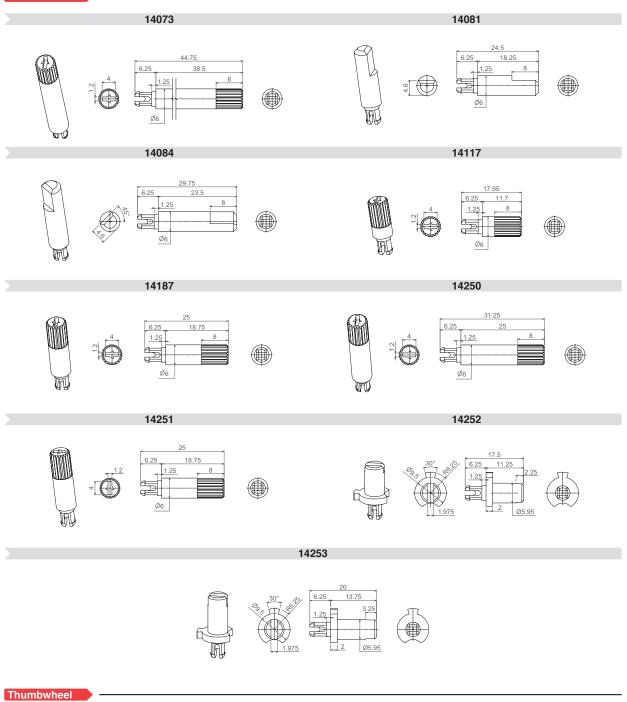
Shafts

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

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

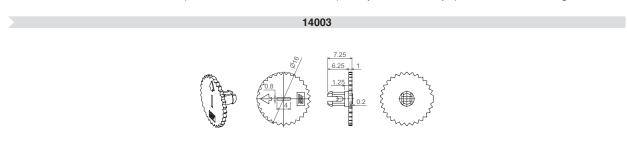
When a shaft is mounted, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:





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

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



Bulk packaging:

Potentiometer model	Potentiometer model With shaft or thumbwheel inserted? Pieces per small box (150 x 10		Pieces per bigger box (250 x 150 x 70, CG on description)
H2.5 - H4 - H5- HA5- HL5- H0	None, only potentiometers.	200 150 for models with*	700 600 for VJ15 - V17,5 - VD7,5 500 for VD11
V12,5 - V15 - VA12,5 - VL12,5 VJ15 - V17,5* - VD11* VD7,5* - VR12,5	14003, 14117, 14042, 14056, 14065	100	400 350 for models with*
	14008, 14015, 14066, 14067, 14072, 14073, 14081, 14084, 14187, 14250.	75	To be determined.

For models with * and an inserted accessory, please, inquire about the quantity per box in that case. Optional box 140x140x70 is available on request.

Tape & Reel packaging:

	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape	
VSMD	None, only potentiometers.	500 pcs per reel, 16mm step between cavities.	800 pcs per reel, 16mm step between cavities.	
VGIVID	14003	350 pcs per reel, 20mm step between cavities.	To be determined.	
VSMD CY	None, only potentiometers.	350 pcs per reel, 20mm step between cavities.	500 pcs per reel, 20mm step between cavities.	
VOIVID OT	14003	350 pcs per reel, 20mm step between cavities.	To be determined.	
HSMD		To be determined	To be determined.	

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

30

 VSMD-T&R
 VSMD-T&R...WT-14003

 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 <t

lectric pecifications

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

	CA14 Through-hole CA14 SMD		CE14 Through-hole and SMD	
Range of resistance values* Lin (A) Log (B) Antilog (C)			$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	
$\label{eq:relation} \begin{array}{l} \mbox{Tolerance}^* & \\ & \mbox{Rn} < 100\Omega; \\ & 100K \leq Rn \leq 100K\Omega \\ & 100K < Rn \leq 1M\Omega; \\ & \mbox{IM}\Omega < Rn \leq 5M\Omega; \\ & \mbox{Rn} > 5M\Omega; \end{array}$	+50%, -30% (out of range) - ±20% ±30% ±20% ±40% ±30% ±50% +50%, -30% (out of range) -		±20% ±20% ±30%	
Variation laws	Lin (A), Log (B), Antilog (C). Other tapers available on request			
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5	≤2Ω		
CRV - Contact Resistance Variation (dynamic)				
CRV - Contact Resistance Variation (static)	≤5%Rn			
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.25W 0.13W		at 70° C. 0.7W 0.30W	
Maximum voltage Lin (A) Log (B), Antilog (C)	250VDC 200VDC			
Operating temperature	-25°C +70°C (+	-40°C +90°C (+125°C on request)		
$\label{eq:constraint} \begin{array}{c} \text{Temperature coefficient} \\ 100\Omega \leq \text{Rn} \leq 10 \text{K}\Omega \\ 10 \text{K}\Omega < \text{Rn} \leq 5 \text{M}\Omega \end{array}$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	±100 ppm ±100 ppm	

