General catalogue









Aragonesa de Componentes Pasivos

The world we have is the result of our way of thinking.

Albert Einstein





Aragonesa de Componentes Pasivos, S. A. (ACP), based in Tarazona (Zaragoza) Spain, is a World recognized specialist in thick-film technology and its application in the field of variable resistance since 1988. Our products include angular position sensors, potentiometers and trimmers which can be found in the following markets: appliances, automotive and industrial.

ACP's expertise lays in the development, characterization and manufacturing of polymeric pastes (resistive, conductive and dielectric) and its deposition in a wide range of substrates. We are vertically integrated, we also design and manufacture the plastic and the metal components that make part of our final products, being experts in materials and manufacturing processes. Finally, we put together all these components in our automated assembly lines that feature the control of the electrical parameters of each and every finished product.

This expertise allows us to adapt our products for customers with special and demanding requirements, providing electromechanical tailor made solutions.

Our products are RoHS and Reach compliant, and we are certified by IQNet under ISO 9001 and IATF 16949.

ACP has a strong R&D department that includes mechanical, chemical, materials, electronics and electrical engineers and also holds collaborations with universities and research institutes. We count with a professional team that makes our flexibility and high service level a key part of our value proposition. Our Prototype Building Team is able to prepare samples in very short lead time.

Equipment:

- In-house designed fully automated assembly lines, with integrated automated control systems.
- Type C clean room (class 10.000), with screen-printing equipment.
- On line drying, curing and sintering furnaces.
- Convection curing furnaces.
- Laser trimmer.
- Reel to reel electroplating.
- Dies and presses for metal strip stamping.
- Plastic injection machines.
- Quality testing laboratory: climate chambers, profile projectors, mechanical life equipment, shakers...





Company certificates:

ISO 9001 (ER-0205/1994)

IATF 16949 (IATF: 0290599, RA02-0006/2005)















Sometimes we have ideas that seem to clash with the world, as we know it. But if we are willing to take a different approach and look at things from a different point of view; they might become a reality. This way of thinking confirms what we understood at ACP some time ago: to be innovative we need to look at things from a different perspective, we need to challenge the established standards. Facing this situation, we have reversed the first rule of industrial production: instead of designing to manufacturing, we manufacture for design. It is the only way to make ideas and the reality compatible and to come up with advanced concepts... We do know that there is no more powerful tool than imagination.

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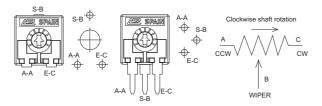
1 General concepts

GENERAL CONCEPTS

Potentiometer configuration

The pin that corresponds to the reading of the wiper is pin B.

A and C are connected to the ends of the resistor, being pin A the initial position and C the final position.



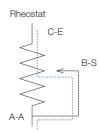
Electric use

Variable resistor

When pins A and B or C and B are connected, the current goes through the wiper (blue line).

Depending on where in the resistor the wiper is placed, it indicates a lower resistive value than the whole resistor would (we say it is used as variable resistor or rheostat).

The output is measured in ohms.

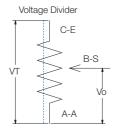


Voltage divider

When a voltage is applied between the ends of the resistor (A and C), the current goes through the resistor, not the wiper.

The wiper sees a proportional share of the voltage applied between the ends (we say this is a Voltage Divider).

The output is a voltage, measured in V.



Resistance

Total resistance (R⊤):

It is the resistance found between the input terminal and the wiper when the latter is positioned to give the maximum value.

Electric noise or contact resistance (Rc):

Noise is any variation in the output signal that does not correspond to a similar variation in the input signal. It appears in the contact point between the resistive element and the wiper. It is measured in Ohms.

This noise can also be measured as "contact resistance variation" (CRV), which is expressed in the percentage of change between the initial resistance and the value of the resistance after a test. It is measured statically and dynamically. ACP's potentiometers have less than 5% CRV.

ACP's standard resistive values

The standard values are as follows, although values out of range can also be studied.

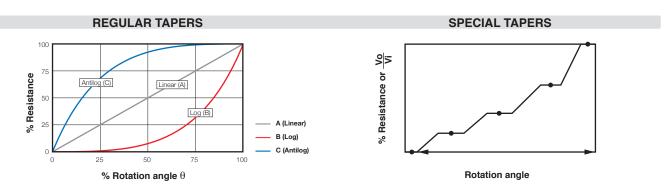
25K	47K	50K	100K	200K	220K	25	oK .	470K	500K	1M	2M	2M5	4M7	5M
0514	4716	501/	40016	0001/	0001/	0.5	.01/	4701/	E001/	414	014	ONAE	4847	
25ΚΩ	47ΚΩ	50ΚΩ	100ΚΩ	200ΚΩ	220KΩ	2 250	ΟΚΩ	470ΚΩ	500ΚΩ	1ΜΩ	2ΜΩ	2.5ΜΩ	4.7ΜΩ	5ΜΩ
100	200	220	250	470	500	1K	2K	2K2	2K5	4K7	5K	10K	20K	22K
100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	$2K\Omega$	$2.2 \text{K}\Omega$	2.5 K Ω	4.7 K Ω	5ΚΩ	10ΚΩ	20 K Ω	22ΚΩ

Variation laws - 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 below.-

ACP can also provide with tapers with different slopes, with areas with constant value or jumps, according to customer's specifications.

Special tapers can be combined with physical detents to match the areas where the customer wants to guarantee a constant value with a particular angular position. This is particularly suitable in applications which can benefit from a feeling of maintained control over the position, for example, regulation of temperature or speed.



Linearity

The term "linearity" implies that the real law obtained from plotting angular position vs voltage output is compared with a straight line.

Independent Linearity (LN)

It is the maximum vertical deviation of the real law from the straight reference line chosen to best minimize the distance from the real line in any position.

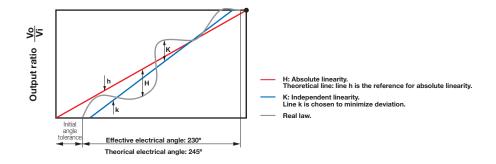
It is expressed as a percentage of the total voltage applied.

In the graph below, "K" would be the maximum independent linearity and "k" the line with which the real law is compared.

Absolute Linearity (LA)

It is the maximum vertical deviation of the real law from the straight reference line that runs through specified minimum and maximum points. These points would be zero and 100% of the maximum applied voltage.

In the graph below, "H" would be the maximum absolute linearity of the real law and "h" the theoretical line with which the real line is compared. When some customers are looking for correspondence of angle and value, this is the concept to consider.



Recommended soldering conditions

Soldering conditions (Lead free, RoHS compliant)*

Manual soldering	Reflow soldering SMD	Flow (wave) soldering
Soldering tools of 20W max.	Preheating temperature: Max 150°C; 60-90 s	Recommended Alloy: SnAgCu
Maximum temperature of soldering tools: 280°C	Temperature Ramp-up: 2-3°C / s.	Preheating stage: Max 100°C; 30-60 s.
Time: 3 s. max.	Over 220°C:<40 s.	Temperature Ramp-up:1.2-2.5°C/s.
	Solder temperature: 240°C for 5 ± 1 s.	Max. wave temp.: 260°C for 4s., (245°C recommended)
	Besides recommended conditions, ACP SMD potentiometers have successfully passed IEC 60068-2-58 tests.	Time within +0°-10°C of peak: 10s.
		Cooling rate: 5°C/s.

^(*) For other information on soldering conditions, please, contact us.

(For reflow soldering SMD) The conditions above are valid for one reflow pass only. For multiple passes, please, enquire.



2 Potentiometers and sensors





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

EXAMPLE: CA6XV2,5-10KA2020 SNP PI WT-6030-BA

	Extra features				Assembled accessory				
Life	Track	Snap in	Housing	Rotor	Wiper	Assembly	Ref #	Color	Flam.
8	9	10	11	12	13		14		
		SNP			PI	WT	-6030	-BA	
			8 9 10	8 9 10 11	8 9 10 11 12	8 9 10 11 12 13	8 9 10 11 12 13	8 9 10 11 12 13 14	8 9 10 11 12 13 14

Standard configuration:	CA6 Through-hole	CA6 SMD
Dimensions:		6mm
Protection:		54 (dust-proof) tinguishable, to meet UL 94 V-0
Substrate:	Carbon technology	Carbon technology, special for high temperature
Color:	Blue housing + white rotor	Brown housing + grey rotor
Packaging:	Bul	k or Tape & Reel
Wiper position:		at 50% ±15°
Terminals:	Snap in P (except model CA6VS5)	
Marking:	Resistive value marke	ed 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: CA6XH2,5-10K CODE C00120.

1 - Series

_	0 4 0	

2 - Rotors			
D	М	N	X

3 - Model and pitch

H2,5	HSMD	V2,5	V5	VS5
VSMD	VESMD	VSMD W	/T	VESMD WT

4 - Packaging	Trough-hole	SMD models
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾
T&R (Tape and 13" reel)	(N.A.) ⁽²⁾	T&R
T&R (Tape and 15" reel)	(N.A.) ⁽²⁾	T&R15

⁽¹⁾ If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

5 - Resistance value

100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	2KΩ	500ΚΩ	1ΜΩ	$2M\Omega$	2Μ2Ω	4M7Ω	5ΜΩ
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M

6 - Resistance law / taper

Lin - Linear	A
Log - Logarithmic	В
Antilog - Antilogarithmic	С
- Special tapers have codes assigned:	CODE YXXXXX

7 - Tolerance

±20%	±25%	±30%	+50%,-30%	±10%	±5%
2020	2525	3030	5030	1010	0505

8 - Operating Life (Cycles)

Standard (1.000 cycles)	(leave blank)
Long life: LV + the number of cycles. ex: LV06 for 6.000 cycles. (others on request)	LVXX: ex: LV06

9 - Cut Track - Open circuit.

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

10 - Terminals

SNAP IN P	SNP
Shorter tip of terminal, TPXX, where XX is tip length (under request)	TPXX, ex: TP20
Steel Terminals	SH

11 - Housing

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

12 - Rotor

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

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

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

13 - 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: <2Ncm)	(leave blank)
Low torque, < 1.5Ncm	PGB

14 - Potentiometers with assembled accessories

Assembled from terminal side	WT
Assembled from collector side	WTI
Accessory Reference	-XXXX
See list of shafts and thumbwheels available	Example: 6030
Color of shaft or thumbwheel	-YY Example, white: BA
Non self-extinguishable.	(leave blank)
Self-extinguishable according to standard UL 94	-V0
(-V0 in box 17 modifies only the accessory please, note.)	

For ordering spare accessories: Accessory reference - color- flammability.

Ex. 6030-AZ-V0 is a blue self-extinguishable 6030 thumbwheel

Color chart for rotor, housing and accessories

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

XXXX-YY-V0

(1) black is not an option for housings.

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.

D M N X





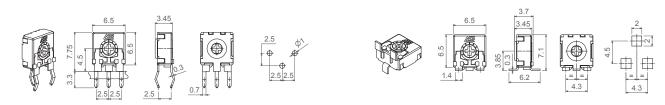




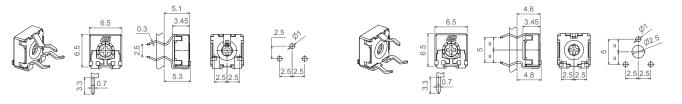
Models

All models shown here have the most common rotor for 6mm potentiometers: the X rotor. Different rotors are available from the menu above.

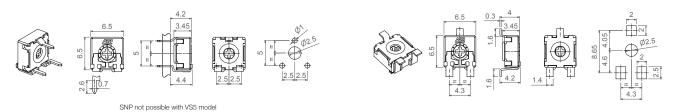
H2,5 HSMD



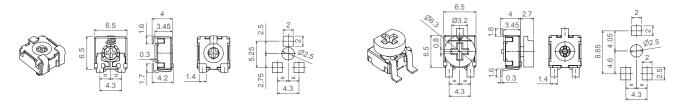
V2,5



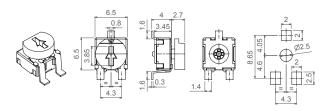
VS5 VSMD



VESMD VSMD WT-6030



VSMD WT-6037



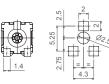
VESMD WT-6030

VESMD WT-6037











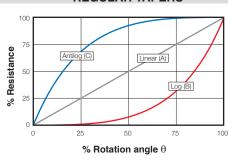




Tapers

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.

PCI









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.

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









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.

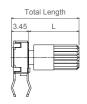
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

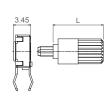
When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:

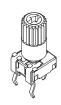
H potentiometer + shaft

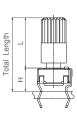
V potentiometer + shaft

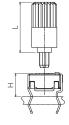












Shaft	6022	6023	6031	6024	6025	6028	6040
L Dimension	10	10	11	12.2	14.5	14.5	21.3

6022 6023

















6024

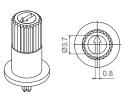


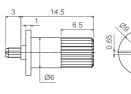










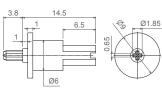


6028

6031

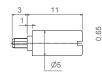




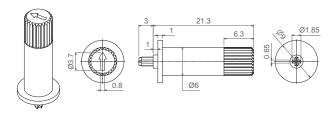








6040



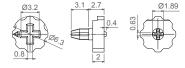
Thumbwheel

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.

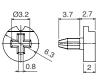
Thumbwheels can be mounted on the potentiometers at ACP (see models with WT-6030 or WT-6037) or sold separately. ACP can study special thumbwheel designs.

> 6001 6030







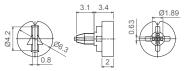




6032

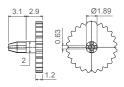
6034







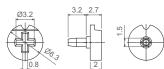




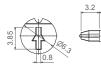
6035 (Designed for M rotor)

6037





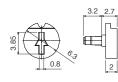






6043







Bulk packaging:

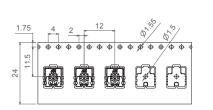
Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	1.000	4.000
H2,5 - V2,5 - V5	6001, 6030, 6032, 6035, 6037	1.000	3.000
VS5 - HSMD - VSMD - VESMD	6024, 6025, 6028	300	To be 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.
VJIVID	6030, 6035, 6037	750 pcs per reel, 12mm step between cavities.	1.100 pcs per reel, 12mm step between cavities.
VESMD	None, only potentiometers.	1.000 pcs per reel, 12mm step between cavities.	1.500 pcs per reel, 12mm step between cavities.
VEGIVIE	6030, 6035, 6037 700 pcs per reel, 12mm step between cavities.		1.000 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.
ПЗИИ	With specific thumbwheel.	Under request.	Under request.

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

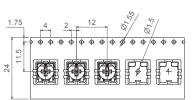
VESMD-T&R

VSMD-T&R...WT-6030 / 6035 / 6037









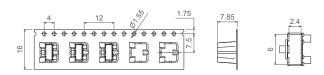


VESMD-T&R...WT-6030 / 6035 / 6037

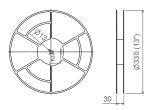


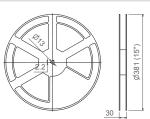


HSMD-T&R



13"Reel 15"Reel







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)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 1MΩ 1 KΩ ≤ Rn ≤ 1 MΩ	
Tolerance* $ \begin{array}{l} Rn < 100\Omega : \\ 100\Omega \le Rn \le 100K\Omega \\ 100K < Rn \le 1M\Omega : \\ 1M\Omega < Rn \le 5M\Omega : \\ Rn > 5M\Omega : \\ \end{array} $	+50%, -30% (out of range)	±25% ±25% ±50%	
Variation laws	Lin (A), Log (B), Antilog (C). Oth	er tapers available on request	
Residual resistance	Lin (A), Log (B), Antilog (C) ≤ 5	*10-3*Rn. Minimum value 2Ω	
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 215°±20° ≤ 3%Rn. Other tapers, please inquire		
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 215°±20° ≤ 5%Rn. Other tapers, please inquire		
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.10W 0.06W		
Maximum voltage Lin (A) Log (B), Antilog (C)	100VDC 60VDC		
Operating temperature	-25°C +70°C (+85°C on request)		
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	

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

Mechanical Specifications

	CA6 Through-hole	CA6 SMD			
Resistive element	Carbon technology Carbon technology				
Angle of rotation (mechanical)	235° ± 10°				
Angle of rotation (electrical)	215° ± 20°				
Wiper standard delivery position	50% ± 15°				
Max. stop torque	4 Ncm				
Max. push/pull on rotor	9.8 N				
Wiper torque*	<2 Ncm				
Mechanical life	1.000 cycles (others available on request)				

^{*} 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.

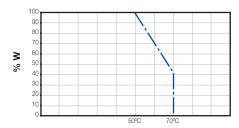
CA6 Through-hole and SMD

	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°C ± 2°C	±4%		
Storage (3 years)	3 years at 23°C ± 2°C	±3%		

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

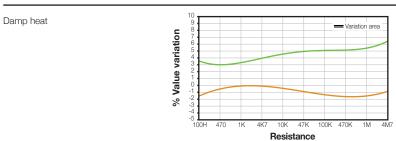
CA6 Through-hole and SMD

Power derating curve:

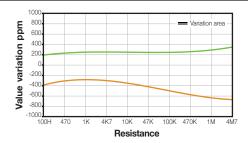


Representation of the typical variation of nominal resistance (with 95% confidence) throughout the ohm value range:

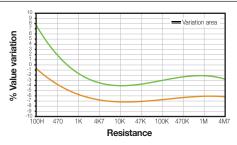




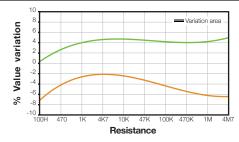
Temperature Coefficient



Load life



Mechanical life









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.

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

EXAMPLE: CE9MH2,5-10KA2020 SNP PI WT-9005-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		
CA9/CE9	М	H2,5		- 10K	Α	2020				SNP			Pl		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.

1 - Ser	ies									
CA9	■ CE9									
2 - Rot	ors									
C [) E	J	K	KA	М	MA	MT	Р	R	Υ
3 - Mo	del and p	itch								
H2,5	H3,8	HS3,8	H5	H	SMD	V7,5	V10	VK1	0	VR10
ΜΔ\/10	N/T\/10) \/\$\/\) \/9	SMD W	T_0002	VSMD	CV	VSMD	CV M	

ackaging	Trough-hole	SMD models
	(blank) ⁽¹⁾	(blank) ⁽¹⁾
Tape and 13" reel)	T&R	T&R
Tape and 15" reel)	T&R15	T&R15
rape and 15 reel)	IARIS	IARI

(1) If blank, bulk packaging is implied.

5 - Resistance value

100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	2ΚΩ	500ΚΩ	1ΜΩ	2ΜΩ	2Μ2Ω	4M7Ω	5ΜΩ
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M

6 - Resistance law / taper

Litt Lineal	71	
Log - Logarithmic	В	
Antilog - Antilogarithmic	С	
- Special tapers have codes assigned:	CODE YXXXXX	

7 - Tolerance

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

8 - Operating Life (Cycles)

Standard (1.000 cycles)	(leave blank)
Long life: LV + the number of cycles. ex: LV10 for 10.000 cycles. (others on request)	LVXX: ex: LV10

9 - Cut Track - Open circuit.

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

Detents (DT)

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

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

<u></u>	<u> </u>	ıer	mi	nais

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

12 - Housing

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

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: 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 only rotor: RT-V0

(blank) V0 CJ-V0, 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
Assembled from collector side	WTI
Accessory Reference	-XXXX
See list of shafts and thumbwheels available	Example: 9010
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

For ordering spare accessories:

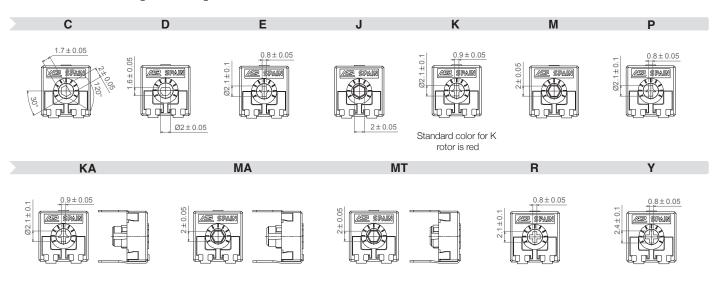
Accessory reference - color- flammability. XXXX-YY-V0 Ex. 9010-AZ-V0 is a blue self-extinguishable 9010 thumbwheel

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

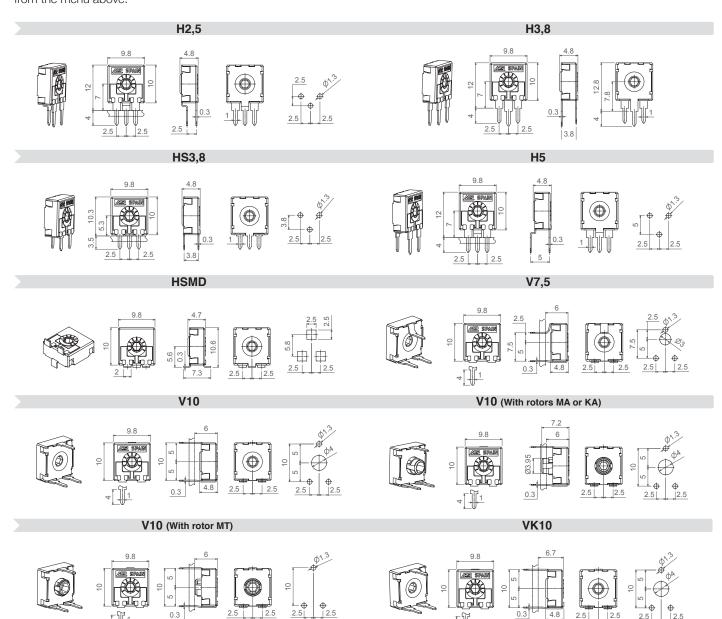
(1) black is not an option for housings.