* Out of range ohm values and tolerances are available on request, please, inquire. ** Dissipation of special tapers will vary, please, inquire.

	CA14 Through-hole	CA14 SMD	CE14 Through-hole and SMD	
Resistive element	Carbon technology	Carbon technology	Cermet	
Angle of rotation (mechanical)	$265^{\circ} \pm 5^{\circ}$			
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 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.

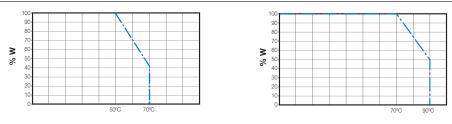
lest	
resu	lts

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

	CA14 Through-hole and SMD		CE14 Through-hole and SMD		
	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. and at 23°C ± 2°C	±3%	1.000 cycles at 10 c.p.m. 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%	

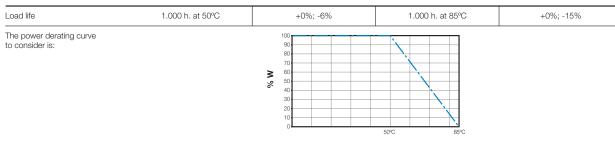
Power derating curve:

CA14 Through-hole and SMD

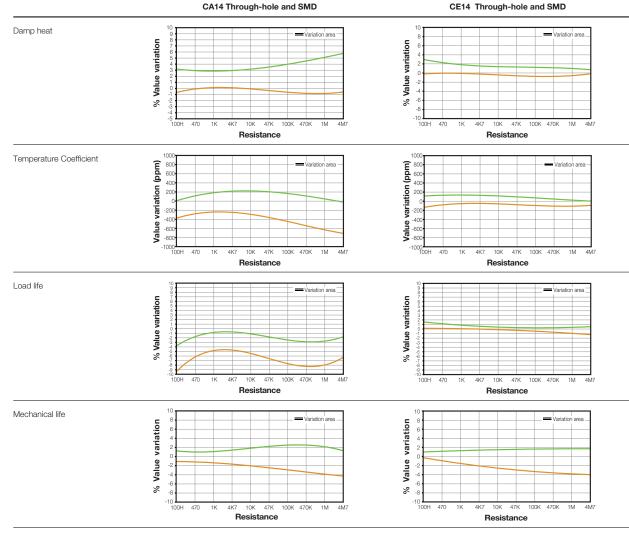


For temperatures out of range

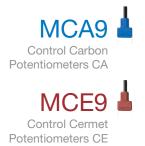
The normal operation temperature for a carbon ACP potentiometer is -25°C to +70°C. When the temperature goes up to 85°C, the following variations should be observed:



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



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

Applications

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

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

CERMET – 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 A MCE9 A HOW TO ORDER

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

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

Standard features					Extra features				Assembled accessory									
Series F	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Detents	Snap in	Housing	Rotor	Wiper	Lin.	Assembl	y Ref#	Color	Flam
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16		
MCA9/MCE9	D	H5		- 10K	А	2020				SNP			PI		WT	-9020	-NE	-V0

MCA9 Through-hole	MCE9 Through-hole			
9	9mm			
	dust-proof) uishable, to meet UL 94 V-0			
Carbon technology	Cermet			
Blue housing + white rotor	Brown housing + white rotor			
E	Bulk			
at 50% ±15°				
Straight, without crimping.				
Resistive value marked on	n housing. Others on request.			
	IP 54 (On request: Self-exting Carbon technology Blue housing + white rotor at 50 Straight, wi			

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: MCA9DH2,5-10K CODE C00111.