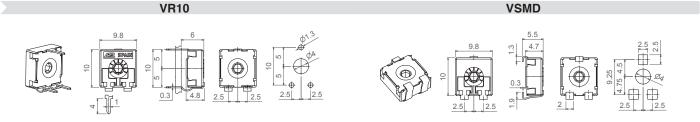
Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.



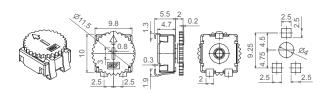
Models

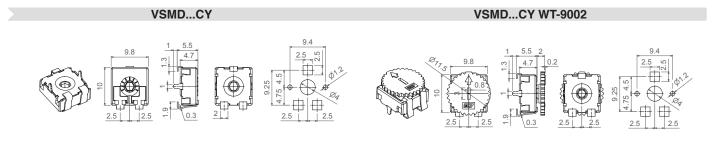
All models shown here have the most common rotor for 9mm potentiometers: the M rotor. Different rotors are available from the menu above.





VSMD WT-9002

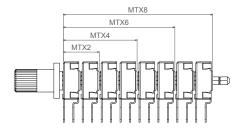




GANGED

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).

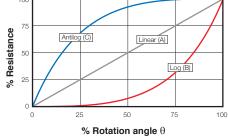
Model	MTX2	MTX4	MTX6	MTX8
Shaft	9048, 9074, 9076	9039, 9051	9018	9056

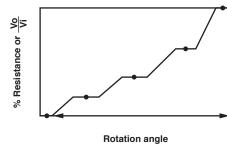


Tapers

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

REGULAR TAPERS SPECIAL TAPERS







The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications.

Mechanical life with cut track needs to be confirmed.

PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.

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

Other positions are available on request.

PCI PCF







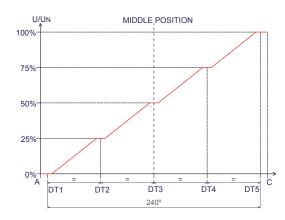


Potentiometers with detents

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:

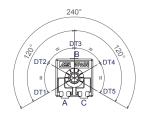
Example of 5DT with control of value in each DT.











Other examples of potentiometers with detents:

10DT 20DT













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

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

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

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

> SNP **SNJ**





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

Standard Terminal

Shorter terminal, for H5 TP25

Shorter terminal, TPXX (under request)







Possibilities for insertion 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









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.

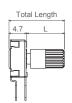
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

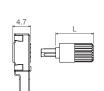
Unless otherwise stated, the arrow in the shafts is in line with the wiper and it points to 50% when assembled with M rotors.

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:

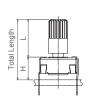
H potentiometer + shaft V potentiometer + shaft

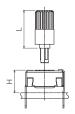










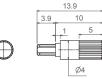


Shaft 9071 9067 9072 9074 9054 9004 9005 9064 9055 9070 9076 9053 9018 9039 9048 9056 9009 9059 9063 9010 9051 9006 9019 9073 9020 9047 L Dimension 3.5 6.5 9.3 10.8 11.9 12 12.1 12.8 12.8 12.8 12.8 14.5 14.5 14.5 19.7 19.9 25.5 25.9 29.8

9004 9005















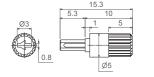


Shafts 9006 9009 3.9 9010 9018 (for 6 ganged potentiometers) Ø6 9019 (Designed for D rotor) 9020 (Designed for D rotor) 0.9 9039 (for 4 ganged potentiometers) 9047 9048 (for 2 ganged potentiometers) 9051 (for 4 ganged potentiometers) 20.5 Ø12 9053 9054 Ø5 9055 9056 (for 8 ganged potentiometers) Metal -Hexagon 9059 9063 18.4 18.4

Ø9

9064 9067









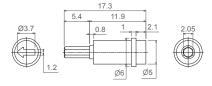




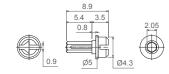
The arrow is in line with the wiper when potentiometer has rotor \boldsymbol{J} (with M rotor, there is a 30° difference).

9070 9071



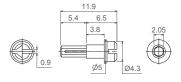




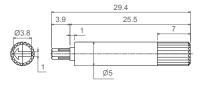


9073 9072





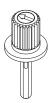


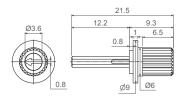




9074 (for 2 ganged potentiometers)

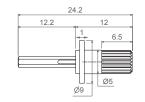
9076 (for 2 ganged potentiometers)











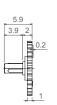


Thumbwheel

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.

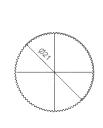




9002

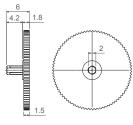






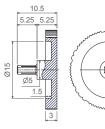
9041

9061

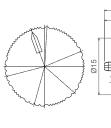


9060 (Designed for R rotor)

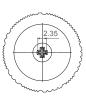








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Bulk packaging:

VSMD

VSMD...CY

HSMD

H2,5...TP25 - H5...

TP25 - HS3,8

V7,5 - V10 - V10...

TP25 - VR10

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 - HS3,8 - H5 HSMD - 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
KAV - MAV – MTV	None, only potentiometers.	400	1.250
MTX2	9048, 9074, 9076	150	To be determined.
MTX4	9039, 9051	75	To be determined.
MTX6	9018	50	To be determined.
MTX8	9056	40	To be determined.

таре & неег раскадінд:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15"
	None, only potentiometers.	900 pcs per reel, 12mm step between cavities.	

9002

None, only potentiometers.

9002

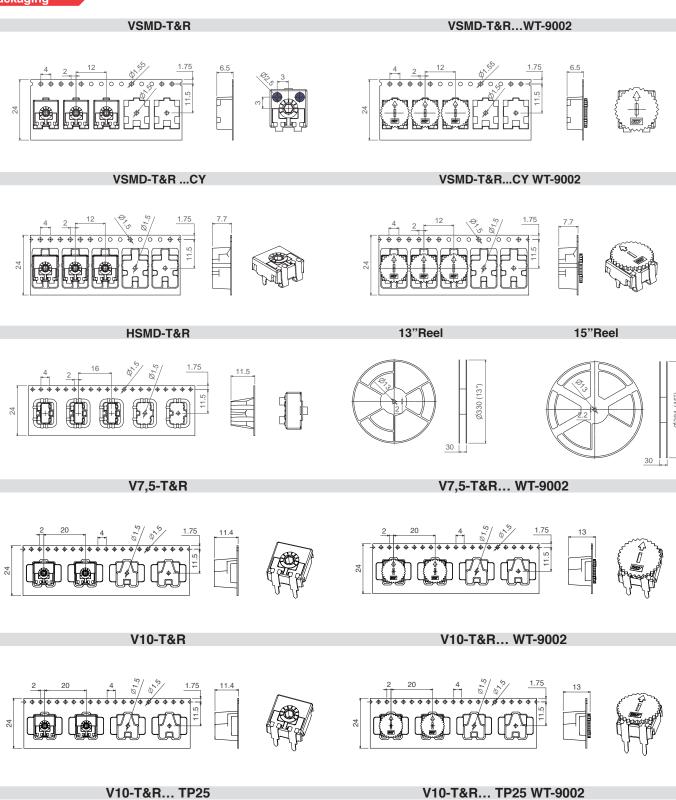
None, only potentiometers or 9002

13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
900 pcs per reel, 12mm step between cavities.	1.250 pcs per reel, 12mm step between cavities.
700 pcs per reel, 12mm step between cavities.	To be determined.
750 pcs per reel, 12 mm step between cavities	1000 pcs per reel, 12 mm step between cavities
To be determined	To be determined
350 pcs per reel, 16 mm step between cavities	475 pcs per reel, 16 mm step between cavities
250	350

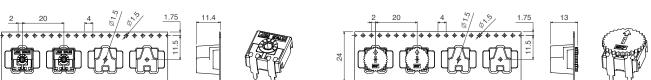
400

250

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

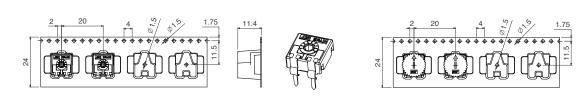






VR10-T&R

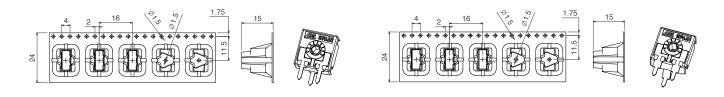
VR10-T&R... WT-9002



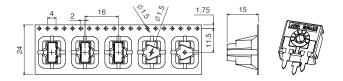


HS3,8-T&R

H5-T&R... TP25



H2,5-T&R... TP25





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

	CA9 Through-hole	CE9 Through-hole and SMD			
Range of resistance values* Lin (A) Log (B) Antilog (C)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 1MΩ 1 KΩ ≤ Rn ≤ 1 MΩ	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω		
Tolerance* $ \begin{array}{l} Rn < 100\Omega \colon \\ 100\Omega \leq Rn \leq 100K\Omega \\ 100K < Rn \leq 1M\Omega \colon \\ 1M\Omega < Rn \leq 5M\Omega \colon \\ Rn > 5M\Omega \colon \\ \end{array} $	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±20% ±30% ±20% ±40% ±30% ±50%			
Variation laws	Lin (A),	Log (B), Antilog (C). Other tapers available o	n request		
Residual resistance	Lin (A), Log (B), Antilog (C) ≤ 5	5*10-3*Rn. Minimum value 2Ω	≤2Ω		
CRV - Contact Resistance Variation (dynamic)		Lin (A) Electrical Angle 220°±20° ≤ 3%Rn. Other tapers, please inquire			
CRV - Contact Resistance Variation (static)		Lin (A) Electrical Angle 220°±20° ≤ 5%Rn. Other tapers, please inquire			
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	0.1	at 50°C 0.15W 0.10W			
Maximum voltage Lin (A) Log (B), Antilog (C)	200° 150°	200VDC			
Operating temperature	-25°C +70°C (-	-25°C +70°C (+85°C on request)			
Temperature coefficient $100\Omega \leq Rn \leq 10K\Omega$ $10K\Omega < Rn \leq 5M\Omega$	+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.

Mechanical
Specifications

	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° ± 20°					
Wiper standard delivery position	50% ± 15°						
Max. stop torque		5 Ncm					
Max. push/pull on rotor	40 N						
Wiper torque*	<2 Ncm Potentiometers with detents: <2.5 Ncm						
Mechanical life	1.000 cyc	es (many more available on request, pl	ease, inquire)				

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

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

CA9 Through-hole and SMD

CE9 Through-hole and SMD

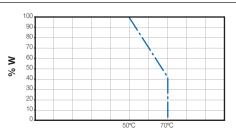
	Test conditions	Typical variation of nominal resistance	Test conditions	Typical variation of nominal resistance
Damp heat	500 h. at 40°C and 95% RH	+5%, -2%	500 h. at 40°C and 95% RH	±2%
Thermal cycles	16 h at 85°C, plus 2 h at -25°C	±2.5%	16 h at 90°C, plus 2 h at -40°C	±2%
Load life	1.000 h. at 50°C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

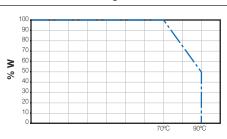
Test results



CE9 Through-hole and SMD

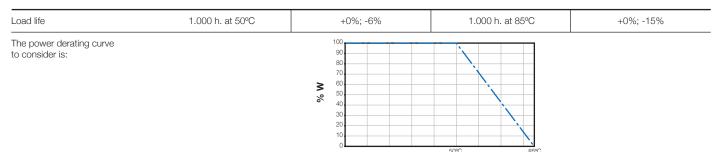
Power derating curve:



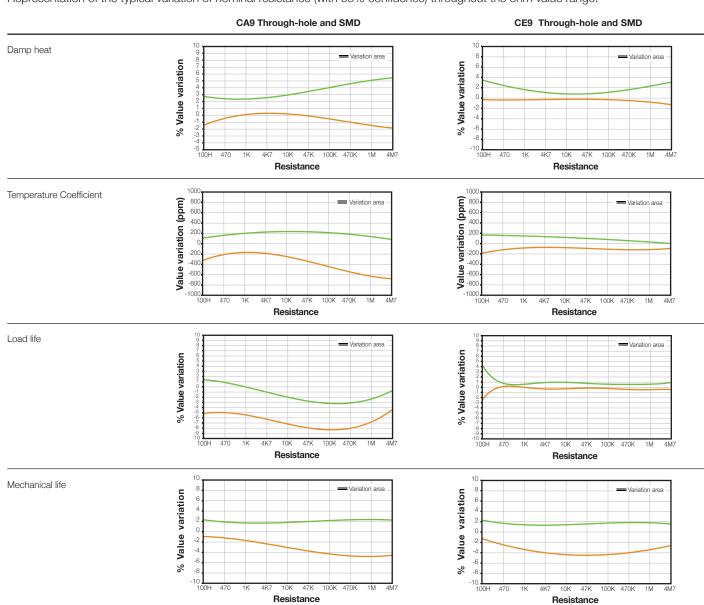


For temperatures out of range

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 - CA14

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.

CERMET - CE14

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.

CA14 R CE14 R HOW TO ORDER

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

EXAMPLE: CE14NV12,5-10KA2020 10DT SNP PI WT-14117-BA-V0

						Extra fe	atures						Assemb	led acc	essory	
Series Rotor Mo	odel Packg. (Ohm value	Taper	Tol.	Life	Track	Detents	s Snap in	Housing	Rotor	Wiper	Lin.	Assembly	Ref #	Color	Flam.
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CA14/CE14 N H2	2,5	- 10K	А	2020			10DT	SNP			PI		WT	14117	-BA	-V0
andard configuration	n:	CA14	Throug	h-hole				CA1	4 SMD			c	E14 Thro	ugh-hol	e and S	MD
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rotection:									dust-proo							
ubstrate:		Carbo	n techr	ology				Self-extingunology, sp						Cermet		
olor:		Blue hous			ır	Oarb		own hous		-	Jerature		Brown hou		vhite rota	nr .
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/iper position:)% ±15°							
erminals:							St	raight, wit		ping.						
larking:						Resistive		narked or			on reques	t.				
special specifications. - Series CA14 CE14	Example: CA	.14PH2,5-	-10K C(ODE COO)111.			<u>11 - Term</u> SNAP IN								SNP
								SNAP IN								SNR
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- Packaging		igh-hole		S	MD mo								using and		00.01, 07.	, 5,000, 1
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Mileterate to the all and a second and the formation of	(O) NI A NI-+ A	Saabla, Taaaa	and Deel an		-1			If only roto								
	. (2) N.A., Not Appl	licable: Tape a	and Reel pa	ackaging is o	nly available		inals.	14 - Wip	er	tandard:	50% + 1	59)			(leav	e blank
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- Resistance value 00 2000 2200 2500 47 00 200 220 250 4 ner resistive values available on re - Resistance law / ta n - Linear og - Logarithmic ntilog - Antilogarithmic Special tapers have coc - Tolerance 20% ±30% 020 3030 - Operating Life (Cyc andard (1.000 cycles) ong life: LV + the number of - Cut Track - Open c	0Ω 500Ω 1KΩ 70 500 1KΩ rouest. per les assigned: +50 les)	2 2KΩ 2 2K 20%,-30% 5030	500KΩ 500K	1MΩ 2M 1M 2 A B C CODE Y> ±10% 1010	MΩ 2M29 M 2M29	±5% (leave blar	inals. iMΩ iMΩ iMΩ ink) v10	14 - Wiper pount of the state o	er position (S CCW W ollowing c rque (Sta ue, < 1.5N parity olled ant linearity c s could be av entiomete d from te d from te d from co y Referen f shafts ar shaft or th ktinguishalt	ock pos ndard: < lcm controlled ailable on re ers with rminal si bllector s ce nd thumb	d & below a & below a assemb de ide	3 hours for dete	nts: <3.5)	-YY	PXH, (leave	PI PF ex: P3H e blank; PGB e blank; ex: LN: Ax%
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- Resistance value 0Ω 200Ω 220Ω 250Ω 47 00 200 220 250Ω 4 ner resistive values available on ner - Resistance law / taner - Linear og - Logarithmic ntilog - Antilogarithmic Special tapers have cocce - Tolerance 20% ±30% 020 3030 - Operating Life (Cycce) andard (1.000 cycles) ong life: LV + the number of compen circuit at beginning pen circuit at end of transpect of the compensation of the	0Ω 500Ω 1KG 70 500 1KG rougest. per les assigned: +50 grouit. rouit.	2 2KΩ 2 2K 20%,-30% 5030	500KΩ 500K	1MΩ 2M 1M 2 A B C CODE Y> ±10% 1010 S. (others on	MΩ 2M2S M 2M2S M 2M2S CI	±5% (leave blar	inals. iMΩ inals. iMΩ inals. iMΩ inals. iMΩ inals. imals.	14 - Wiper pount of the control of t	position (SCW) W W Ollowing c rque (Sta Jue, < 1.5N parity olled Int linearity c so sould be ave entiometr and from te and from te and from te and from co y Referen f shafts ar shaft or the xtinguishaft y reference y reference y reference	ock pos ndard: < lcm controlled ailable on re ers with rminal si bllector s ce nd thumb umbwhe ble. Self-e modifies e acces e - color	d & below: & below: & below: assemb de	3 hours for dete	essories	-YY dard)	PXH, (leav F (leave LNx%; L W W -XXX Example Example (leave	PI PF ex: P3I e blank PGB ex: LN: Ax%
- Resistance value 100 2000 2200 2500 47 100 200 220 250 4 101 200 220 250 4 102 200 220 250 4 103 200 220 250 4 104 250 4 105 250 4 106 250 4 107 250 4 108 250 4 109 250 4 10	0Ω 500Ω 1KΩ 70 500 1K equest. per les assigned: +50 cycles. ex: LV1 ircuit. of track, fully CW	2 2KΩ 2 2K 20%,-30% 5030	500KΩ 500K	1MΩ 2M 1M 2 A B C CODE Y> ±10% 1010 S. (others on	MΩ 2M2C M 2M2C M 2M2C CI CI CF	±5% (leave blar	inals. iMΩ iMΩ inh() v10	14 - Wiper pount of the control of t	position (SCCW) W W Ollowing c rque (Statue, < 1.5N parity olled Int linearity c sould be av pentiomete and from te and from te and from te and from te to the from to to the f	ock pos ndard: < lcm controlled ontrolled ailable on re ers with rminal si ollector s ce nd thumb umbwhee ole. Self-e modifies e acces e - color s a blue :	d & below a & below a delevatinguishal only the actions assertion of the actions are also results.	3 hours for dete	essories ding to stand please, note	-YY dard)	PXH, (leav F (leave LNx%; L W W -XXX Example Example (leave	PI PF ex: P3 e blank PGB e blank ex: LN Ax%

X number of detents

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

XDT: 10DT

NE

ВА

(1) black is not an option for housings.

IN

RO

VΕ

AM

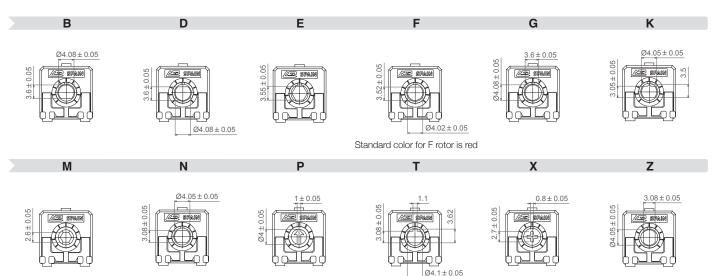
ΑZ

GS

MR

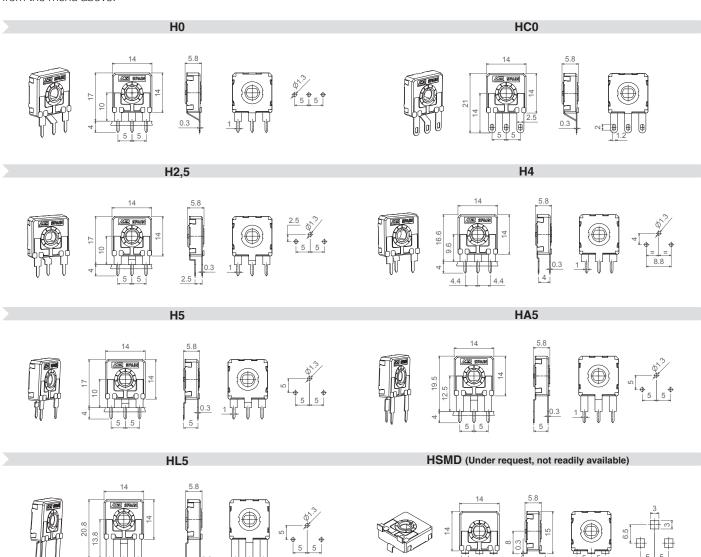
TA

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.

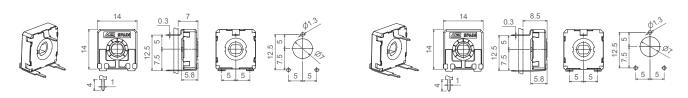


Models

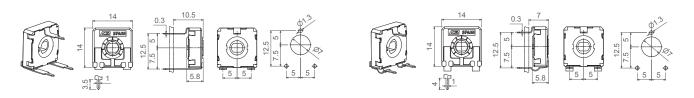
All models shown here have the most common rotor for 14mm potentiometers: the N rotor. Different rotors are available from the menu above.



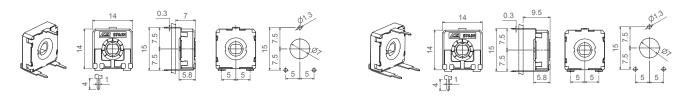
V12,5 VA12,5



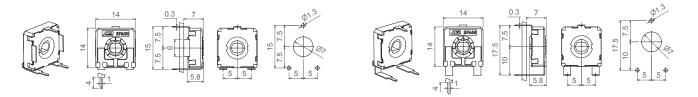
VR12,5 VL12,5



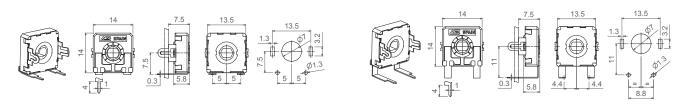
VJ15 V15



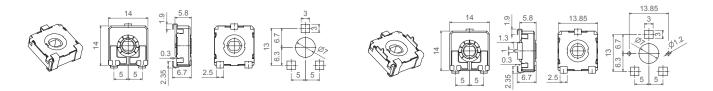
V17,5 V15...CFF



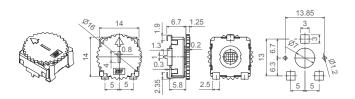
VD7,5 VD11



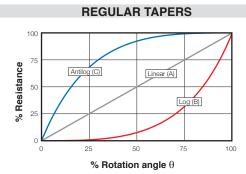
VSMD VSMD...CY

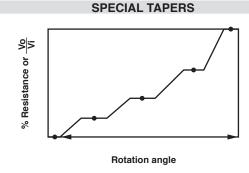


VSMD...CY WT-14003



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.

PCI PCF







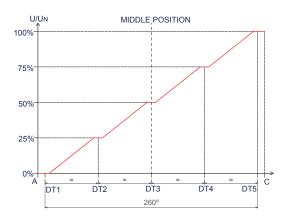


Potentiometers with detents

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:

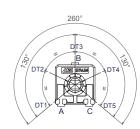
Example of 5DT with control of value in each DT.





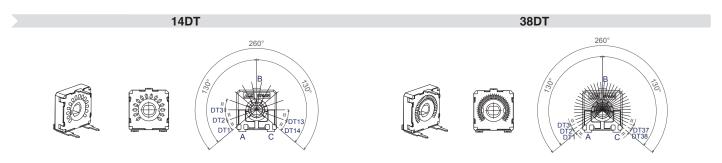








Examples of some potentiometers with detents:



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.

SNP SNR



R1.5

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

Standard Terminal	Shorter terminal, for V12,5	Shorter terminal, TPXX (under request)
	,	
\$ <u></u>	SIN A	žĽV V V

Possibilities for insertion

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
		Π	T

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.

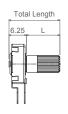
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

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:

H potentiometer + shaft

V potentiometer + shaft

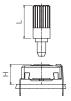










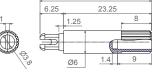


Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

14008 14015



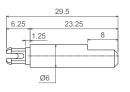














14042

14056

















14065 (Designed for E rotor)

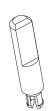
14066















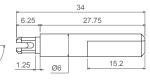


14067

14072



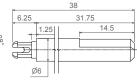














14073

14081

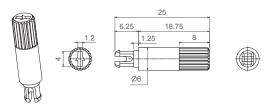
14084

14117

14187

14250

14251



Thumbwheel

6.25

1.25

18.75

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.

14003

6.25

1.25

Ø6

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)
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
HC0 - V12,5 - V15 - VA12,5 VL12,5 - VJ15 - V17,5*	14003, 14117, 14042, 14056, 14065	100	400 350 for models with*
VD11* - VD7,5* - VR12,5	14008, 14015, 14066, 14067, 14072, 14073, 14081, 14084, 14187, 14250.	75	To be determined.

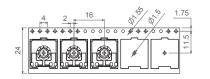
For models with * and an inserted accessory, please, inquire about the quantity per box in that case. Optional box 140x140x70 is available on request.

Tape & Reel packaging:

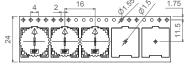
	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
VSMD	None, only potentiometers.	500 pcs per reel, 16mm step between cavities.	800 pcs per reel, 16mm step between cavities.
VSIVID	14003	450 pcs per reel, 16mm step between cavities.	To be determined.
VSMD CY	None, only potentiometers. 350 pcs per reel, 20mm step between cavities.		500 pcs per reel, 20mm step between cavities.
VSIVID 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.

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





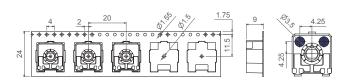


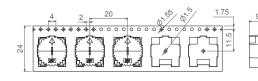




VSMD-T&R ... CY

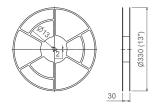
VSMD-T&R...CY WT-14003

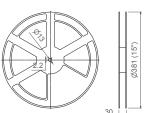






13" Reel 15" Reel







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)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 1MΩ 1 KΩ ≤ Rn ≤ 1 MΩ	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω		
Tolerance* $ \begin{array}{l} Rn < 100\Omega \colon \\ 100\Omega \leq Rn \leq 100K\Omega \\ 100K < Rn \leq 1M\Omega \colon \\ 1M\Omega < Rn \leq 5M\Omega \colon \\ Rn > 5M\Omega \colon \\ \end{array} $	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±20% ±30% ±20% ±40% ±30% ±50%			
Variation laws	Lin (A),	Log (B), Antilog (C). Other tapers available of	n request		
Residual resistance	Lin (A), Log (B), Antilog (C) ≤ 8	5*10-3*Rn. Minimum value 2Ω	≤2Ω		
CRV - Contact Resistance Variation (dynamic)		Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire			
CRV - Contact Resistance Variation (static)		Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire			
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 5 0.2 0.1	at 70° C. 0.7W 0.30W			
Maximum voltage Lin (A) Log (B), Antilog (C)					
Operating temperature	-25°C +70°C (-40°C +90°C (+125°C on request)			
mperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega \\ 10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega \\ +200/\ -300 \text{ ppm}$		+200/ -500 ppm +200/ -1000 ppm	±100 ppm ±100 ppm		

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

Mechanical Specifications

	CA14 Through-hole	CA14 SMD	CE14 Through-hole and SMD				
Resistive element	Carbon technology	Carbon technology	Cermet				
Angle of rotation (mechanical)		265° ± 5°					
Angle of rotation (electrical)		245° ± 20°					
Wiper standard delivery position		50% ± 15°					
Max. stop torque		10 Ncm					
Max. push/pull on rotor		50 N	50 N				
Wiper torque*		m					
Mechanical life	1.000 cy	cles (many more available on request, pl	ease, inquire)				

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



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

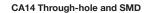
CA14 Through-hole and SMD

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%
Storage (3 years)	3 years at 23°C ± 2°C	±3%	3 years at 23°C ± 2°C	±1%

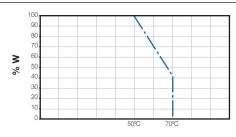
^{**} Dissipation of special tapers will vary, please, inquire.

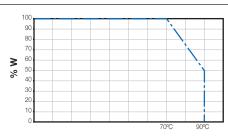




CE14 Through-hole and SMD

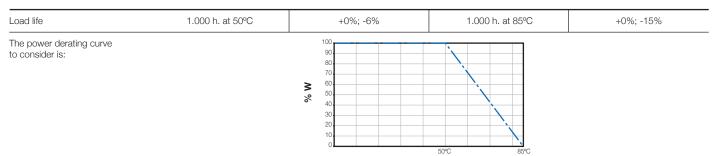
Power derating curve:



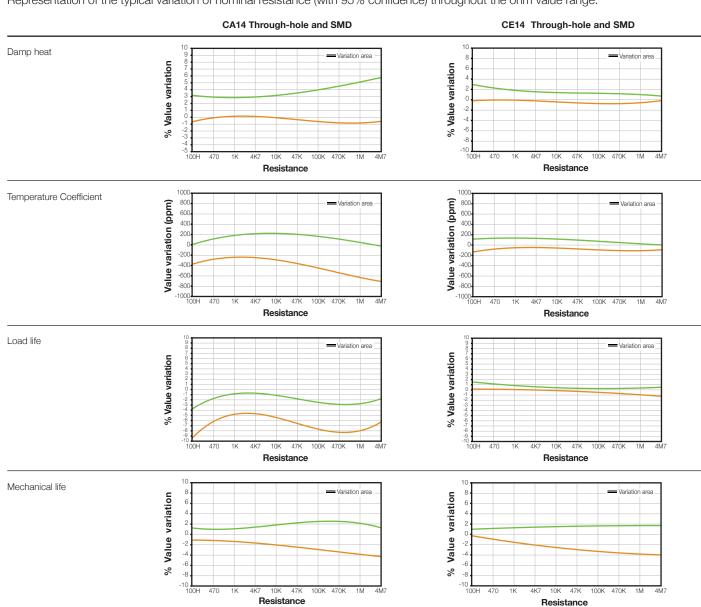


For temperatures out of range

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 Potentiometers CAR



Cermet Potentiometers CER







CARBON - CAR 14

This product family born as an alternative to the CA14 series when curved designs appear. Housing shape has been modified in order to set the product properly.

CAR14, 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 configuration is available; for SMD version, please, inquire. 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.

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.

Applications

CAR14 is 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.

CERMET - CER14



This product family born as an alternative to the CA14 series when curved designs appear. Housing shape has been modified in order to set the product properly.

CER14, 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 configuration is available; for SMD version, please, inquire. 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.

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.

Applications

CER14 is 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.

CAR14 @ CER14 @ HOW TO ORDER

Tol.

Life

Extra features

Track Detents Snap in Housing Rotor

EXAMPLE: CAR14NV12,5-10KA2020 10DT SNP PI WT-14117-BA

Series Rotor Model Packg. Ohm value Taper

Standard features

EXAMPLE: CER14NV12,5-10KA2020 10DT SNP PI WT-14117-BA-V0

Lin.

Wiper

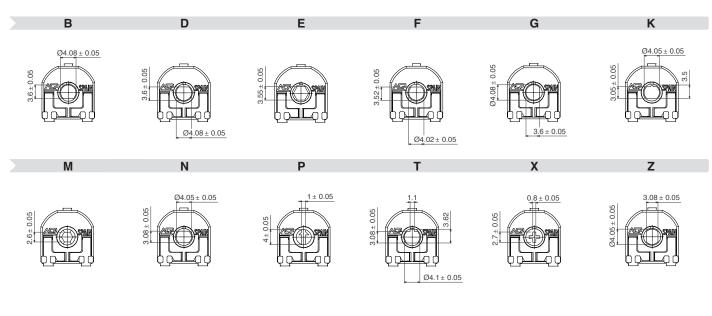
Assembled accessory

Assembly Ref # Color

Flam.

	3	4	5	6	7	8	9	10	11	12	13		14	15			16		
CAR14/CER14 N	H2,5	-	- 10K	А	2020			10DT	SNP				PI		W	T 14	4117	-BA	-V0
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Protection:									IP 54 (d										
) ub atrata			Carbs	n taaba	alam.		On r	equest: S	elf-extingui	ishable,	to meet	UL 94	V-0			0.0			
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Packaging:			ue nous	siriy + v	hite roto					Bulk					DIOWI	THOUSII	ig + wi	iile rotor	
Viper position:										% ±15	0								
erminals:								Str	aight, with										
Marking:							Resistive		arked on			rs on i	eanes	t.					
													•						
Customized produ III special specificati					_		nized pro	duct. Ser	ries, rotor,	mode	l and tot	tal resi	stive va	alue ar	e indica	ed befo	ore the o	code that	includ
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- Series									11 - Term										2010
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D E	F C	G K	М	N	Р	Т	X	<u> </u>	Steel Term	ninals									SH
								_ 1	12 - Hous	sing									
- Model and pitc	h							_ 9	Color: For	colors	other tha	n stand	dard: -S	See colo	or chart b	elow-	CJ-c	olor, ex., re	ed: CJ-
15								_ 1	13 - Roto	r									
- Packaging		Trougi	h-hole						Color: For	colors o	other tha	n stand	dard: -S	See colo	or chart b	elow-	RT-co	olor; ex., b	lue: RT
ulk			nk) ⁽¹⁾					_ ;	Self-ext	inguis	hable p	roper	ty, VO	for h	ousing	and ro	tor:		
) If blank, bulk packaging is								F a	By default, For carbon: and rotor a f only rotor	: self-ex re V0. If	tinguisha only the	able pro	perty c	an be	added. V) means))	blank) V0 /0, RT
00Ω 200Ω 220Ω 250)Ω 470Ω 50	00Ω 1ΚΩ	2KΩ	500ΚΩ	1MΩ 2N	IΩ 2M2Ω	Ω 4M7Ω 5	iMΩ 1	14 - Wipe	er									
00 200 220 25	0 470 5	000 1K	2K	500K	1M 2l	M 2M2		\ 5M	Wiper po	sition	(Standa	rd: 50)% ± 1	5°)				(leave b	olank)
ther resistive values availab	ble on request.								nitial or C	CW								PI	
								F	Final or C\	N								PF	:
- Resistance law	/ taper							<u> </u>	Others: fol	llowing	clock p	ositior	ns; at	3 hour	s: P3H			PXH, ex	: P3H
in - Linear					A			— ī	Wiper tor	que (S	Standard	d: <2.5	Ncm,	for det	tents: <3	3.5)		(leave b	olank)
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og - Logarithmic ntilog - Antilogarith	mic				С				_ow torqu									PG	В
		signed:		(C CODE YX	XXXX			15 - Line	arity	0140111								
ntilog - Antilogarith		signed:		(XXXX		<u></u>	15 - Linea	arity olled				2/ 5		00/ 11		(leave b	olank)
ntilog - Antilogarithi Special tapers have - Tolerance	e codes as		30%	(CODE YX	XXXX	+5%		15 - Linea Not contro	arity olled nt linear	ity contro				example,	3%: LN	3% l	(leave b	olank) :: LN39
ntilog - Antilogarith Special tapers have - Tolerance	e codes as:	+50%	6,-30%	(±10%	XXXX	±5%		15 - Linea Not contro ndepender Absolute li	arity olled nt linear	ity contro	led & k	pelow :	x%	example,	3%: LN	3% L	(leave b	olank) :: LN39
ntilog - Antilogarith Special tapers have - Tolerance	e codes as	+50%	%,-30% D30	(CODE YX	××××	±5% 0505	- 1 - 1 - N III	15 - Lines Not contro ndepender Absolute li Other features	arity olled nt linear inearity could be	ity control control available c	led & k	pelow :	X% , ask.			13% L	(leave b	olank) :: LN39
ntilog - Antilogarith Special tapers have - Tolerance	e codes as: 30% 3030	+50%		(±10%	××××			Not control ndepender Absolute li Other features	arity blled Int linear inearity s could be	ity control control available c	led & k on reques	pelow :	X% , ask.			13% L	(leave t LNx%; ex LAx	olank) :: LN39
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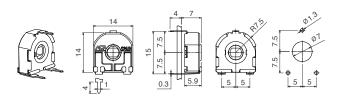
Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated.



Models

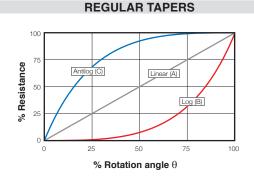
All models shown here have the most common rotor for 14mm potentiometers: the N rotor. Different rotors are available from the menu above.

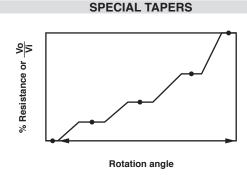
V15



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.

PCI PCF







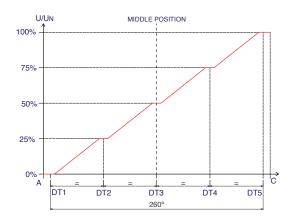


Potentiometers with detents

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.

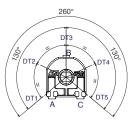
Detents can be light or strong, or even a combination of different feelings. They can be evenly distributed along the angle (standard) or tailored to match customers' request. They can also be combined with special tapers: constant value areas, open circuit zone, different slopes, etc. One common example 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 5T with control of value in each DT.









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 this product, detents are only available under request.

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.

SNF



Shorter terminal tips are only available under request.

Possibilities for insertion

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 WTI





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.

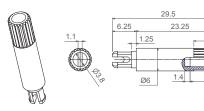
When a shaft is mounted, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:

V potentiometer + shaft

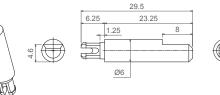


Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

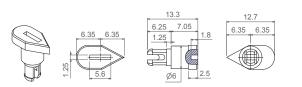
14008 14015

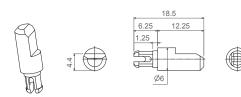






14042 14056





14065 (Designed for E rotor) 14066



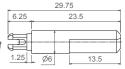




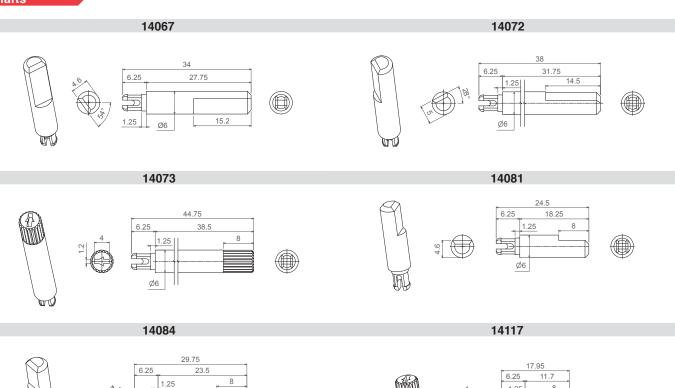








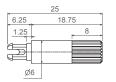




14187 14250



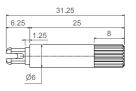










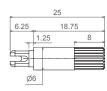


Ø6



14251







56

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.

14003









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.	200 150 for models with*	700
V15	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.



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

CAR14 Through-hole

CER14 Through-hole

Range of resistance values* Lin (A)	100Ω ≤ Rn ≤ 5MΩ	100Ω ≤ Rn ≤ 5MΩ					
Log (B) Antilog (C)	1 KΩ ≤ Rn ≤ 2M2Ω	$1 \text{ K}\Omega \leq \text{Rn} \leq 2\text{M}2\Omega$					
Tolerance* $Rn < 100\Omega: \\ 100\Omega \le Rn \le 100K\Omega \\ 100K < Rn \le 1M\Omega: \\ 1M\Omega < Rn \le 5M\Omega: \\ Rn > 5M\Omega:$	+50%, -30% (out of range)	- ±20% ±20% ±30% -					
Variation laws	Lin (A), Log (B), Antilog (C). Oth	her tapers available on request					
Residual resistance	Lin (A), Log (B), Antilog (C) ≤ 5*10-3*Rn. Minimum value 2Ω	≤2Ω					
CRV - Contact Resistance Variation (dynamic)		Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire					
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle Other tapers, p						
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50℃ 0.25W 0.13W	at 70° C. 0.7W 0.30W					
Maximum voltage Lin (A) Log (B), Antilog (C)	250V 200V						
Operating temperature	-25°C +70°C (+85°C on request)	-40°C +90°C (+125°C on request)					
Temperature coefficient $100\Omega \leq Rn \leq 10K\Omega$ $10K\Omega < Rn \leq 5M\Omega$	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm					

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

Mechanical Specifications

	CAR14 Through-hole	CER14 Through-hole					
Resistive element	Carbon technology	Cermet					
Angle of rotation (mechanical)	265°) ± 5°					
Angle of rotation (electrical)	245° ± 20°						
Wiper standard delivery position	50% ± 15°						
Max. stop torque	10 1	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.

Test results

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

CAR14 Through-hole

CER14 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%
Storage (3 years)	3 years at 23°C ± 2°C	±3%	3 years at 23°C ± 2°C	±1%

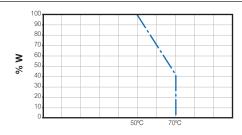
^{**} Dissipation of special tapers will vary, please, inquire.