 Serie: MCA9 	MC	È CO										
NICAS		123										
2 - Rotor	S											
D												
0 Mada												
3 - Mode H2,5	H3		ŀ	15		V7,5	V	10	\	/K10	\	/R10
4 - Packa	aging					Tro	ugh-ho	le				
Bulk							(blank)					
5 - Resis	tance	value										
100Ω 200Ω			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 - Resis	tance	law /	taper									
Lin - Linea	ar								А			
Log - Log	arithmi	С					В					
Antilog - A	Antiloga	arithmi	С						С			
- Special	tapers	have c	codes	assigi	ned:			CODE	YXXX	XX		
7 - Tolera ±20%	ince	±30)%		+50%	6,-30%	,	±10	1%		±59	%
2020		303				030		101			050	
8 - Opera	ating L	ife (C	ycles									
Standard	(1.000	cycles	s)							(eave b	lank)
Long life: L	V + the	numbe	r of cy	cles. e	<: LV45	5 for 45.	000 cycle	S. (othe	rs on requ	iest) L\	/XX: ex:	LV45
9 - Cut T					fully				PCI			
Open circuit at beginning of track, fully CCW Open circuit at end of track, fully CW							-					
open circ	uit at e	na of 1	uack,	iully C	VV				PCF			
10 - Dete	ents (D	T)										
One deter			nning						DTI			
One detei	nt at th	e end							DTF			
X number	of dete	ents, e	evenly	distrik	outed.			XD	F: 10D	Т		
		ileble ee	request	If you a	also nee	d to assig	n a voltage	value to	each de	tent. plea	ase inquin	э.

11 - Terminals

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

12 - Housing

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

13 - Rotor

Color: For colors other than standard: -See color chart below	PT color: ox	. blue: RT-AZ
COLOR: FOI COLORS OLITER LITARI STATIONALOSEE COLOR CHAIL DELOW	- ni-cuiui, ex.	, DIUE. NI-MZ

* 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 and rotor are V0. If only the housing needs to be V0, then CJ-V0. If I only rotor: RT-V0

14 - Wiper

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

15 - Linearity

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

16 - Potentiometers with assembled accessories

Assembled from terminal side	WT-
Accessory Reference (9019 or 9020)	-XXXXX, Example: 9019
Color of shaft Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)	-YY Example, black: NE (leave blank) -V0

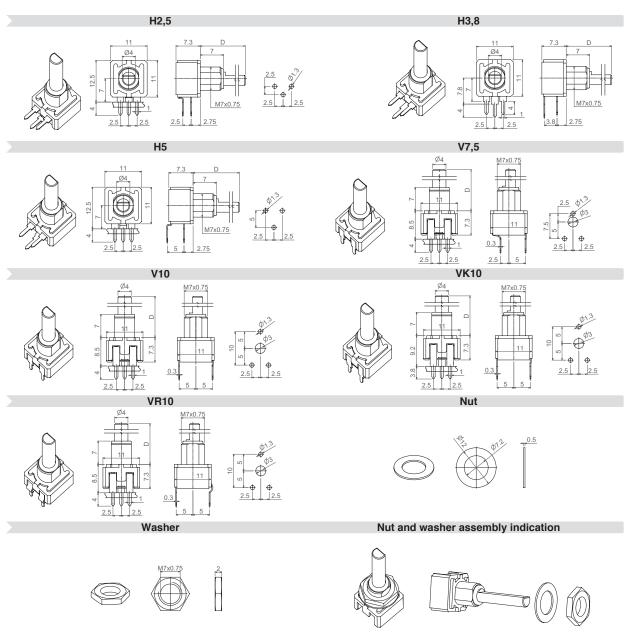
Color chart for rotor, housing and accessories

Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR
(1) black is	(1) black is not an option for housings.								

68 VIII www.acptechnologies.com

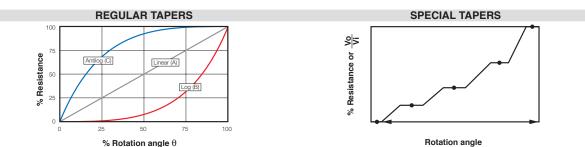
Models

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.-



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.