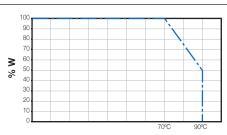


CAR14 Through-hole

CER14 Through-hole

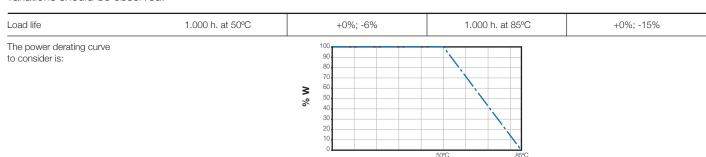
Power derating curve:



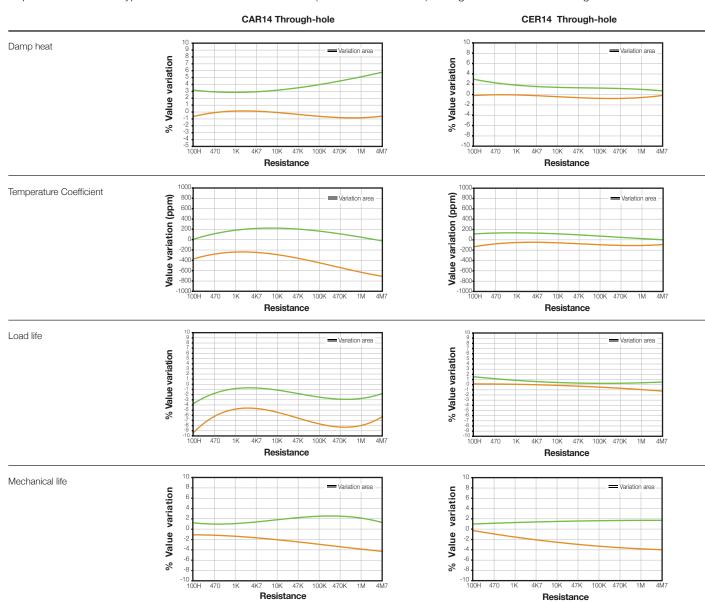


For temperatures out of range

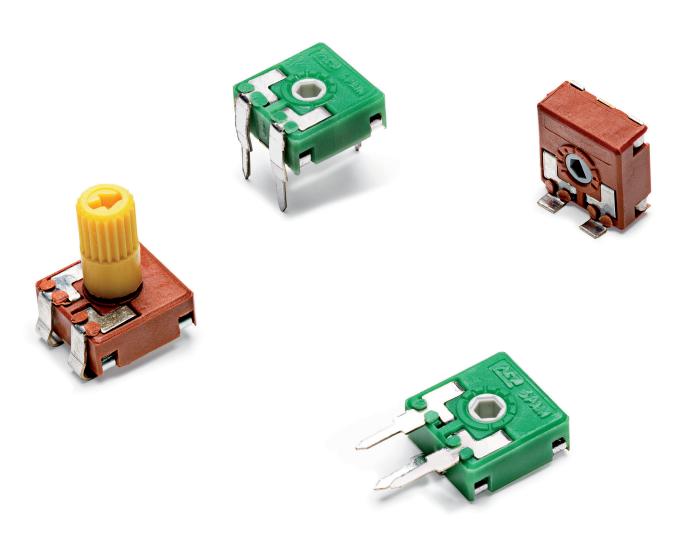
The normal operation temperature for a carbon ACP potentiometer is -25° C to $+70^{\circ}$ C. When the temperature goes up to 85° C, the following variations should be observed:



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









9mm Rotary Sensor appropriated for position sensing and control applications capable of withstanding high configurations of mechanical life.

- Standard: from 25.000 to 50.000 cycles
- Long life: up to 200.000 cycles. More cylcles available under request.

RS9 has 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 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.

Standard taper is linear, with independent linearity of ±3%. ACP can study other special tapers (even cut tracks, step curves with areas of constant value, etc), as well as more strict linearity.

Thumbwheels and shafts can be provided either separately or already inserted in the sensor. Our RS9 can be manufactured in a wide range of possibilities regarding: resistance value, tolerance, tapers, pitch, positioning of the wiper, housing and rotor color.

Applications

- Household appliances: temperature control, position sensor.
- Automotive: position adjustment and sensing. Industrial controls.

RS9 F HOW TO ORDER

EXAMPLE: RS9MH2,5-10KA2020 SNP PI WT-9005-BA

tandard	l featur	es						Extra fe	eatures						Assemb	led acc	essory	
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		
RS9	М	H2,5		- 10K	А	2020				SNP			PI		WT	-9005	-BA	-VC

RS9 Through-hole	RS9 SMD					
	9mm					
	54 (dust-proof) tinguishable, to meet UL 94 V-0					
Carbon technology	Carbon technology, special for high temperature					
Green housing + white rotor Brown housing + grey rotor						
	Bulk					
	at 50% ±15°					
Straigh	it, without crimping.					
Resistive value marked on housing. Others on request.						
	IP On request: Self-ex Carbon technology Green housing + white rotor Straigh					

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.

1 - 3	eries							
RS9)							
2 - R	otors							
C	D	F	J	K	М	Р	R	

3 - Model and pitch

H2,5 H3,8 HS3,8 H5 HSMD V7,5 V10 VK10 VR10 VSMD VSMD WT-9002

4 - Packaging	Trough-hole	SMD models
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾
T&R (Tape and 13" reel)	(N.A.) ⁽²⁾	T&R
T&R (Tape and 15" reel)	(N.A.) ⁽²⁾	T&R15

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

5 - Resistance value

10K

The RS9 has 10K, linear taper and ±30% by default. Other resistive values, tolerances and tapers (log, antilog, cut tracks, constant value areas, etc.) can be studied on request. Please, enclose a drawing when ordering special tapers.

6 - Resistance law / taper

Lin - Linear	А
- Special tapers have codes assigned:	CODE YXXXXX

7 - Tolerance

±30% 3030

8 - Operating Life (Cycles)

Standard: between 25.000-50.000 cycles ex:LV25; LV50 Long life: LV+the number of cycles. ex: LV200 for 200.000 cycles. (others on request) LVXXX:ex: LV200

9 - Cut Track - Open circuit.

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

10 - Detents (DT)

Not applicable for RS9

1	1	-	ıer	m	ına	IS

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

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. Self-extinguishable property (blank) can be added. V0 means housing and rotor are V0. 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: <2Ncm)	(leave blank)
Stronger or softer torque feeling is available on request.	

15 - Linearity

Standard Independent Linearity	LN3%
Other Independent linearity below x%, for example, 4%: LN4% LNx%; ex:	LN4%
Absolute linearity controlled & below x% LAx%	I Ax%

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: 9010
Color of shaft or thumbwheel	-YY Example, white: BA

Non self-extinguishable. Self-extinguishable according to standard UL 94 (leave blank) (-V0 in box 17 modifies only the accessory, please, note.) -V0

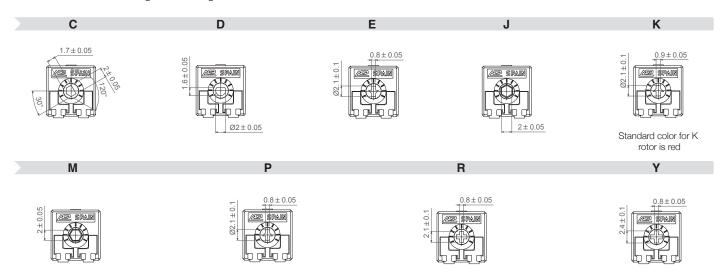
For ordering spare accessories: Accessory reference - color- flammability. Ex. 9010-AZ-V0 is a blue self-extinguishable 9010 thumbwheel XXXX-YY-V0

Color chart for rotor, housing and accessories

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

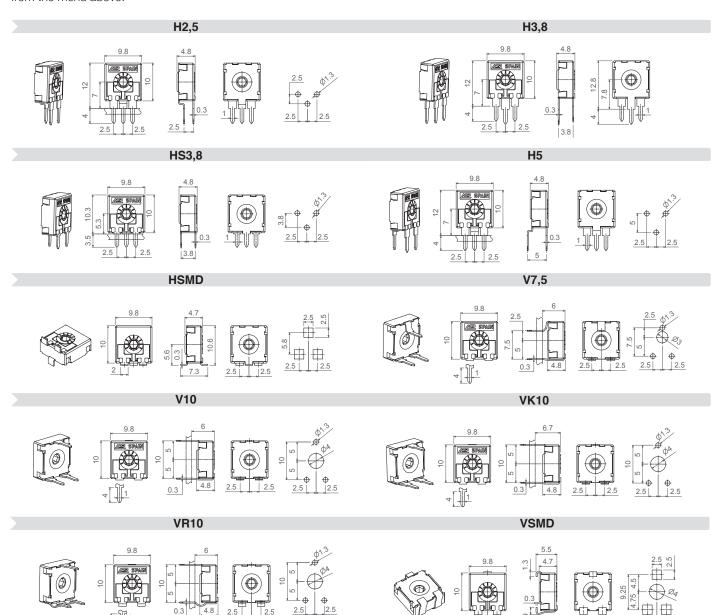
(1) black is not an option for housings.

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.



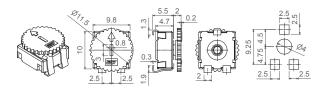
Models

All models shown here have the most common rotor for 9mm potentiometers: the M rotor. Different rotors are available from the menu above.

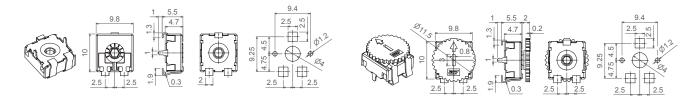


2.5

VSMD WT-9002



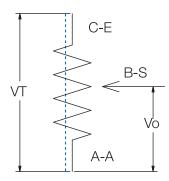
VSMD...CY **VSMD...CY WT-9002**



Tapers

The standard taper is linear (A) and the standard ohm value is 10K, since a RS9 will normally be used as a voltage divider. For other tapers, please, inquire.

Voltage Divider



Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications.

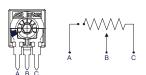
Mechanical life with cut track needs to be confirmed.

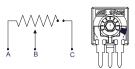
PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.

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

Other positions are available on request.

PCI **PCF**





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

> SNP **SNJ**





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

Standard Terminal

Shorter terminal, for H5 TP25

Shorter terminal, TPXX (under request)







Possibilities for insertion

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









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.

Unless otherwise stated, the arrow in the shafts is in line with the wiper and it points to 50% when assembled with M rotors.

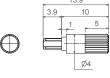
When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:

V potentiometer + shaft H potentiometer + shaft Total Length Shaft 9071 9067 9072 9054 9004 9005 9064 9055 9070 9053 9009 9059 9063 9010 9006 9019 9073 9020 9047 3.5 6.5 9.5 10 10 10 10.8 12.1 14.5 14.5 15 19.7 19.9 25.5 L Dimension 14.5 25.9 29.8

9004 9005







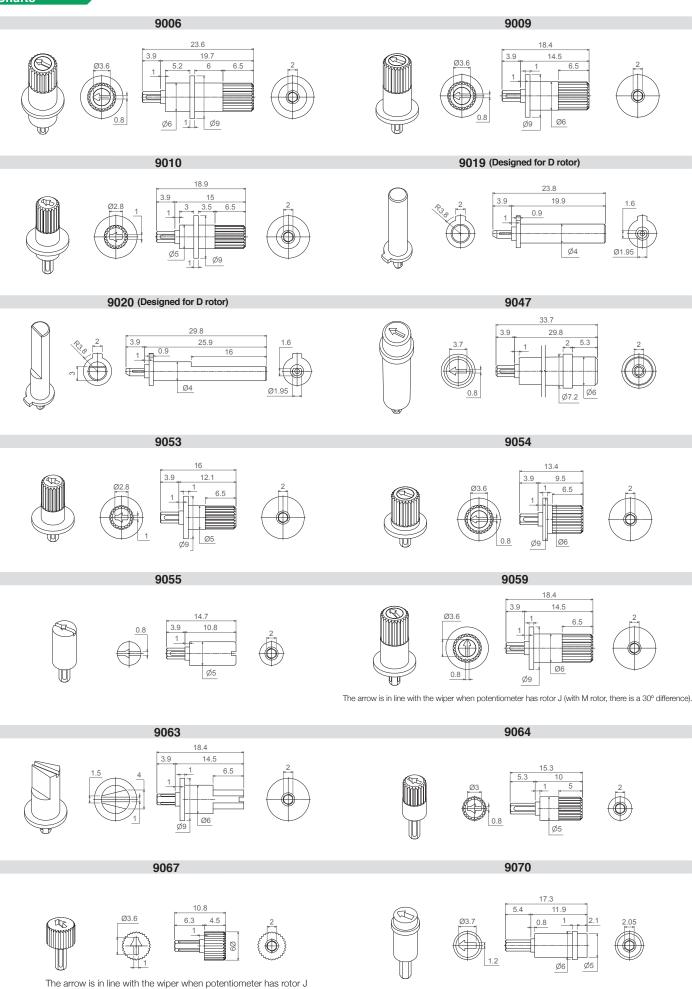








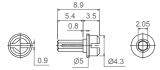




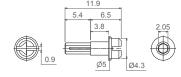
(with M rotor, there is a 30° difference).

9071 9072



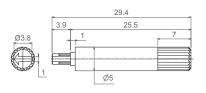






9073



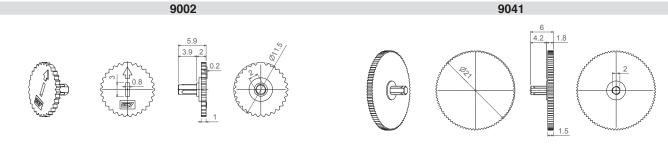


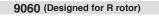


Thumbwheel

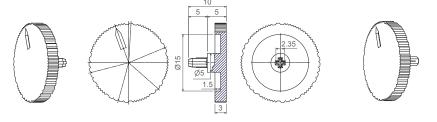
Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

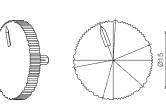
Thumbwheels can be mounted on the potentiometers at ACP or sold separately. ACP can study special thumbwheel designs.

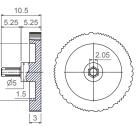




9061







Gear Wheels

In addition to the range of shafts and thumbwheels we can provide gear wheels under study according to customer's requirements. The below model is already available for prototyping purposes. It can be supplied loose or already mounted on the RS9 series









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 - HS3,8 - H5 HSMD - V7,5 - V10 VK10 - VR10 - VSMD	9004, 9005, 9006, 9009, 9010, 9041, 9047, 9053, 9054, 9055, 9059, 9060, 9061, 9063, 9064, 9067, 9070.	200	1.000 in general
	9071, 9072	400	1.250

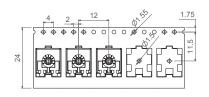
_	_			
Tane	&	Reel	packag	ina:
·upo	~		paomag	

rapo a ricor packaging.	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
1/01/10	None, only potentiometers.	900 pcs per reel, 12mm step between cavities.	1.250 pcs per reel, 12mm step between cavities.
VSMD	9002	700 pcs per reel, 12mm step between cavities.	To be determined.
VSMDCY	None, only potentiometers.	750 pcs per reel, 12 mm step between cavities	1000 pcs per reel, 12 mm step between cavities
VOINDO1	9002	To be determined	To be determined
HSMD		350 pcs per reel, 16 mm step between cavities	475 pcs per reel, 16 mm step between cavities

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

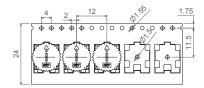
VSMD-T&R

VSMD-T&R...WT-9002







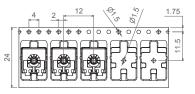






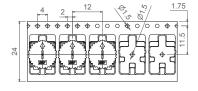
VSMD-T&R ...CY

VSMD-T&R...CY WT-9002







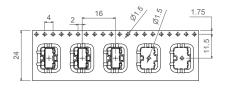






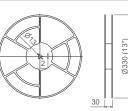
HSMD-T&R

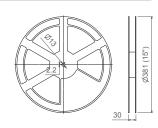
13"Reel 15"Reel













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

RS9 Through-hole and SMD

Range of resistance values* Lin (A) Log (B) Antilog (C)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 1MΩ 1 KΩ ≤ Rn ≤ 1 MΩ	
Tolerance* $Rn < 100\Omega: \\ 100\Omega \le Rn \le 100K\Omega \\ 100K < Rn \le 1M\Omega: \\ 1M\Omega < Rn \le 5M\Omega: \\ Rn > 5M\Omega:$	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±30% ±40% ±50%	
Variation laws	Lin (A). Other tapers	s available on request	
Residual resistance	Lin (A) ≤ 5*10-3*Rr	n. Minimum value 2Ω	
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 220°±20° ≤ 3%Rn. Other tapers, please inquire		
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 220°±20° ≤ 5%Rn. Other tapers, please inquire		
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.15W 0.10W		
Maximum voltage Lin (A) Log (B), Antilog (C)	200VDC 150VDC		
Operating temperature	-25°C +70°C (+85°C on request)		
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	

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

Mechanical Specifications

RS9 Through-hole and SMD

Resistive element	Carbon technology		
Angle of rotation (mechanical)	240° ± 5°		
Angle of rotation (electrical)	220° ± 20°		
Wiper standard delivery position	50% ± 15°		
Max. stop torque	5 Ncm		
Max. push/pull on rotor	40 N		
Wiper torque*	<2 Ncm		
Mechanical life	Standard: between 25.000 and 50.000cycles. Long life: up to 200.000cycles (more available on request, please, inquire)		

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

Test results

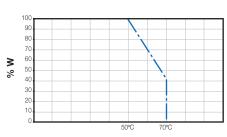
The following typical test results are given at 23°C \pm 2°C and 50% \pm 25% RH.

RS9 Through-hole and SMD

	Test conditions	Typical variation of nominal resistance
Damp heat	500 h. at 40°C and 95% RH	±20%
Thermal cycles	16 h at 85°C, plus 2 h at -25°C	±20%
Load life	1.000 h. at 50°C	±20%
Mechanical life	1.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±20%
Storage (3 years)	3 years at 23°C ± 2°C	±20%

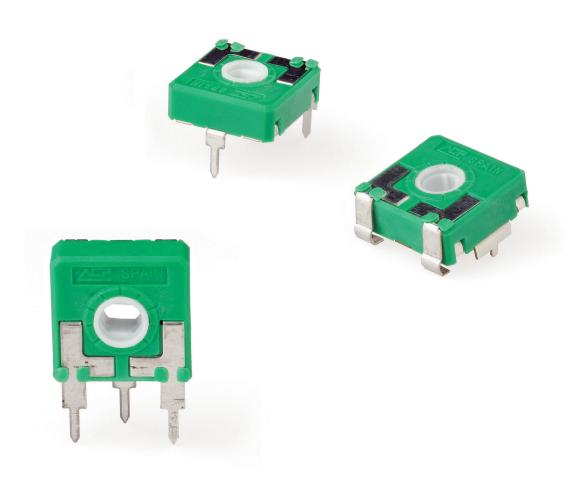
Power derating curve:

RS9 Through-hole and SMD



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





RS14 M

14mm Rotary Sensor with up to 1.000.000 cycles of mechanical life depending on configuration, making it particularly appropriate for control applications.

RS14 has 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 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.

Standard taper is linear, with linearity of ±3%. ACP can study other special tapers (even cut tracks, step curves with areas of constant value, etc), as well as more strict linearity.

Thumbwheels and shafts can be provided either separately or already inserted in the sensor. Our RS14 can be manufactured in a wide range of possibilities regarding: resistance value, tolerance, tapers, pitch, positioning of the wiper, housing and rotor color.

Applications

- Household appliances: temperature control, position sensor.
- Automotive: position adjustment and sensing.
- Industrial controls.

RS14 HOW TO ORDER

EXAMPLE: RS14TV15-10KA3030 WT-14008-NE-V0

tandard	featur	es						Extra fe	eatures						Assemb	led acc	essory	
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		
RS14	Т	V15		- 10K	А	3030									WT	-14008	-NE	-VC

Standard configuration:	RS14 Through-hole	RS14 SMD
Dimensions:		14mm
Protection:		54 (dust-proof) tinguishable, to meet UL 94 V-0
Substrate:	Carbon technology	Carbon technology, special for high temperature
Color:	Green housing + white rotor	Green housing + grey rotor
Packaging:		Bulk
Wiper position:	1	at 50% ±15°
Terminals:	Straigh	t, without crimping.
Marking:	Resistive value marke	ed 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: RS14TV15-10K CODE C00111.

1 - Series

■ RS14

2 - Rotors Ν Ζ

3 - Model and pitch

H5 HA5 HL5 V12.5 VA12.5 VL12.5 HC0 H2.5 VR12,5 V15 VJ15 (V15) ... CFF V17.5 VD7.5 VD11 VSMD VSMD ... CY

HSMD (Under request, not readily available)

4 - Packaging	Trough-hole	SMD models
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾
T&R (Tape and 13" reel)	(N.A.) ⁽²⁾	T&R
T&R (Tape and 15" reel)	(N.A.) ⁽²⁾	T&R15

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals

5 - Resistance value

10K

The RS14 has 10K, linear taper and $\pm 30\%$ by default. Other resistive values, tolerances and tapers (log, antilog, cut tracks, constant value areas, etc.) can be studied on request. Please, enclose a drawing when ordering special tapers.

6 - Resistance law / taper

Lin - Linear	Α	
- Special tapers have codes assigned:	CODE YXXXXX	

7 - Tolerance

±30%

8 - Operating Life (Cycles)

Long life: LV + number of cycles. i.e: LV100 for 100.000 cycles, LV150, LV1M LVXXX: ex: LV100

9 - Cut Track - Open circuit.