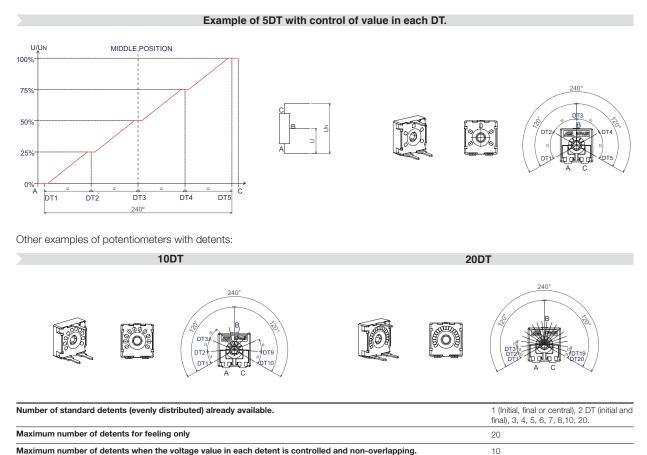
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

Other positions are available on request.



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:



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.

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) ossibilities

accessories

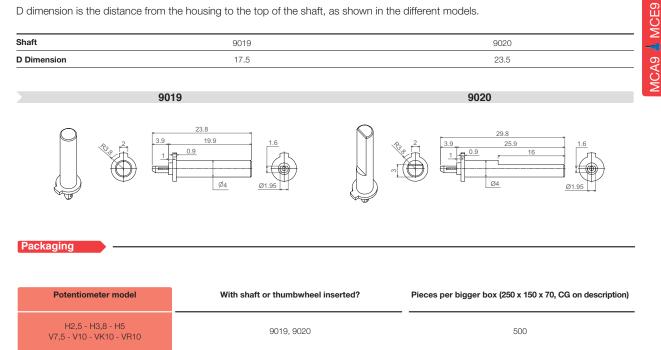
r insertion

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.





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)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$			
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). Other tapers available on request				
Residual resistance	Lin (A), Log (B), Antilog (C) $\leq 5^{*}10\text{-}3^{*}\text{Rn}.$ Minimum value 2Ω	<u>≤</u> 2Ω			
CRV - Contact Resistance Variation (dynamic)	≤3%	6Rn			
CRV - Contact Resistance Variation (static)	≤5%Rn				
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)			
$\begin{array}{l} \text{Temperature coefficient} \\ 100\Omega \leq \text{Rn} \leq 10\text{K}\Omega \\ 10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega \end{array}$	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm			

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

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

	MCA9 Through-hole	MCE9 Through-hole	
Resistive element	Carbon technology	Cermet	
Angle of rotation (mechanical)	240)° ± 5°	
Angle of rotation (electrical)	$220^{\circ} \pm 20^{\circ}$		
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 avai	lable on request, please, inquire)	

* Stronger or softer torque feeling is available on request.

Test results

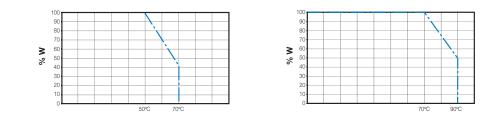
The following typical test results are given at 23°C \pm 2°C and 50% \pm 25% RH.

	MCA9 Thr	ough-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%		
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%		

Power derating curve:

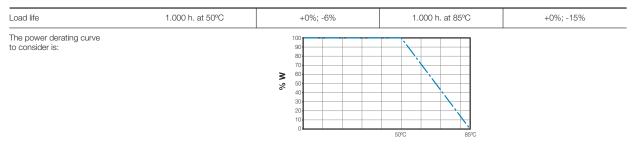
MCA9 Through-hole



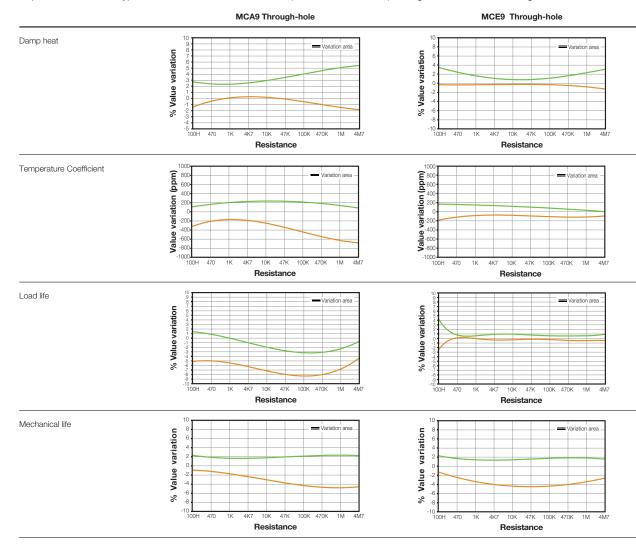


For temperatures out of range

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



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









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 L MCE14 HOW TO ORDER

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

EXAMPLE: MCE14NH2,5-10KA2020 SNP PI WT-14187-BA-V0

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	А	2020				SNP			PI		WT	-14187	-BA	