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

10 - Detents (DT)

Not applicable for RS14

П	١-	iermin	aıs

SNAP IN P	SNP
SNAP IN J	SNJ
Shorter tip of terminal, TPXX, where XX is tip length (under request)	TPXX, ex: TP30
Steel Terminals	SH

12 - Housing

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

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

V0

(leave blank) -V0

XXXX-YY-V0

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

(blank) By default, carbon is non self-extinguishable. Self-extinguishable property can be added. V0 means housing and rotor are V0. CJ-V0, RT-V0 If only the housing needs to be V0, then CJ-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: <1.5Ncm	(leave blank)

Stronger or softer torque feeling is available on request.

15 - Linearity

Standard linearity 3%	(leave blank)
Independent linearity controlled & below x%, for example, 2%: LN2%	LNx%; ex: LN2%
Absolute linearity controlled & below x%	LAx%

Other features could be available on request, please, ask.

16 - Potentiometers with assembled accessories

Assembled from terminal side	VVI
Assembled from collector side	WTI
Accessory Reference See list of shafts and thumbwheels available	-XXXXX Example: 14117
Color of shaft or thumbwheel	-YY Example, white: BA
Non self-extinguishable. Self-extinguishable according to standard	(leave blank) -V/O

UL 94 (-V0 in box 17 modifies only the accessory, please, note.) For ordering spare accessories: Accessory reference - color- flammability.

Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumbwheel

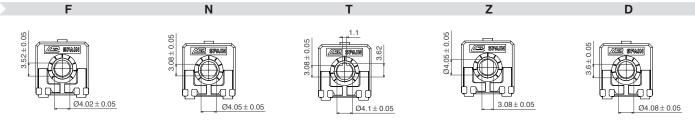
Color chart for rotor, housing and accessories

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

(1) black is not an option for housings.

T is the standard rotor for RS14. Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested.

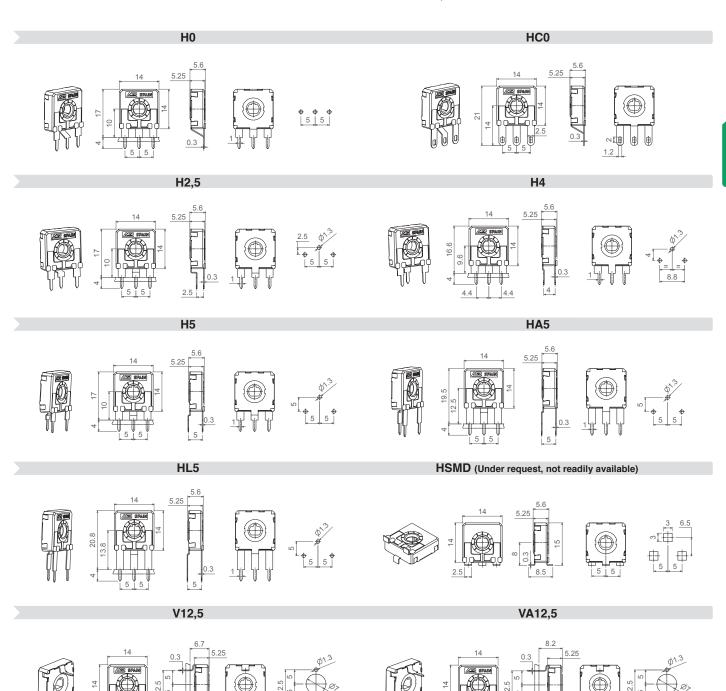
Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated. Other rotor styles, on request.



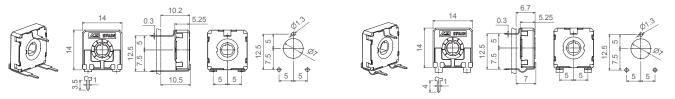
Standard color for F rotor is red

Models

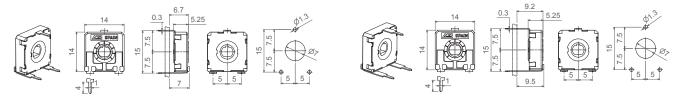
All models shown here have the most common rotor for RS14, the T rotor.



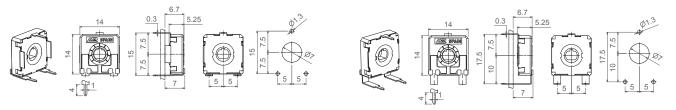




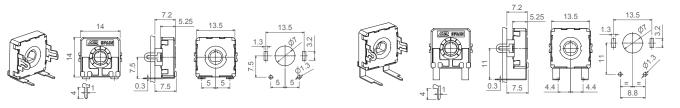
V15 VJ15



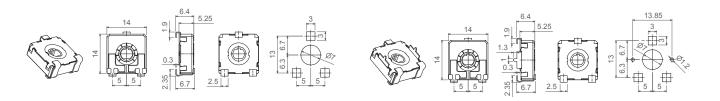
V15...CFF V17,5



VD7,5 VD11



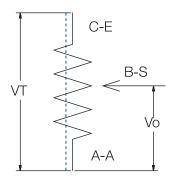
VSMD...CY



Tapers

The standard taper is linear (A) and the standard ohm value is 10K, since a RS14 will normally be used as a voltage divider. For other tapers, please, inquire.

Voltage Divider



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 available with cut track needs to be confirmed case by case.

PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.

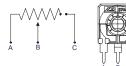
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

Other positions are available on request.

PCI PCF







Terminals

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

SNP SNR





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

Standard Terminal

Shorter terminal, for V12,5 TP30

Shorter terminal, TPXX (under request)







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

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.

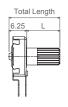
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

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:

H potentiometer + shaft

V potentiometer + shaft

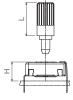










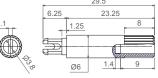


Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

14008 14015

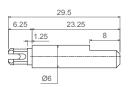














14042

14056















14065 (Designed for E rotor)

14066

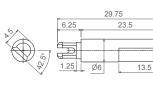












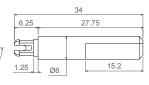


14067

14072



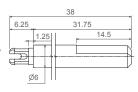






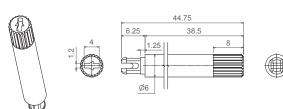


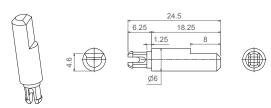






14073 14081

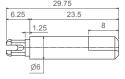




14084 14117













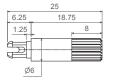




14187



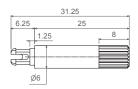












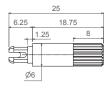
14250



14251









Thumbwheel

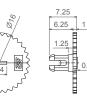
Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

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

14003









Bulk packaging:

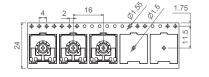
RS14 model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description		
H2,5 - H4 - H5- HA5- HL5- H0	None, only potentiometers.	200 150 for models with*	700 600 for VJ15 - V17,5 - VD7,5 500 for VD11		
HC0 - V12,5 - V15 - VA12,5 VL12,5 - VJ15 - V17,5*	14003, 14117, 14042, 14056, 14065	100	400 350 for models with*		
VD11* - VD7,5* - VR12,5	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.

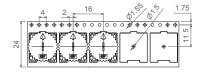
Tape & Reel packaging:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
VSMD	None, only potentiometers.	500 pcs per reel, 16mm step between cavities.	800 pcs per reel, 16mm step between cavities.
VOIVID	14003	450 pcs per reel, 16mm step between cavities.	To be determined.
VSMD CY	None, only potentiometers.	350 pcs per reel, 20mm step between cavities.	500 pcs per reel, 20mm step between cavities.
VOIVIE OT	14003	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 VSMD-T&R...WT-14003





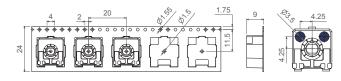


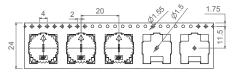




VSMD-T&R ... CY

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

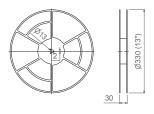


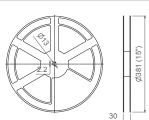






15" Reel 13" Reel







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

RS14 Through-hole

RS14 SMD

Range of resistance values* Lin (A)	Standard value is 10K, as voltage divider use is supposed				
Tolerance*	30%				
Variation laws	Lin (A). Other tapers available on request				
Residual resistance	Minimum value 2Ω				
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire				
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire				
Maximum power dissipation** Lin (A)	at 50°C, 0.15W				
Maximum voltage Lin (A)	250VDC				
Operating temperature	-25°C +85°C				
Linearity	3%				
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm			

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

Mechanical Specifications

RS14 Through-hole and SMD

Resistive element	Carbon technology
Angle of rotation (mechanical)	265° ± 5°
Angle of rotation (electrical)	245° ± 20°
Wiper standard delivery position	50% ± 15°
Max. stop torque	10 Ncm
Max. push/pull on rotor	50 N
Wiper torque*	<1.5 Ncm
Mechanical life	Up to 1.000.000 cycles (please, specify the cycles needed).

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

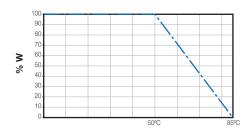
Test results

The following typical test results (with 95% confidence) are given at 23°C \pm 2°C and 50% \pm 25% RH. Maximum linearity after mechanical tests: 4%.

RS14 Through-hole and SMD

	Test conditions	Typical variation of Rn
Damp heat	500 h. at 40°C and 95% RH	±20%
Temperature Coefficient	16 h at 85°C, plus 2 h at -25°C	±20%
Load life	1.000 h. at 50°C	±20%
Mechanical life	150.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±20%
Storage (3 years)	3 years at 23°C ± 2°C	±3%

Power derating curve:



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









RSR14

This product family born as an alternative to the RS14 series when curved designs appear. Housing shape has been modified in order to set the product properly.

14mm Rotary Sensor appropriated for position sensing and control applications capable of withstanding high configurations of mechanical life.

- Standard: 100.000, 150.000 or 250.000 cycles
- Long life, up to 1 million turns (please, inquiry)

RSR14 has 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 configurations is available; for SMD version, please inquire. 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.

Standard taper is linear, with independent linearity of ±3%. ACP can study other special tapers (even cut tracks, step curves with areas of constant value, etc), as well as more strict linearity.

Thumbwheels and shafts can be provided either separately or already inserted in the sensor. Our RSR14 can be manufactured in a wide range of possibilities regarding: resistance value, tolerance, tapers, pitch, positioning of the wiper, housing and rotor color.

Applications

- Household appliances: temperature control, position sensor.
- Automotive: position adjustment and sensing.
- Industrial controls.



RS14 HOW TO ORDER

EXAMPLE: RSR14TV15-10KA3030 WT-14008-NE-V0

Standard	featur	es						Extra fe	eatures						Assemb	led acc	essory	
Series F	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		
RSR14	Т	V15		- 10K	Α	3030									WT	-14008	-NE	-V0

Standard configuration:	RSR14 Through-hole	
Dimensions:	14mm	
Protection:	IP 54 (dust-proof) On request: Self-extinguishable, to meet UL 94 V-0	
Substrate:	Carbon technology	
Color:	Green 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: RS14TV15-10K CODE C00111.

1 - Series ■ RSR14

2 - Rotors				
F	N	Т	Z	D

3 - Model and pitch

V15

4 - Packaging	Trough-hole	SMD models
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

5 - Resistance value

10K

The RSR14 has 10K, linear taper and $\pm 30\%$ by default. Other resistive values, tolerances and tapers (log, antilog, cut tracks, constant value areas, etc.) can be studied on request. Please, enclose a drawing when ordering special tapers.

6 - Resistance law / taper

Lin - Linear	Α	
- Special tapers have codes assigned:	CODE YXXXXX	

7 - Tolerance

±30% 3030

8 - Operating Life (Cycles)

Standard:	100.000 cycles: LV100 150.000 cycles: LV150
	250.000 cycles: LV250
Long life: LV + number of cycles. i.e: LV100 for 300.000 cycles, LV300, L	V1M LVXXX: ex: LV300

9 - Cut Track - Open circuit.

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

10 - Detents (DT)

Not applicable for RSR14

 -	Term	ına	IS

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

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-A

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

By default, carbon is non self-extinguishable. 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-If only rotor: RT-V0

(blank) V0 CJ-V0, 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: <1.5Ncm	(leave blank)
Stronger or softer torque feeling is available on request.	

15 - Linearity

Standard Independent linearity 3%	LN3%
Other Independent linearity below x%, for example, 4%: LN4%	LNx%; ex: LN4%
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	-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

For ordering spare accessories: Accessory reference - color- flammability.

Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumbwheel XXXX-YY-V0

Color chart for rotor, housing and accessories

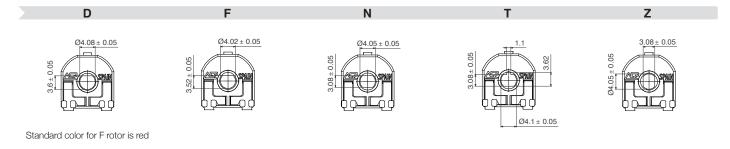
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	ВА	IN	TA	RO	VE	AM	AZ	GS	MR

(1) black is not an option for housings.

Rotors

T is the standard rotor for RSR14. Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested.

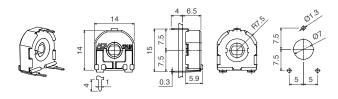
Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated. Other rotor styles, on request.



Models

All models shown here have the most common rotor for RSR14, the T rotor.

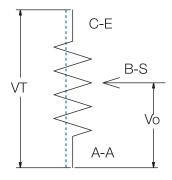
V15



Tapers

The standard taper is linear (A) and the standard ohm value is 10K, since a RSR14 will normally be used as a voltage divider. For other tapers, please, inquire.

Voltage Divider



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.

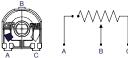
Mechanical life available with cut track needs to be confirmed case by case.

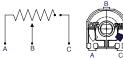
PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.

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

Other positions are available on request.

PCI PCF





Terminals

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

SNP



Shorter terminal tips are only available under request.

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





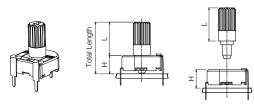
Shafts

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:

V potentiometer + shaft

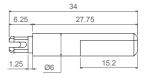


Shaft	14117	14081	14187	14251	14067	14084	14250	14072	14073
L Dimension	11.70	18.25	18.75	18.75	27.75	23.50	25.00	31.75	38.50

14067 14072



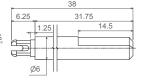








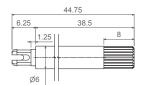








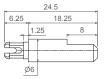




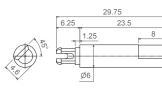
















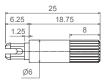








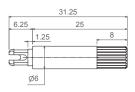








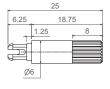














Thumbwheel

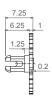
Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

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

14003









Packaging

Bulk packaging:

RSR14 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.	200 150 for models with*	700
V15	14003, 14117	100	400 350 for models with*
	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.



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

RSR14 Through-hole

Range of resistance values* Lin (A)	Standard value is 10K, as voltage divider use is supposed
Tolerance*	30%
Variation laws	Lin (A). Other tapers available on request
Residual resistance	Minimum value 2Ω
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire
Maximum power dissipation** Lin (A)	at 50°C, 0.15W
Maximum voltage Lin (A)	250VDC
Operating temperature	-25°C +85°C
Independent Linearity	3%
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm

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

Mechanical Specifications

RSR14 Through-hole

Resistive element	Carbon technology
Angle of rotation (mechanical)	265° ± 5°
Angle of rotation (electrical)	245° ± 20°
Wiper standard delivery position	50% ± 15°
Max. stop torque	10 Ncm
Max. push/pull on rotor	50 N
Wiper torque*	<1.5 Ncm
Mechanical life	Standard: 100.000. 150.000 and 250.000 cycles. Up to 1.000.000 cycles (please, inquiry).

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

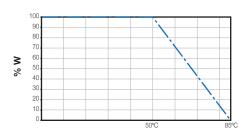
Test results

The following typical test results (with 95% confidence) are given at 23°C \pm 2°C and 50% \pm 25% RH. Maximum linearity after mechanical tests: 4%.

RSR14 Through-hole

	Test conditions	Typical variation of Rn
Damp heat	500 h. at 40°C and 95% RH	±20%
Temperature Coefficient	16 h at 85°C, plus 2 h at -25°C	±20%
Load life	1.000 h. at 50°C	±20%
Mechanical life	150.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±20%
Storage (3 years)	3 years at 23°C ± 2°C	±3%

Power derating curve:



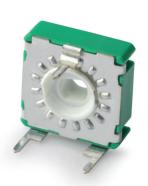
^{**} Dissipation of special tapers will vary, please, inquire.















CS14 🏲

14mm rotary position sensor with 360° mechanical rotation angle (electrical angle up to 330°).

Two configurations available:

- Standard, 15.000 turns, combinable with detents.
- Long life, up to 1 million turns.

Our 360° rotary sensor, CS14, can be manufactured in a wide range of possibilities regarding: resistance, tolerance, tapers, click effect (up to 50), positioning of the wiper, housing and rotor color.

Standard taper is linear. ACP can study other special tapers, (even cut tracks, step curves with areas of constant values, etc) as well as more strict linearity.

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

CS14 has plastic housing and Ingress Protection rating type IP 54 (high level 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.

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

Applications

Control, function selector, position sensor for household appliances, automotive and industrial.



CS14 🏓 HOW TO ORDER

EXAMPLE: CS14NV15-10KA3030 LV15 RSN LN3% WT-14015-NE-V0

tandard	featur	es						Extra fe	eatures						Assemb	led acc	essory	
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		
CS14	N	V15		- 10K	А	3030	LV15					RSN		LN3%	WT	-14015	-NE	-V0

Standard configuration:	CS14 Through-hole	CS14 SMD					
Dimensions:	14mm						
Protection:		54 (dust-proof) tinguishable, to meet UL 94 V-0					
Substrate:	Carbon technology	Carbon technology, special for high temperature					
Color:	Green housing + white rotor	Brown housing + grey rotor					
Packaging:	Bulk T&R						
Wiper position:		at 50% ±15°					
Terminals:	Straight, without crimping.	J-Lead					
Marking:	Resistive value marke	ed 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: CS14NV15-10K CODE C00111.

VSMD...CY

1 - 9	Series										
= CS	614										
2 - 1	Rotors										
В	D*	Е	F*	G	K	М	N*	Р	T*	Х	Z*
* Roto	re available	for version	ne with \ 1	5 000 turns	2						

3 - Model and pitch

4 - Packaging	Trough-hole	SMD models
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾
T&R (Tape and 13" reel)	(N.A.) ⁽²⁾	T&R
T&R (Tape and 15" reel)	(N.A.) ⁽²⁾	T&R15

V15...CFF

VSMD

В

С

CODE YXXXXX

V15

Big Box: See page 9

Log - Logarithmic

Antilog - Antilogarithmic

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

5 - Resistance value (see also page 10)

V12,5

100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	2KΩ	. 500KΩ	1ΜΩ	2ΜΩ	2Μ2Ω	4M7Ω	5ΜΩ
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M
6 - R	esista	ance l	aw/t	aper	(see a	ılso p	age 10)					
Lin - Linear A													

- Special tapers have codes assigned:

7 - Tolera	nce (see also page 10	0)		
±30%	+50%,-30%	±20%	±10%	±5%
2020	E030	2020	1010	0505

8 - Operating Life (Turns)

Standard (15.000 turns) (others on request).	LV15
Long life: LV + number of turns. ex: LV100 for 100.000 turns, LV150, LV1M	LVXXX: ex: LV100

9 - Cut Track - Open circuit

CS14 already has an open circuit area at the base of the potentiometer (between 330° and 0°). Additional cut tracks can be studied on request.

10 - Detents (DT) (Available for up to 15.000 turns) Standard 16 detents

X number of detents: ex.16 detents

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

11 - Terminals (THT)

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

1	2	-	Н	οι	us	ın	g

Color: For colors other than standard: -See color chart below-

13 - Rotor

Rotors N, T, Z	RSN
All others rotors:	(leave blank)
Color: For colors other than standard: -See color chart below-	RT-color: ex blue: RT-A7

* Self extinguishable property V0 for housing and rotor

Not V0 (by default)	(leave blank)
Housing and rotor V0	VO
Only housing V0	CJ-V0
Only rotor V0	RT-V0

14 - Wiper

Wiper position (Standard: 50% ± 15°)	(leave blank)		
Initial or CCW	PI		
Final or CW	PF		
Others: following clock positions. Ex at 3 hours: P3H	PXH, ex: P3H		
Wiper torque			
Standard for 15.000 turns: <2.5 Ncm, detents <3.5 Ncm	(leave blank)		
Special low torque for 15.000 turns <1.5 Ncm	PGB		

(leave blank)

Stronger or softer feeling than above, available on request.

Standard for >15.000 turns <1.5 Ncm

15 - Linearity

Standard, according to IEC 190	(leave blank)
Independent linearity controlled and below x%. Ex: 3%	LNx%, ex: LN3%
Absolute linearity controlled and below x%. Ex: 2,5%	LAx%, ex: LA2,5%

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 ex: 14117
Color of shaft or thumbwheel	-YY ex: white: BA
Non self-extinguishable. Self-extinguishable according to standard	(leave blank) -V0

For ordering spare accessories: Accessory reference - color- flammability. Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumbwheel

Color chart for rotor, housing and accessories

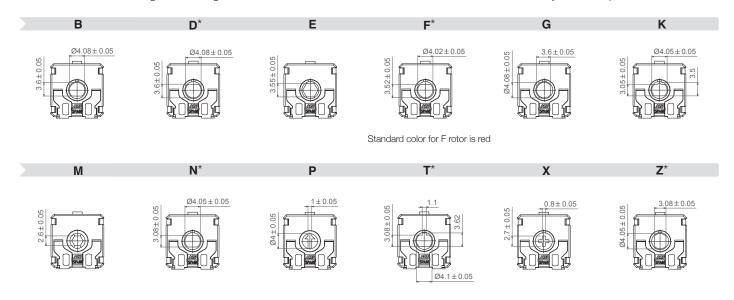
UL 94 (-V0 in box 17 modifies only the accessory, please, note.)