Dimensions:	14mm					
Protection:		(dust-proof) juishable, 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	0% ±15°				
Terminals:	Straight, wi	ithout crimping.				
Marking:	Resistive value marked or	n 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 - Serie	s										
MCA14	MCE14	1									
2 - Rotor											
N	Z										
3 - Mode	Model and pitch										
HO	HC0 H2,5 H4			ł	-15	I5 HA5		HL5 V12		12,5	
VA12,5	VL12,5	VR12,	5	V15	١	VJ15	V17	,5	VD7,8	5 \	/D11
4 - Pack	aging				Tre	ough-ho	le				
Bulk						blank) ⁽¹⁾					
	tance val		5000	41/0	01/0	5001/0	4140	0140	0140.0	4470	5140
	Ω 220Ω 250			1KΩ		500ΚΩ			2M2Ω		
100 200) 220 25	50 470	500	1K	2K	500K	1M	2M	2M2	4M7	5M
6 - Resis	tance law	/ taper									
Lin - Line	ar							А			
Log - Log	arithmic							В			
Antilog - /	Antilogarith	nmic						С			
- Special	tapers hav	e codes	assigi	ned:			CODE	YXXX	XX		
7 - Tolera				= 0.0				<u>.</u>			
±20%		-30%			6,-30%	б ————————————————————————————————————	±10			±59	
2020	(3030		5	030		101	0		050)5
8 - Opera	ating Life	(Cycles)								
	(1.000 cyc								()	eave b	lank)
Long life: L	V + the num	nber of cy	cles. e	c: LV45	5 for 45	.000 cycle	S. (other	rs on requ	iest) L\	/XX: ex:	LV45
	rack – Op										
-	uit at begi	-			CVV			PCI			
Open circ	uit at end	of track,	tully C	;vv				PCF			
10 - Dete	ents (DT)										
	nt at the be	eginning						DTI			
One dete	nt at the er	nd				DTF					

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 and rotor are V0. If only the housing needs to be V0, then CJ-V0. CJ-V0, RT-V0 If only rotor: RT-V0

14 - Wiper

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

15 - Linearity

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

16 - Potentiometers with assembled accessories

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

Color chart for rotor, housing and accessories

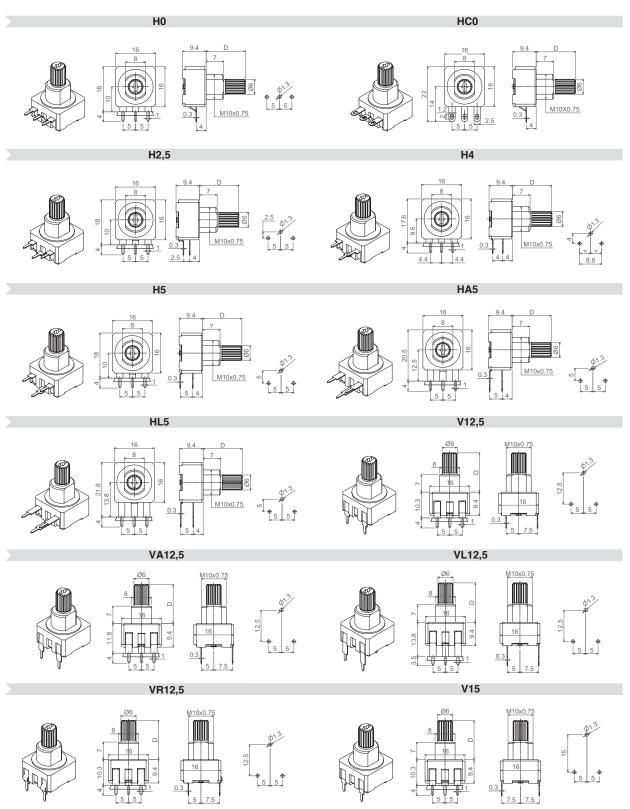
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR
(1) black is	not an opt	ion for housir	as.						