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

(1) black is not an option for housings.

N is the standard rotor for CS14, but the following options are also available. Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested.

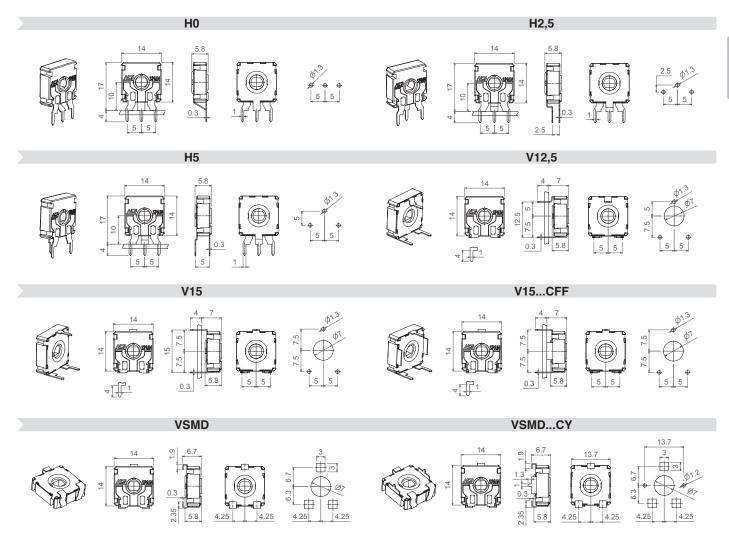
Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated. Other rotor styles, on request.



^{*}Please, note that for more than 15.000 turns (up to 1.000.000 turns) the following rotors are available: D, F, N, T, Z.

Model

H0, H2,5, H5, V12,5, V15, V15...CFF, VSMD, VSMD...CY. For other models, such as those shown for the CA14, please inquire.



LV 15 > LV 15

Position indicating notch included on all LV15 rotors, except types M and P.

Tapers

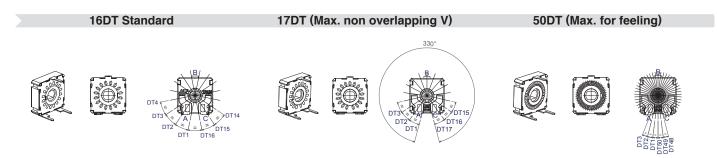
The Standard taper is linear (A). Log (B) and Antilog (C) tapers are also available, as well as special tapers according to customer specifications. See an example on the application described on page 11.

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:



Our patented design with two wipers gives 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 15.000 turns if no additional turns are mentioned. Please, indicate the number of turns needed. When needing a special number of detents or matching taper, a drawing is kindly requested.

Terminals

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

SNP SNR

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

Standard Terminal Shorter terminal, TPXX (under request)

Accessories can be mounted on potentiometers through either the front side (WT) or the metal 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.

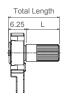
Shafts can be sold separately or already mounted on the potentiometer.

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 drawing:

H potentiometer + shaft

V potentiometer + shaft

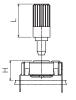












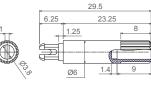
(H is set by the potentiometer model. See page 5)

Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

14008 14015



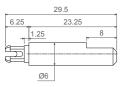














14042

14056















14065 (Designed for E rotor)

14066



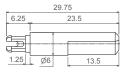








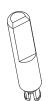




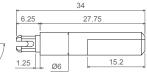


14067

14072



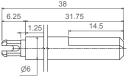




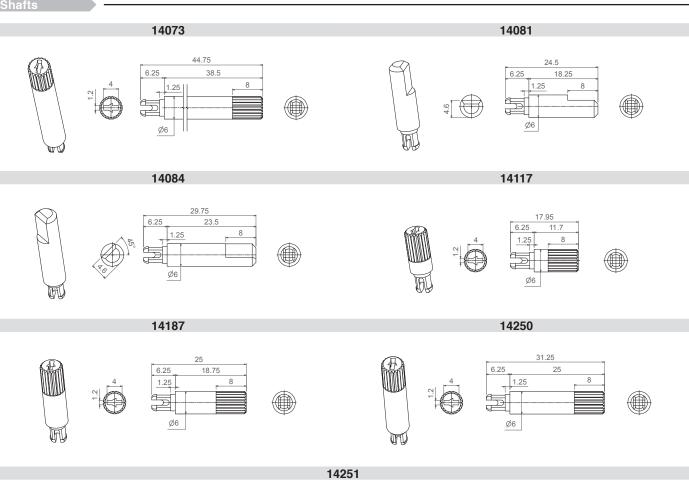


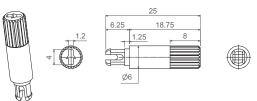










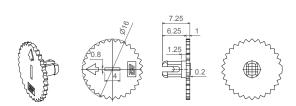


Thumbwheel

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.

14003



Bulk packaging:

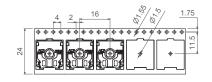
CS14 model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	(250 x 150 x 70) add CG at the end of the product description
	None, only potentiometers.	200	700
H0 - H2,5 - H5 - V12,5 V15 - V15CFF	14003, 14117, 14042, 14056, 14065	100	400
	14008, 14015, 14066, 14067, 14072, 14073, 14081, 14084, 14187, 14250.	75	To be determined.

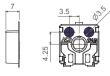
Tape & Reel packaging:	With thumbwheel inserted?	13" Reel, with 24mm width tape	15" Reel, with 24mm width tape	
VSMD	None, only potentiometers.	500 pcs per reel, 16mm step between cavities.	800 pcs per reel, 16mm step between cavities.	
(on request*)	14003	450 pcs per reel, 16mm step between cavities.	To be determined.	
VSMD CY	None, only potentiometers.	350 pcs per reel, 20mm step between cavities.	500 pcs per reel, 20mm step between cavities.	
(on request*)	14003	To be determined.	To be determined.	

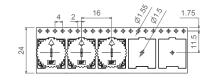
Sticker on component available on request.

VSMD-T&R

VSMD-T&R...WT-14003





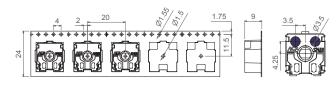


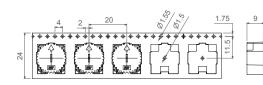




VSMD-T&R...CY

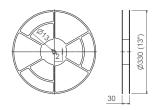
VSMD-T&R...CY WT-14003

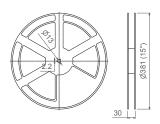






13" Reel 15" Reel







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

CS14 Through-hole

CS14 SMD (upon availability)

	3	continue (apon aranasmy)			
Range of resistance values* Lin (A) Log (B) Antilog (C)	100 Ω ≤ Rn ≤ 5M Ω 1 K Ω ≤ Rn ≤ 2M2 Ω	100Ω ≤ Rn ≤ 1MΩ 1 KΩ ≤ Rn ≤ 1 MΩ			
Tolerance* (Please, inquire for >100K turns) $100\Omega \le Rn \le 100K\Omega$ $100K\Omega < Rn \le 1M\Omega:$ $1M\Omega < Rn \le 5M\Omega:$ $Rn > 5M\Omega:$	±30% ±30% ±30% +50%, -30% (out of range)	±30% ±40% ±50%			
Variation laws	Lin (A). Other tapers available on request				
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 330°±20° ≤ 3%Rn. Other tapers, please inquire				
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 330°±20° ≤ 5%Rn. Other tapers, please inquire				
Maximum power dissipation** Lin (A)	at 50°C, 0.15W				
Maximum voltage Lin (A)	250VDC				
Operating temperature	-25°C +70°C (+85°C on request) Special Version 120° C				
Angle of rotation (electrical)	330° ± 20°				
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm			

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

Mechanical Specifications

CS14 Through-hole and SMD

Resistive element	Carbon technology
Angle of rotation (mechanical)	360°
Wiper standard delivery position	50% ± 15°
Max. push/pull on rotor	35 N / 50 N
Wiper torque*	For 15.000 turns <2.5 Ncm, detents <3.5 Ncm For >15.000 turns <1.5Ncm
Mechanical life	Standard is 15.000 turns. Up to 1.000.000 turns available depending on configuration

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

Test results

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

CS14 Through-hole and SMD

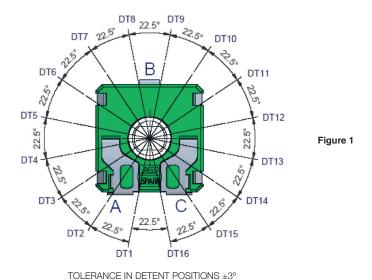
	Test conditions	Typical variation of Rn
Damp heat	500 h. at 40°C and 95% RH	±20%
Temperature Coefficient	16 h at 85°C, plus 2 h at -25°C	±20%
Load life	1.000 h. at 50°C	±20%
Mechanical life	15.000 turns at 10 c.p.m. and at 23°C ± 2°C	±20%
Storage (3 years)	3 years at 23°C ± 2°C	±3%

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

CS14 as alternative to a 4 bit absolute encoder. Linear curve.

A combination of a controlled linear curve and mechanical detents distributed along the 360° of the endless turn CS14 is an alternative to a 4-bit absolute encoder

Using the CS14 as a voltage divider, we can obtain 16 non-overlapping voltage values at each one of the 16 detents located evenly spread along the full circumference with a separation of 22.5° between each contiguous detent. See figure 1.



The graph of the linear curve that provides this performance is in the figure 2. We call it the curve FP and it makes possible to differentiate 16 non-overlapping different voltage levels from the collector output pin. (B in figure 1)

The function of the detents is to position and fix the wiper contact on the surface of the linear taper. An electrical control of each one of the 16 detents of each individual potentiometer during the assembly process ensures that the voltage levels are correct in each one of them.

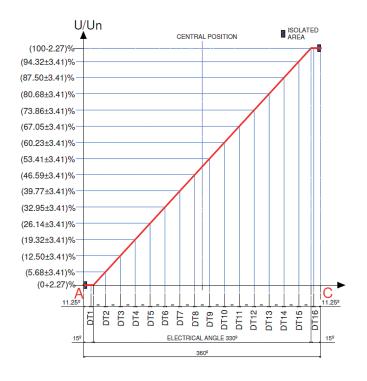
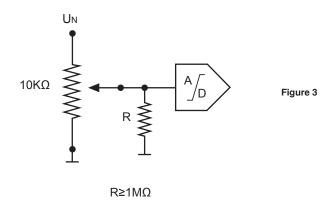


Figure 2 Curve FP

The endless rotation feature of the CS14 allows to move from the detent number 16 (U/Un = 100%) to the detent number 1 (U/Un = 0%). During the transition between these two detents, the wiper will slide on a dead zone for a few degrees, meaning that at that moment there will be no electrical contact with the resistive track.

In order to cope with this we recommend either to introduce a pull-up or pull-down resistor into the circuit design. ACP proposes the latter, a pull-down resistor whose value has to be at least 100 times the potentiometer nominal value. In that case, the collector pin output will be 0% (U/Un) when the slider transits on the dead zone.



ACP standard configuration is a potentiometer of 10K Ohm and a recommended pull-down resistor equal or greater than $1M\Omega$. (Figure 3). The mechanical life is 15.000 turns.

Connecting the collector terminal to the AD port of a microcontroller to feed into it the output voltage of such a configuration will allow for the selection of 16 different functions.

The table below (figure 4) shows the equivalence between the output function of this potentiometer, indicating the tolerance at each detent, and a 4-bit digital encoder signal.

An example of How to Order would be CS14NV15-10KFP3030 LV15 16DT RSN. Note that it is not necessary to indicate the linearity, as it is already implicit in the curve FP.

Detent	U/UN	Decimal	Hexadecimal	Binary	Octal
1	(0+2,27)%	0	0	0000	0
2	(5,68±3,41)%	1	1	0001	1
3	(12,50±3,41)%	2	2	0010	2
4	(19,32±3,41)%	3	3	0011	3
5	(26,14±3,41)%	4	4	0100	4
6	(32,95±3,41)%	5	5	0101	5
7	(39,77±3,41)%	6	6	0110	6
8	(46,59±3,41)%	7	7	0111	7
9	(53,41±3,41)%	8	8	1000	10
10	(60,23±3,41)%	9	9	1001	11
11	(67,05±3,41)%	10	А	1010	12
12	(73,86±3,41)%	11	В	1011	13
13	(80,68±3,41)%	12	С	1100	14
14	(87,50±3,41)%	13	D	1101	15
15	(94,32±3,41)%	14	E	1110	16
16	(100-2,27)%	15	F	1111	17

Figure 4

www.acptechnologies.com









Q16 **9**

Q16 is a particular application of the CS14 product family when robust and precise detents are required. This ACP patented design consists of a 16x15mm. rectangular shape external housing with a built-in detent mechanism, fitted on a CS14 V potentiometer.

The standard configuration has 16 detents evenly distributed along its 360° endless rotation, and allows to choose between 4 different detent torque values, from 3 Ncm to 6 Ncm to provide different degrees of softer or harder feeling.

The linear characteristics and materials of the CS14 core potentiometer, combined with the detent mechanism, guarantee at least 10.000 turns and no voltage overlapping between contiguous positions.

The rotor design allows a thru shaft to be inserted into the rotor from either top or below side. A Poka-Yoke feature incorporated in the rotor avoids shaft misplacement.

This Rotary Potentiometer Switch is the ideal alternative to Absolute Encoders and Rotary Switches for control applications like Program Selector Switches in White Goods: Washing Machines, Dishwashers, Dryers, Electrical Ovens etc., Controls in other Appliances like Ranges, Microwave Ovens, Kitchen Robots, etc., and HVAC in Automotive: Air Flow Distribution Switch, Temperature Setting and Fan Speed Selection.

Ingress Protection rating type is IP54 and plastic materials can be self-extinguishable according to UL 94V0 whenever required.

Q16 HOW TO ORDER

EXAMPLE: Q16RV15 10KA3030 LV10 16DT 3N PDT1

Standard fo	eatures											
Series	Rotor	Model	Packaging	Ohm value	Taper	Tolerance	Life	N° Detents	Det.torque.	Terminals	Flammability	Position
1	2	3	4	5	6	7	8	9	10	11	12	13
Q16	R	V15		10K	А	3030	LV10	16DT	3N			PDT1

Standard configuration:	Q16	
Dimensions:	16x15mm	
Protection:	IP 54. On request: Self extinguishable, to meet UL 94 V0	
Core potentiometer:	CS14	
Packaging:	Bulk	
Wiper position:	Detent 1 (PDT1)	
Terminals:	Straight	
Marking:	Resistive value marked on housing. Others on request.	

1 - Series	
■ Q16	
2 - Rotors	
R Standard. (Others under study).	
2. Maddanda 22.	
3 - Model and pitch	
V15 Standard. VSMD under study.	
4 - Packaging	

Bulk	(blank) ⁽¹⁾
(1) Products supplied bulk packed in bags, unless	otherwise specified.

100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	10KΩ standard	5ΜΩ
100	200	220	250	470	500	1K	10K	5M
6 - Tap	oer							

Lin - Linear	А
Others under study. Code will be assigned case by case.	

7 - Tolerance		
100 Ω ≤ Rn ≤ 100 ΚΩ:	100 KΩ < Rn ≤ 1MΩ:	1 M Ω < Rn \leq 5M Ω :
±30%	±30%	+50%,-30%
3030	3030	5030
0 1111	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

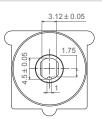
Special tolerances under request. F	Please check availability.
-------------------------------------	----------------------------

8 - Operating Life (Turns)	
Standard (10.000 turns) (others on request).	LV10
Long life: LV + number of turns. (please inquire availability).	LVXXX: ex: LV20
9 - Numbers of detents	
Standard: 16 detents.	16DT
Other configurations under study	
10 - Detent torque	
Standard: 3 Ncm	3N
Others available 4Ncm, 5Ncm, 6Ncm	4N, 5N, 6N
11 - Terminals	
By default, terminals are always straight	(leave blank)
SNAP IN P	SNP
Steel Terminals	SH
12 - Flammability	
Standard: Non self extinguishable. All housings and rotors self extinguishable according to UL 94 VO.	(leave blank) V0
Only Q16 housing and rotor self extinguishable V0	Q-V0
13 - Delivery position	
Standard, position at detent 1	PDT1
Position at detent. XX= (position number)	PDTXX
Special marking	
Special marking	GRE

Rotor

5 - Resistive value

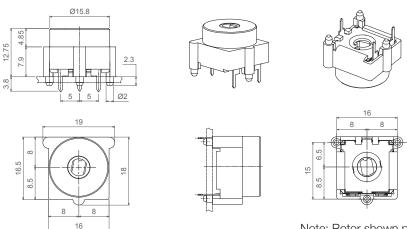
R is the standard rotor for Q16. Other options can be made under study.



This drawing shows the rotor at 50% position in order to better depict the dimensions and tolerances, it is not a valid delivery option of the 16 position version.

V15 is the standard model.

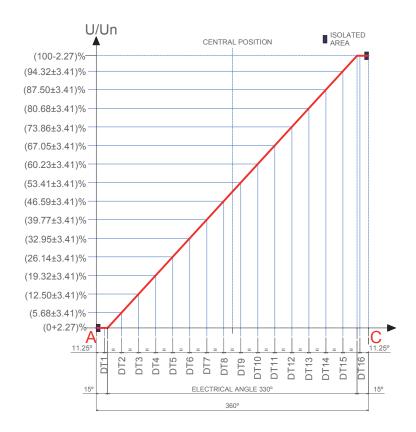
V15



Note: Rotor shown positioned at detent 1 (PDT1)

Tapers

The CS14 core potentiometer has a linear taper that provides the voltage ratios indicated at each detent shown in the graph. Non overlapping voltage between contiguous positions is guaranteed.



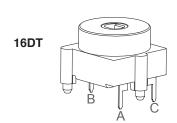
DETENT	VALUE
1	(0+2.27)% Un
2	(5.68±3.41)% Un
3	(12.50±3.41)% Un
4	(19.32±3.41)% Un
5	(26.14±3.41)% Un
6	(32.95±3.41)% Un
7	(39.77±3.41)% Un
8	(46.59±3.41)% Un
9	(53.41±3.41)% Un
10	(60.23±3.41)% Un
11	(67.05±3.41)% Un
12	(73.86±3.41)% Un
13	(80.68±3.41)% Un
14	(87.50±3.41)% Un
15	(94.32±3.41)% Un
16	(100-2.27)% Un

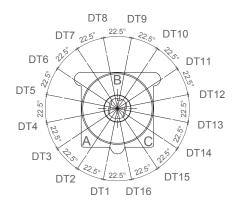
Detents/Torque

Conceived specifically for control applications where robust click feeling is required along the full circumference. The Q16 incorporates an ACP patented design that provides 4 possible different torque levels: 3Ncm, 4Ncm, 5Ncm or 6Ncm, upon customer's choice, with a mechanical life of at least 10.000 turns.

The standard number of detents is 16, all of them evenly spread along the 360° mechanical travel, an ideal configuration for 16 function selection in White Goods.

Tailor made configurations with different number of detents, preferrably even numbers equally spread along the 360°, can be studied on request. Other mechanical life requirements are also possible upon study.





Delivery

Unless otherwise specified, the Q16 is delivered with the wiper on position 1 (PDT1).

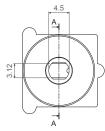
Shafts

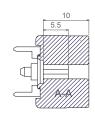
Shafts are sold separately. They can be inserted from either top or below side.

Please consult ACP for studying special designs.

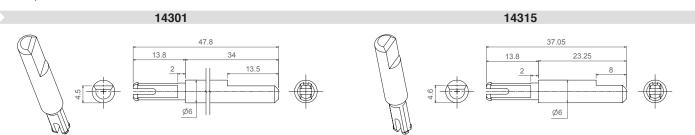
Rotor inner dimensions shown for customer's own shaft design.

Rotor inner dimensions





This drawing shows the rotor at 50% position in order to better depict the dimensions and tolerances, it is not a valid delivery option of the 16 position version.



Packaging

Bulk packaging: Pieces per box (250 x 150 x 70)

Q16 model 200

Electrical Specifications

(See CS14 Through Hole table on page 66).

Mechanical Specifications

Resistive element	Carbon
Angle of rotation (mechanical)	360°
Wiper standard delivery position	Detent 1 (PDT1)
Max. push/pull on rotor	50N
Wiper torque*	From 3N to 6N depending on customer choice.
Mechanical life	At least 10.000 turns.

Test results

Damp heat	
Temperature Coefficient	
Load life	(See CS14 table on page 66)
Mechanical life	
Storage (3 years)	







QJ16 9

ACP Q16 series expands its range with the launching of the new spring loaded potentiometer version called QJ16.