76 VSR www.acptechnologies.com

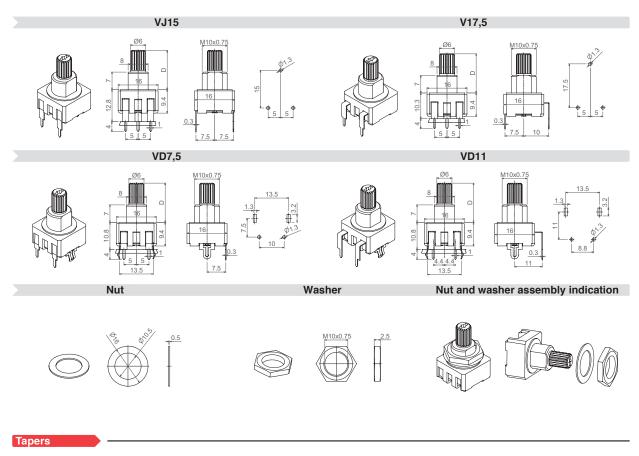
Special detents are available on request: If you also need to assign a voltage value to each detent, please inquire.

Models

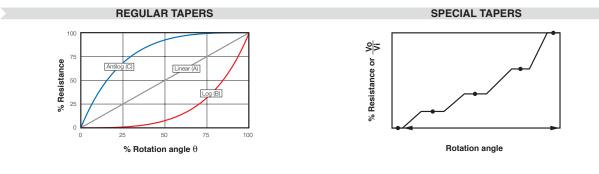
All models shown here have shaft 14187, but other shafts can be chosen from the list below. The D dimension indicated on the drawings refers to the possible length of the shaft, to be chosen at "shafts" section. Potentiometers are sold separately from the nuts and washers.



MCA14 🛓 MCE14 🛓



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.-



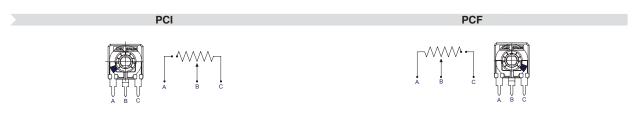
Potentiometers with cut track

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.

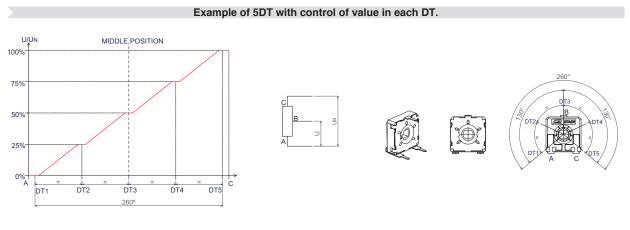
Other positions are available on request.



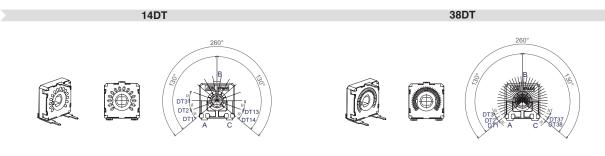
Potentiometers with detents

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:



Examples of some potentiometers with detents:



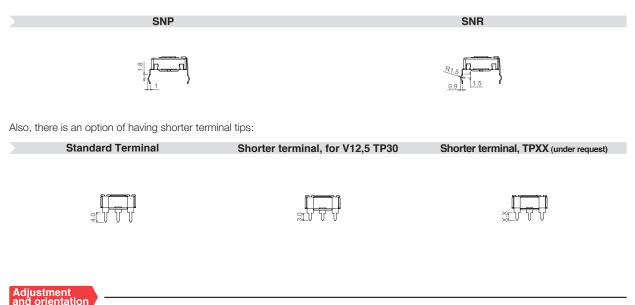
Number of standard detents (evenly distributed) already available.	1 (Initial, final or central), 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 17, 22, 27, 38.
Maximum number of detents for feeling only	38
Maximum number of detents when the voltage value in each detent is controlled and non-overlapping.	14

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.

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.



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

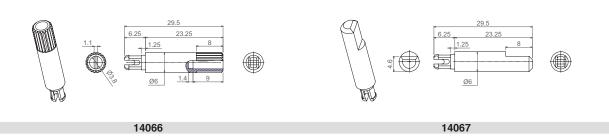
Shafts are available in different colors (color chart in "how to order" section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.

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

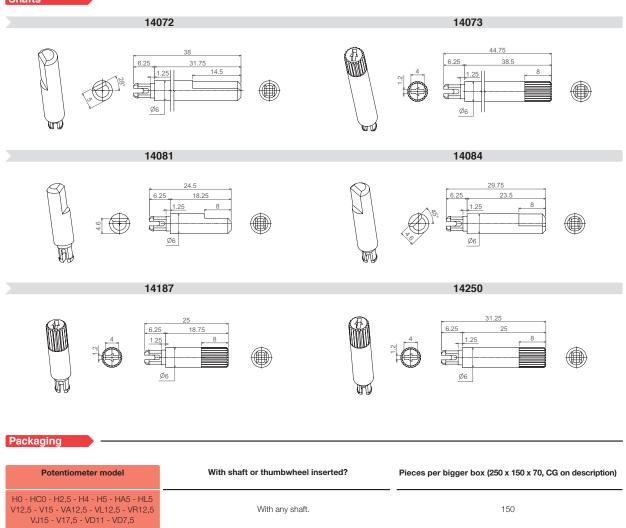
Shaft	14081	14187	14067	14008	14015	14066	14084	14250	14072	14073
D Dimension	15.2	15.7	24.7	20.2	20.2	20.45	20.45	21.95	28.7	35.45

14008

14015









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* Lin (A) Log (B) Antilog (C)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$
$\label{eq:constraint} \begin{split} \text{Tolerance}^* & \text{Rn} < 100\Omega; \\ 100\Omega \leq \text{Rn} \leq 100 \text{K}\Omega \\ 100 \text{K} < \text{Rn} \leq 1 \text{M}\Omega; \\ 1 \text{M}\Omega < \text{Rn} \leq 5 \text{M}\Omega; \\ \text{Rn} > 5 \text{M}\Omega; \end{split}$	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±20% ±20% ±30%
Variation laws	Lin (A), Log (B), Antilog (C). Ot	ther tapers available on request
Residual resistance	Lin (A), Log (B), Antilog (C) $\leq 5^{*}10\text{-}3^{*}\text{Rn}.$ Minimum value 2Ω	<u>≤</u> 2Ω
CRV - Contact Resistance Variation (dynamic)		%Rn
CRV - Contact Resistance Variation (static)		%Rn
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.25W 0.13W	at 70°C. 0.7W 0.30W
Maximum voltage Lin (A) Log (B), Antilog (C)		VDC VDC
Operating temperature	-25°C +70°C (+85°C on request)	-40°C +90°C (+125°C on request)
$\label{eq:coefficient} \begin{array}{l} \text{Temperature coefficient} \\ 100\Omega \leq \text{Rn} \leq 10 \text{K}\Omega \\ 10 \text{K}\Omega < \text{Rn} \leq 5 \text{M}\Omega \end{array}$	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm

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

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

	MCA14 Through-hole	MCE14 Through-hole				
Resistive element	Carbon technology	Cermet				
ngle of rotation (mechanical)	265° ± 5°					
ngle of rotation (electrical)	245° ± 20°					
/iper standard delivery position	50% ± 15°					
x. stop torque	10	0 Ncm				
x. push/pull on rotor		50 N				
per torque*		.5 Ncm ith detents: <3.5 Ncm				
echanical life	1.000 cycles (many more ava	ailable on request, please, inquire)				

iable on request. oner lorque

Test results

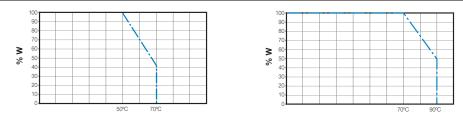
The following typical test results (with 95% confidence) are given at 23°C ±2°C and 50% ±25% RH.

	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. and at 23°C ± 2°C	±3%	1.000 cycles at 10 c.p.m. 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%

Power derating curve:

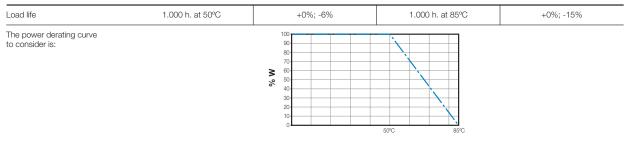
MCA14 Through-hole





For temperatures out of range

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



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