Keeping the same dimensions and layout of the Q16, the functionality is completely different. When the operator turns the knob CW or CCW from the central rest position, a spring mechanism fitted into the component provides an opposite torque. When releasing the knob, the spring returns the potentiometer to the central rest position.

Electrically, the potentiometer is a standard 245° linear taper with a 5% absolute linearity. The mechanical rest position corresponds to the physical middle position, hence to the central value of the output signal. Starting from there, the output value varies along the linear curve until reaching the corresponding end stop.

An alternative output signal to the above is an SPDT (Single Pole, Doble Throw) configuration, with "on" positions at both mechanical end stops and "off" position in the central rest position. Mechanical angle option available is ±45°.

This Spring Loaded potentiometer is the ideal alternative to a tact switch or incremental encoder to increase or decrease the value of a certain parameter.

QJ16 HOW TO ORDER

EXAMPLE: QJ16RV15 10KA3030 LV10

atures										
Rotor	Model	Packaging	Ohm value	Taper	Tolerance	Life	Mechanical Angle	Terminals	Flammability	Position
2	3	4	5	6	7	8	9	10	11	12
R	V15		10K	А	3030	LV10	±45°			
	Rotor 2	Rotor Model 2 3	Rotor Model Packaging 2 3 4	Rotor Model Packaging Ohm value 2 3 4 5	Rotor Model Packaging Ohm value Taper 2 3 4 5 6	Rotor Model Packaging Ohm value Taper Tolerance 2 3 4 5 6 7	Rotor Model Packaging Ohm value Taper Tolerance Life 2 3 4 5 6 7 8	RotorModelPackagingOhm valueTaperToleranceLifeMechanical Angle23456789	RotorModelPackagingOhm valueTaperToleranceLifeMechanical AngleTerminals2345678910	RotorModelPackagingOhm valueTaperToleranceLifeMechanical AngleTerminalsFlammability234567891011

Standard configuration:	QJ16	
Dimensions:	16x15mm	
Protection:	IP 54. On request: Self extinguishable, to meet UL 94 V0	
Core potentiometer:	CA14 // RS14	
Packaging:	Bulk A	
Wiper position:	Middle position	
Terminals:	Straight	
Marking:	Resistive value marked on housing. Others on request.	

QJ16	
2 - Rotors	
R Standard. (Others under study).	
3 - Model and pitch	

4 - Packaging	
Bulk	(blank) ⁽¹⁾
(1) Products supplied bulk pa	acked in bags, unless otherwise specified.
5 - Resistive value	

100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	$10 \text{K}\Omega$ standard	5ΜΩ
100	200	220	250	470	500	1K	10K	5M
6 - Tap	er							

7 - Tolerance 100Ω ≤Rn≤ 100KΩ:	100KΩ ≤Rn≤ 1MΩ:	1MΩ ≤Rn≤ 5MΩ:
±30%	±30%	+50%,-30%
3030	3030	5030

8 -	Operating	Life	(Turns)

Standard (10.000 cycles)	LV10
Long life: LV + number of cycles. (please inquire availability).	LVXXX: ex: LV20

9 - Mechanical Angle

Standard ±45°	(leave blank)
Other configurations under study	

10 - Terminals

By default, terminals are always straight	(leave blank)
SNAP IN P	SNP
Steel Terminals	SH

11 - Flammability

Standard: Non self extinguishable.	(leave blank)
All housings and rotors self extinguishable according to UL 94 VO.	VO
Only QJ16 housing and rotor self extinguishable V0	Q-V0

12 - Delivery position

Standard, middle position	(leave blank)
---------------------------	---------------

Special marking

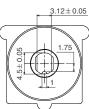
Special marking

Rotor

1 - Series

V15 Standard. VSMD under study.

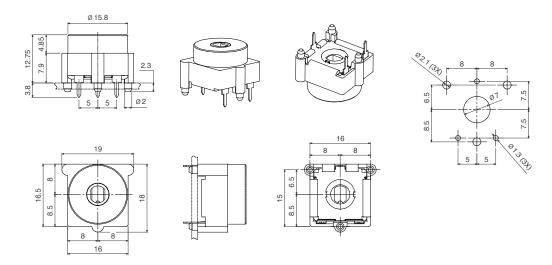
R is the standard rotor for QJ16. Other options can be made under study.



This drawing shows the rotor at 50% position, which is the standard delivery position.

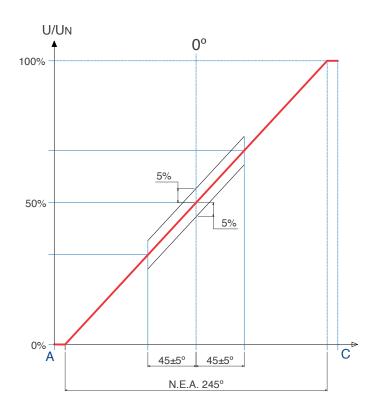
V15 is the standard model.

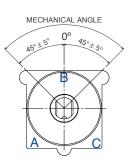
V15



Tapers

The core potentiometer is a standard 245° linear taper with a 5% absolute linearity. The mechanical rest position corresponds to the physical middle position, hence to the central value of the output signal. Starting from there, the output value varies along the linear curve until reaching the corresponding end stop.





An alternative output signal to the above is an SPDT* configuration, with "on" positions at both mechanical end stops and "off" position in the central rest position. Mechanical angle option available: ±45°

*Single pole, double throw. A simple break-before-make changeover switch: C (COM, Common) is connected either to L1 or to L2

Delivery Position

The QJ16 is delivered with the wiper on middle position.

Shafts are sold separately. They can be inserted from either top or below side.

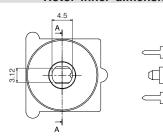
Please consult ACP for studying special designs.

Rotor inner dimensions shown for customer's own shaft design.

Rotor inner dimensions

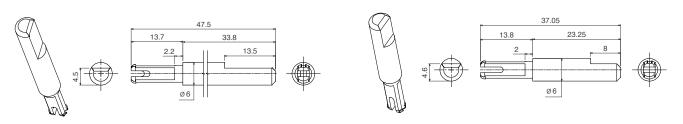
5.5

A-A



This drawing shows the rotor at 50% position, which is the standard delivery position

14301 14315



Packaging

Bulk packaging:

Pieces per box (250 x 150 x 70)

200

QJ16 model

Electrical Specifications

Range of resistance values*	Standard value is 10k	
Tolerance	±30%	
Variation laws	Lin (A). Other tapers available on request	
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire	
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire	
Maximum power dissipation**	at 50°C, 0.15W	
Maximum voltage	250VDC	
Operating temperature	-25°C +70°C (Other under request)	
Electrical angle	245° ± 20°	
Linearity	5%	
Temperature coefficient	+200/ -300 ppm	
·	· · · · · · · · · · · · · · · · · · ·	

Mechanical Specifications

Resistive element	Carbon technology	
Angle of rotation (mechanical)	±45° ±5°	
Wiper standard delivery position	Neutral position ±5°	
Max. stop torque	50Ncm	
Max. push/pull on rotor	50N	
Wiper torque*	0,5-3,5Ncm	
Mechanical life	10.000 cycles.	
	•	

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

Test results

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

	Test conditions	Typical variation of Rn	Linearity after test
Damp heat	500 h. at 40°C and 95% RH	±20%	7%
Thermal cycles	16 h at 85°C, plus 2 h at −25°C	±20%	7%
Load life	1.000 h. at 50°C	±20%	7%
Mechanical life	10.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±20%	7%
Storage (3 years)	3 years at 23°C ± 2°C	±3%	7%









CARBON - MCA9

9mm carbon potentiometers with plastic enclosure and shaft.

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

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

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

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

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

Applications

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

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

CERMET - MCE9

9mm cermet potentiometers with plastic enclosure and shaft. Cermet potentiometers have better thermal stability, allow for higher thermal dissipation and withstand higher temperatures than carbon potentiometers.

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

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

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

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

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

Applications

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

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

MCA9 ▲ MCE9 ▲ HOW TO ORDER

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

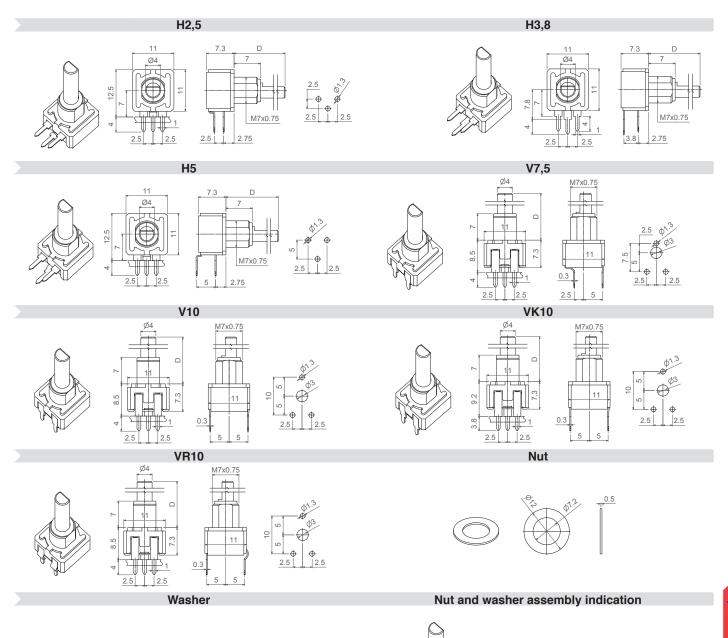
EXAMPLE: MCE9DH5-10KA2020 SNP PI WT-9020-NE-V0

	featu								eatures								ed acc	essor	•	
Series	Rotor			Ohm value		Tol.	Life		Detents			Rotor	Wiper	Lin.	Asser	mbly	Ref #	Color	r Fla	ım.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			16			
MCA9/MCE	9 D	H5		- 10K	А	2020				SNP			PI			T	-9020	-NE	-\	/0
andard co	nfigur	ation:			М	CA9 Thr	ough-h	ole						MCE9	Throug	gh-ho	ole			
mensions:										(9mm									
otection:								05	wassusati C		dust-proo		041/0							
ubstrate:						Carbon te	echnolog		request: S	eit-extingi	uishable, to	meet UL	_ 94 V-0		Cermet					
olor:							+ white	-					Bı	rown hoi	using + \		rotor			
ackaging:											Bulk									
iper positio	n:									at 50	0% ±15°									
erminals:									Str	raight, wi	ithout crin	nping.								
arking:								Resistiv	e value m	narked or	n housing	. Others	on reque	est.						
ustomized special spe						_		mized pro	oduct. Se	ries, roto	or, model a	and total	resistive	value ar	e indicat	ted b	efore th	ne code	that i	nclu
Series										11 - Terr										
MCA9	MCE9									SNAP IN										ΝP
										SNAP IN	11								12	۸J
- Rotors									—	Shorter ti	ip of termi	nal, TPX	X, where	XX is tip	length (u	ınder re	quest)	Т	PXX, e	:X:
										Steel Ter	minals								S	Н
2,5 - Packagir	H3,8	H	5	V7,5	∨ ugh-ho	10 le	VK10	VI			or colors ot	her than s	standard:	-See cold	or chart b	elow-	C	J-color,	ex., red	d: C
										13 - Rot	or									
	ce valu	ıe		((blank)					Color: Fo * Self-ex By default	or colors ot xtinguish t, carbon is	able pro	perty, V	0, for h	ousing a	and i	rotor: inguisha		(b	lank V0
- Resistan 00Ω 200Ω 22 00 200 2	0Ω 250	Ω 470Ω :		Ω 2ΚΩ	blank) . 500KΩ 500K	1ΜΩ 2Ι	MΩ 2M2 2M 2M3	Ω 4M7Ω 2 4M7	5 5 5 5 5 5 1	* Self-ex By default For carbon and rotor If only roto	xtinguish t, carbon is on: self-extinare VO. If cor: RT-VO	able pro non self- nguishabl	perty, V extinguish e property	O, for he hable, cer	ousing a met is Se added. V	and i	rotor: inguisha ans hous	able:	(b	lank V0
- Resistan 0Ω 200Ω 22 00 200 2	0Ω 250: 20 250	Ω 470Ω : Ο 470		Ω 2ΚΩ	. 500ΚΩ	1ΜΩ 2Ι			5MΩ (5MΩ)	* Self-ex * Self-ex By default For carbor and rotor and rotor only roto	xtinguish t, carbon is on: self-extinare VO. If cor: RT-VO	able pro non self- nguishable only the ho	pperty, V extinguish e property busing nee	O, for he hable, cer	ousing a met is Se added. V	and i	rotor: inguisha ans hous	able: sing	(b	lanl V0), R
- Resistan 0Ω 200Ω 22 00 200 2	0Ω 250: 20 250	Ω 470Ω : Ο 470		Ω 2ΚΩ	. 500ΚΩ	1ΜΩ 2Ι			5ΜΩ (2 5ΜΩ (2 5Μ	* Self-ex By default For carbor and rotor if only rotor	xtinguish t, carbon is on: self-extinare V0. If cor: RT-V0	able pro non self- nguishable only the ho	pperty, V extinguish e property busing nee	O, for he hable, cer	ousing a met is Se added. V	and i	rotor: inguisha ans hous	able: sing	(b	lanl V0), R
- Resistan 0Ω 200Ω 22 00 200 2 - Resistan	0Ω 250 20 250 ce law	Ω 470Ω : Ο 470		Ω 2ΚΩ	. 500ΚΩ	1MΩ 2l	2M 2M		5MΩ (2) 5MΩ (3) 1	* Self-ex * Self-ex By default For carbor and rotor and rotor only roto	or colors ot xtinguish t, carbon is n: self-extir are V0. If c or: RT-V0 per osition (S	able pro non self- nguishable only the ho	pperty, V extinguish e property busing nee	O, for he hable, cer	ousing a met is Se added. V	and i	rotor: inguisha ans hous	able: sing	(b CJ-V(lanl V0), R
- Resistan 00 2000 22 00 200 2 - Resistan n - Linear og - Logarith	0Ω 250. 20 250 ce law	Ω 470Ω : Ο 470 / taper		Ω 2ΚΩ	. 500ΚΩ	1MΩ 2l 1M 2	2M 2M		55MΩ (1) 55	Color: Fo * Self-ex By default For carbo and rotor If only roto 14 - Wip Wiper po Initial or C	xtinguish t, carbon is t, carbon is reself-extin are V0. If c or: RT-V0 per osition (S CCW	able pro	extinguish e property vusing near the control of th	0, for he hable, cerd can be a eds to be	ousing a rmet is Se added. Vo VO, then	and i	rotor: inguisha ans hous	able: sing (leav	(b CJ-V0 /e blar PI PF	lanl V0), F
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- Resistan 0Ω 200Ω 22 100 200 2 - Resistan 1 - Linear 10g - Logarith 1 - Linear 11d - Antil 12d - An	0Ω 2500 20 250 ce law nmic ogarithmers have	Ω 470Ω : 10 470	500 1	K 2K K 2K	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y:	2M 2M	2 4M7 ±5%	55MΩ (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	* Self-ex By default For carbon and rotor If only rotor Miper polloitial or C Others: for Wiper to	xtinguish t, carbon is are V0. If c or: RT-V0 cer osition (S CCW CW CW collowing c corque (Sta que, < 1.5	able pro- non self- nguishabl inly the ho Standard	extinguish e property busing need to 50% ±	0, for honable, cervican be a deds to be	ousing a rmet is Se added. Vo VO, then	and i elf-ext 0 mea i CJ-V	rotor: inguisha ans hous	explain the state of the state	(b) CJ-V() /e blar Pl PF , ex: P	lanl V0), F
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- Resistan 0Ω 200Ω 22 100 200 2 - Resistan 10 - Linear 10 - Logarith 11tilog - Antil 15 - Apecial tape - Tolerance 20% 1020	0Ω 2500 20 250 ce law mmic ogarithmors have	Ω 470Ω (1) 7 taper mic a codes a co	500 1	K 2K K 2K	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y:	2M 2M	2 4M7 ±5%	55MΩ 2 55M 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Color: Fo * Self-ex * Self-ex By default For carbo and rotor 14 - Wip Wiper p Initial or C Others: fo Wiper to Low torq Not control Not control * Self-ex *	xtinguish t, carbon is n: self-extin are V0. If c or: RT-V0 cer osition (S CCW CW corrue (Sta que, < 1.51 earity	able production and the production of the produc	extinguish e property, vertinguish e property ousing need to the property ousing need to the property of the p	(0, for hinable, cervican be a ceds to be a ceds to be a teds to be a teds to be a teds to be a ted to	ousing armet is Seadded. Vo., then	and I	rotor: inguisha ns hous 0.	PXH,	(b) CJ-V(control of the control of t	lank VO), R
- Resistan 00 2000 2 - Resistan 1 - Linear 1 - Logarith 2 - Toleranc 20% 200 - Operatin	000 2500 2500 2500 2500 2500 2500 2500	Ω 470Ω 1 7 taper mic a codes a 30% 030 (Cycles)	500 1	K 2K K 2K	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y:	2M 2M	±5% 0508	55MΩ 55M 55M	* Self-ex By default For carbon and rotor 14 - Wip Wiper polinitial or C Others: for Wiper to Low torq 15 - Line Not contributed	or colors of xtinguish t, carbon is nn: self-extin are V0. If c or: RT-V0 per osition (\$ CCW CW following c orque (\$ta que, < 1.5 earity rrolled	able programme and a self-inguishable in the horizontal standard standard standard: Norm	pperty, V extinguish e property pousing new to the property pousing new to the property to the	10, for hable, cer of can be a eds to be 15°)	ousing armet is Seadded. Vo., then	and I	rotor: inguisha ns hous 0.	PXH, (leav	(b) CJ-V(control of the control of t	lank VO), R
- Resistan 00 2000 2 - Resistan 10 - Linear 10 - Logarith 11 - Linear 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 18 - Logarith 18 - Logarith 19 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 11 - Logarith 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 18 - Logarith 19 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 11 - Logarith 11 - Logarith 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 17 - Logarith 18 -	000 2500 2500 2500 2500 2500 2500 2500	Ω 470Ω (1) 7 taper mic a codes a 30% (Cycles) es)	assigned +5	KΩ 2KΩ K 2K I: 0%,-30%	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ 2 3 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* Self-ex By default For carbon and rotor 14 - Wip Wiper polinitial or C Trinal or C Others: for Wiper to Low torq Not contributed Independent	r colors of xtinguish t, carbon is n: self-exit are V0. If c or: RT-V0 per osition (S CCW CW corrue (Sta que, < 1.51 earity colled ent linearity of	able programme and a mon self- inguishable in the horizontal selection of the horizont	pperty, V extinguish e property e property pousing need : 50% ± sitions; a <<2.5Ncm	t 3 hours, for det	ousing armet is Seadded. Vo. Vo., then s: P3H eents: <3	and I	rotor: inguisha ns hous 0.	PXH, (leav	(b) CJ-V(c) //e blar PF , ex: P //e blar PGB	lank VO), R
- Resistan 00 2000 2 - Resistan 10 - Linear 10 - Logarith 11 - Linear 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 18 - Logarith 18 - Logarith 19 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 11 - Logarith 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 18 - Logarith 19 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 10 - Logarith 11 - Logarith 11 - Logarith 12 - Logarith 13 - Logarith 14 - Logarith 15 - Logarith 16 - Logarith 17 - Logarith 17 - Logarith 18 -	000 2500 2500 2500 2500 2500 2500 2500	Ω 470Ω (1) 7 taper mic a codes a 30% (Cycles) es)	assigned +5	KΩ 2KΩ K 2K I: 0%,-30%	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ 1 5M 1 5 M 1	Color: Fo * Self-ex By default For carbo and rotor 14 - Wip Wiper p Initial or C Others: fo Wiper to Low torq 15 - Line Not contr Independe Absolute	r colors of xtinguish t, carbon is n: self-exti are V0. If c or: RT-V0 cer osition (S CCW CW collowing c correct que, < 1.51 earity crolled ent linearity c entiomet	able production and a controlled controlled and architecture.	pperty, V extinguish e property e property e property ousing necessitions; a state of the state	t 3 hours, for det	ousing armet is Seadded. Vo. Vo., then s: P3H eents: <3	and I	rotor: inguisha ns hous 0.	PXH, (leav	(b) CJ-VC ve blar PI PF , ex: P ve blar PGB ve blar ; ex: Ll	lank VO), R
- Resistan 00 2000 2 - Resistan 1 - Linear 1 - Logarith 1 - Linear 1 - Logarith 1 - Logarith 1 - Logarith 1 - Logarith 2 - Antil 3 - Antil 4 - Toleranc 20% 200 - Operatin 20 and and and (1.0) 20 ng life: LV + 1	000 2500 2500 2500 2500 2500 2500 2500	1 470Ω 1 470Ω 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	assigned +5	KΩ 2KΩ K 2K I: 0%,-30%	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Color: Fo * Self-ex * Self-ex By default For carbo and rotor 14 - Wip Wiper p Initial or C Others: fo Wiper tc Low torq Not control Independe Absolute 16 - Pot Assemble	r colors ot xtinguish t, carbon is n: self-exti are V0. If c or: RT-V0 per osition (S CCW CW following c orque (Sta que, < 1.5l earity crolled ent linearity c tentiomet led from te	able pro a non self- nguishabl inly the ho Standard Standard Nom controlled controlled cers with erminal s	pperty, V extinguish extinguish substitutions; as <2.5Ncm	15°) 15°) 15°) 15°) 15°) 15°)	ousing armet is Seadded. Vo. Vo., then s: P3H eents: <3	and I	rotor: inguisha ns hous 0.	PXH, (leav	(b) CJ-V(c) /e blar PI PF , ex: P /e blar PGB	ank VO), R
- Resistan 00 2000 2 - Resistan 1 - Linear 10 - Logarith 1 - Linear 10 - Antil 10 - Antil 10 - Antil 10 - Operatin 10 - Operatin 11 - Operatin 12 - Operatin 13 - Operatin 14 - Cut Traci	000 2500 2500 2500 2500 2500 2500 2500	Ω 470Ω (1) 7 taper 7 taper 10 codes a code	+500 1 	I:	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ 2 3 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* Self-ex By default For carbon and rotor 14 - Wip Wiper polinitial or (Final or C Others: for Wiper to Low torq 15 - Line Not contributed Absolute Accessor	r colors of xtinguish t, carbon is nr. self-exit are V0. If c or: RT-V0 cer osition (S CCW CW correct co	able pro a non self- nguishabl inly the ho Standard Standard Nom controlled controlled cers with erminal s	pperty, V extinguish extinguish substitutions; as <2.5Ncm	15°) 15°) 15°) 15°) 15°) 15°)	ousing armet is Seadded. Vo. Vo., then s: P3H eents: <3	and I	rotor: inguisha ans hous 0.	PXH, (leav	(b) CJ-VC ve blar PF , ex: P ve blar PGB ve blar ve blar WT- Examp	lank VO), R 3H lik)
- Resistan 100 2000 22 100 200 22 100 200 2 100 200 2 100 200 2 100 - Resistan 100 - Linear 100 - Logarith 101 - Tolerance 102 - Tolerance 103 - Tolerance 104 - Tolerance 105 - Operatin 106 - Count Trace 107 - Cut Trace 108 - Cut Trace 109 - Cut Trace 100 - Cu	000 2500 2500 2500 2500 2500 2500 2500	Ω 470Ω 1 7 taper Mic codes a 30% 030 (Cycles) es) per of cycle ning of tr	+5 es. ex: L\ it.	I:	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y ±10% 1010	2M 2M:	±5% 0508	55MΩ 55M 55M	Color: Fo * Self-ex	or colors of xtinguish t, carbon is n: self-exti are V0. If c or: RT-V0 oer osition (S CCW CW following c original of correction (State of correction (S correction	able production and a controlled	pperty, V extinguish pushing necessitions; a standard & below a standard to st	t 3 hours, for det	ousing armet is Seadded. Vo. Vo, then s: P3H ents: <3	and I plf-ext 0 mea CJ-V	rotor: inguisha ans hous 0.	PXH, (leav	(b) CJ-VC ve blar PF , ex: P ve blar PGB ve blar ve blar WT- Examp	lank VO), R 3H lik) N39
- Resistan 00 2000 2 - Resistan 1 - Linear 10 - Logarith 1 - Linear 10 - Logarith 11 - Toleranc 120% 1200 - Operatin 13 - And Indian (1.0) 14 - Cut Track 15 - Cut Track 16 - Cut Track 17 - Cut Track 18 - Cut Track 18 - Cut Track 19 - Cut Track	00 250 250 250 250 250 250 250 250 250 250	Ω 470Ω 1 7 taper Mic codes a 30% 030 (Cycles) es) per of cycle ning of tr	+5 es. ex: L\ it.	I:	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ 55M 55M	Color: Fo * Self-ex	r colors ot xtinguish t, carbon is n: self-extin are V0. If c or: RT-V0 oer osition (\$ CCW collowing c corque (\$ta que, < 1.5 earity crolled ent linearity c tentiomet led from te cyr Referer shaft extinguisha	able production and a controlled	pperty, V extinguish pushing necessitions; a standard & below a standard to st	t 3 hours, for det	ousing armet is Seadded. Vo. Vo, then s: P3H ents: <3	and I plf-ext 0 mea CJ-V	rotor: inguisha ans hous 0.	PXH, (leav	(b) CJ-VC /e blar PI PF , ex: P /e blar PGB we blar WT- Examp pple, blar	lank VO), R 3H lik) V39
- Resistan 00 2000 2 - Resistan 10 Linear 10 Logarith 11 Logarith 12 Logarith 13 Logarith 14 Logarith 15 Logarith 16 Logarith 17 Logarith 18 Logarith 18 Logarith 19 Logarith 20% 20% 20% 20% 20% 20% 20% 20	000 2500 2500 2500 2500 2500 2500 2500	A 470Ω (1) 7 taper Thic a codes a code a co	+5 es. ex: L\ it.	I:	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y: ±10% 1010	2M 2M:	±5% 0508	55MΩ 1 5M	Color: Fo * Self-ex * Self-ex By default For carbo and rotor 14 - Wip Wiper p Initial or C Others: fo Wiper tc Low torq 15 - Line Not contr Independe Absolute Accessor Color of s Non self-ex Self-exting (-V0 in bo)	or colors of xtinguish t, carbon is n: self-exti are V0. If c or: RT-V0 oer osition (S CCW CW following c original of correction (State of correction (S correction	able production and a controlled	poperty, V extinguish poperty, V extinguish pusing near the property pusing the p	15°) It 3 hours It 4 hours It 4 hours It 4 hours It 4 hours It 5	ousing armet is Seadded. Vo. Vo., then s: P3H example, example,	and i	rotor: inguisha ans hous 0.	PXH, (leav	(b) CJ-VC /e blar PI PF , ex: P /e blar PGB we blar WT- Examp pple, blar	lanle VO (VO), Finale (VO),
- Resistan	000 2500 2500 2500 2500 2500 2500 2500	α 470Ω (1) / taper mic c codes a 30% 030 (Cycles) es) per of cycl ning of tr if track, fi	+5 es. ex: L\ it.	I:	. 500KΩ 500K	1MΩ 2l 1M 2 A B C CODE Y ±10% 1010 PC PC	2M 2M: XXXXX A request)	±5% 0508	55MΩ (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Color: Fo * Self-ex * Self-ex By default For carbo and rotor 14 - Wip Wiper p Initial or C Others: fo Wiper tc Low torq 15 - Line Not contr Independe Absolute Accessor Color of s Non self-ex Self-exting (-V0 in bo)	r colors ot xtinguish t, carbon is n: self-exti are V0. If c or: RT-V0 per osition (\$ CCW collowing c orque (\$ta que, < 1.5 earity crolled ent linearity c tentiomet led from te viry Referer shaft extinguishable a px 17 modifi	able production and a controlled	pperty, V extinguish to extend to standa are access using ar	15°) It 3 hours It 4 hours It 4 hours It 4 hours It 4 hours It 5	ousing armet is Seadded. Vo. Vo., then s: P3H example, example,	and i	rotor: inguisha ans hous 0.	PXH, (leav	(b) CJ-VC /e blar PI PF , ex: P /e blar PGB we blar WT- Examp pple, blar	lank VO), R 3H lik) V39

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

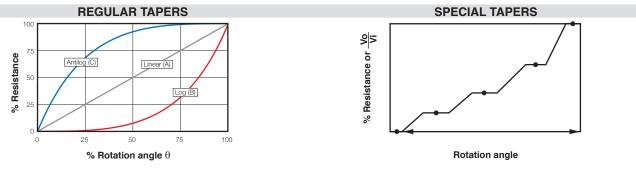
(1) black is not an option for housings.

All models shown here have shaft 9020, but other shafts can be chosen from the list below (Page 71). The D dimension indicated on the drawings refers to the possible length of the shaft, to be chosen at "shafts" section. Potentiometers are sold separately from the nuts and washers.



Tapers

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





The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications.

Mechanical life with cut track needs to be confirmed.

PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.

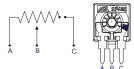
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

Other positions are available on request.

PCF PCI





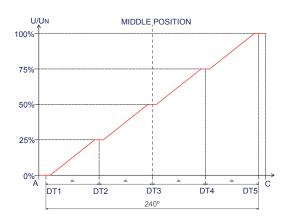




ACP's patented detent (DT) feature is especially suitable for control applications where the end user will turn a knob inserted in the potentiometer. Detents can be used to add a click feeling to the turning of the potentiometer or to control the position in which the wiper is placed, assuring a particular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

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

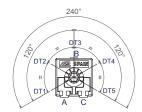
Example of 5DT with control of value in each DT.









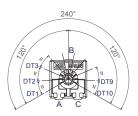


Other examples of potentiometers with detents:

10DT **20DT**

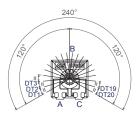












Number of standard detents (evenly distributed) already available.	1 (initial or final), 2 DT (initial and final), 3, 4, 5, 6, 7, 8,10, 20.
Maximum number of detents for feeling only	20
Maximum number of detents when the voltage value in each detent is controlled and non-overlapping.	10

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

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

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

Terminals

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

SNP SNJ





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

Standard Terminal

Shorter terminal, for H5 TP25

Shorter terminal, TPXX (under request)







Possibilities for insertion of accessories

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

Shafts

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

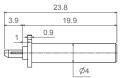
D dimension is the distance from the housing to the top of the shaft, as shown in the different models.

Shaft	9019	9020
D Dimension	17.5	23.5

9019 9020



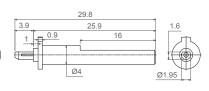












Packaging

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



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

MCA9 Through-hole

MCE9 Through-hole

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

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

Mechanical Specifications

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

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



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

MCA9 Through-hole

MCE9 Through-hole

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

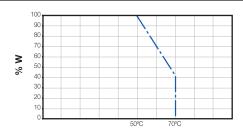
^{**} Dissipation of special tapers will vary, please, inquire.

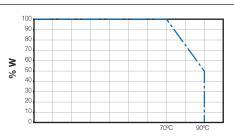




MCE9 Through-hole

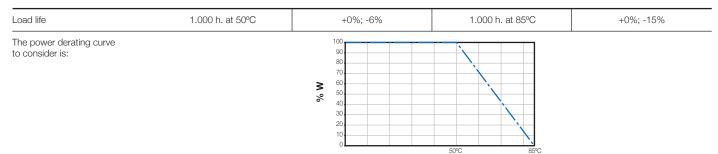
Power derating curve:



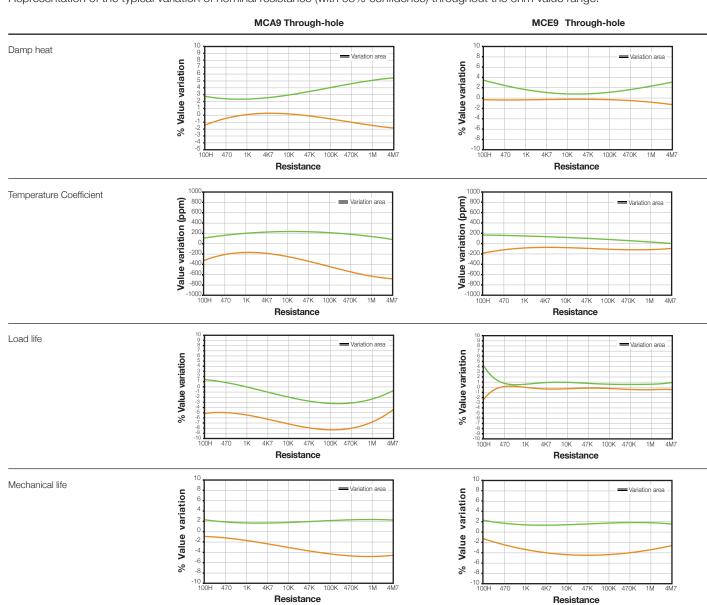


For temperatures out of range

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



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









CARBON - MCA14 1

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.

CFRMFT - MCF14 L

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

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

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

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

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

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

Applications

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

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

MCA14 MCE14 HOW TO ORDER

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

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

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	Α	2020				SNP			PI		WT	-14187	-BA	

Standard configuration:	MCA14 Through-hole	MCE14 Through-hole				
Dimensions:		14mm				
Protection:		(dust-proof) guishable, to meet UL 94 V-0				
Substrate:	Carbon technology	Cermet				
Color:	Blue housing + white rotor	Brown housing + white rotor				
Packaging:		Bulk				
Wiper position:	at (50% ±15°				
Terminals:	Straight, v	vithout crimping.				
Marking:	Resistive value marked of	on housing. Others on request.				

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

1 - Serie	es									
■ MCA14 ■ MCE14										
2 - Roto	ors									
N	Z									
3 - Mod	el and pito	h								
НО	HC0	H2,5	H4	H5	HA5	HL5	V12,5			
VA12,5	VL12,5	VR12,5	V15	VJ15	V17,5	VD7,5	VD11			

4 - Packaging	Trough-hole	
Bulk	(blank) ⁽¹⁾	

5 - F	5 - Resistance value													
100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	2KΩ	500ΚΩ	1ΜΩ	2ΜΩ	2Μ2Ω	4M7Ω	5ΜΩ	
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M	
6 - F	6 - Resistance law / taper													
Lin -	Linea	r								Α				
Log -	Log - Logarithmic									В				
Antilo	na - Ai	ntiloga	arithmi	ic						С				

7 - Toleran	ce			
±20%	±30%	+50%,-30%	±10%	±5%
2020	3030	5030	1010	0505

CODE YXXXXX

PCF

- Special tapers have codes assigned:

Open circuit at end of track, fully CW

8 - Operating Life (Cycles)	
Standard (1.000 cycles)	(leave blank
Long life: LV + the number of cycles. ex: LV45 for 45.000 cycl	es. (others on request) LVXX: ex: LV4
9 - Cut Track - Open circuit.	
Open circuit at beginning of track, fully CCW	PCI

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

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

11 - Terminals	
----------------	--

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

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

3 - Rote	or		

RT-color; ex., blue: RT-AZ 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:

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

14 - Wiper

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

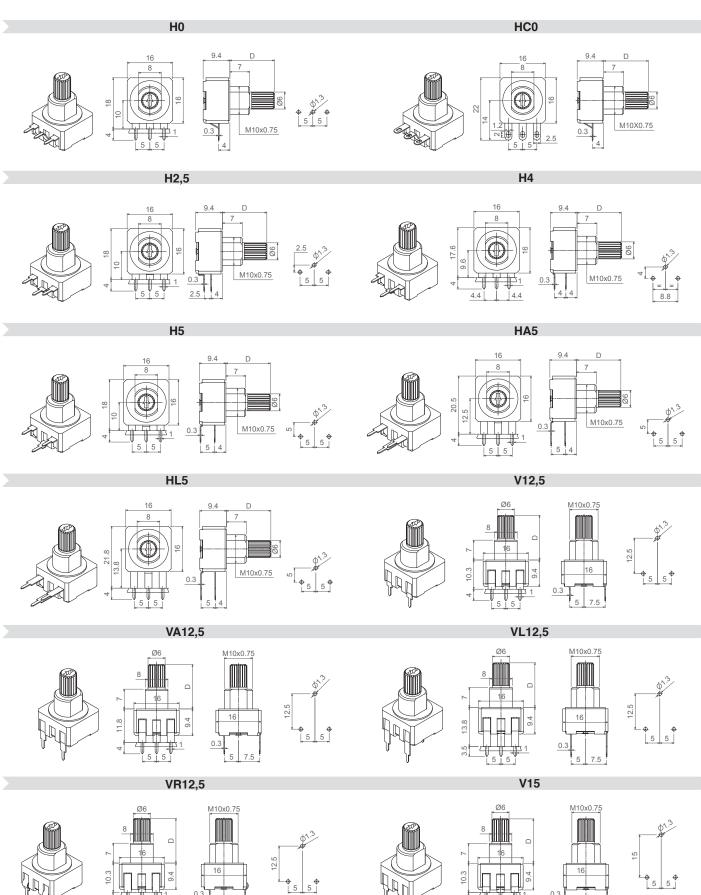
Assembled from terminal side	WT
Accessory Reference See list of shafts and thumbwheels available	-XXXXX Example: 14187
Color of shaft or thumbwheel	-YY Example, white: BA
Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)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

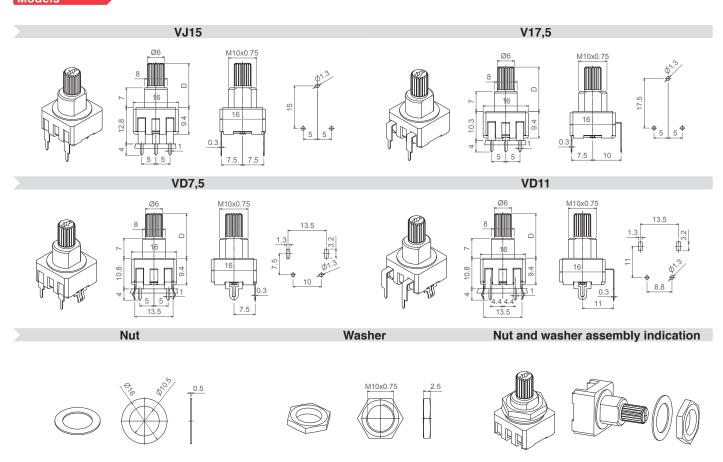
Color chart for rotor, housing and accessories

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

(1) black is not an option for housings.

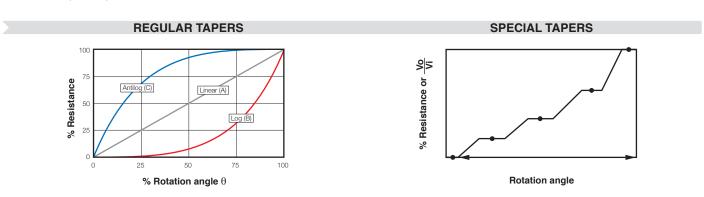
All models shown here have shaft 14187, but other shafts can be chosen from the list below. The D dimension indicated on the drawings refers to the possible length of the shaft, to be chosen at "shafts" section. Potentiometers are sold separately from the nuts and washers.





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.

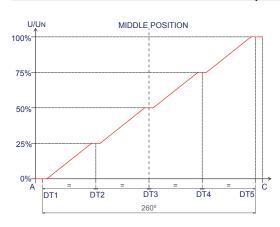




ACP's patented detent (DT) feature is especially suitable for control applications where the end user will turn a knob inserted in the potentiometer. Detents can be used to add a click feeling to the turning of the potentiometer or to control the position in which the wiper is placed, assuring a particular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

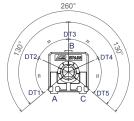
Example of 5DT with control of value in each DT.









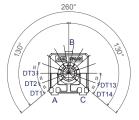


Examples of some potentiometers with detents:

14DT 38DT













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

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

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

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

Terminals

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

> SNP **SNR**





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

Standard Terminal

Shorter terminal, for V12,5 TP30

Shorter terminal, TPXX (under request)







Adjustment and orientation

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

Shafts

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

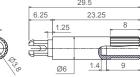
D dimension is the distance from the housing to the top of the shaft, as shown in the different models.

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

14008 14015

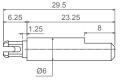












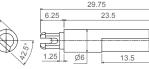


14066

14067

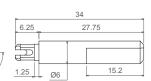










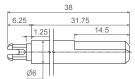




14072 14073



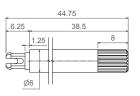










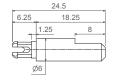




14081 14084



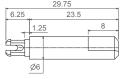










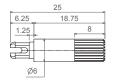




14250 14187



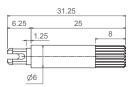














Packaging

Potentiometer model

With shaft or thumbwheel inserted?

Pieces per bigger box (250 x 150 x 70, CG on description)

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

With any shaft.

150



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)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω				
Tolerance* $Rn < 100\Omega: \\ 100\Omega \le Rn \le 100K\Omega \\ 100K < Rn \le 1M\Omega: \\ 1M\Omega < Rn \le 5M\Omega: \\ Rn > 5M\Omega: $	+50%, -30% (out of range)	±20% ±20% ±30%				
Variation laws	Lin (A), Log (B), Antilog (C). O	ther tapers available on request				
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5*10-3*Rn. Minimum value 2Ω	≤2Ω				
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire					
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire					
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 (+85°C on request)	-40°C +90°C (+125°C on request)				
Temperature coefficient $100\Omega \leq \text{Rn} \leq 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \leq 5\text{M}\Omega$	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm				

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

Mechanical Specifications

	MCA14 Through-hole	MCE14 Through-hole					
Resistive element	Carbon technology	Cermet					
Angle of rotation (mechanical)	265	° ± 5°					
Angle of rotation (electrical)	245	2 ± 20°					
Wiper standard delivery position	50% ± 15°						
Max. stop torque	10	Ncm					
Max. push/pull on rotor	5	0 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.

Test results

The following typical test results (with 95% confidence) are given at 23°C \pm 2°C and 50% \pm 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%
Storage (3 years)	3 years at 23°C ± 2°C	±3%	3 years at 23°C ± 2°C	±1%

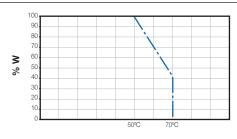
^{**} Dissipation of special tapers will vary, please, inquire.

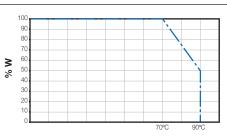
Test results



MCE14 Through-hole

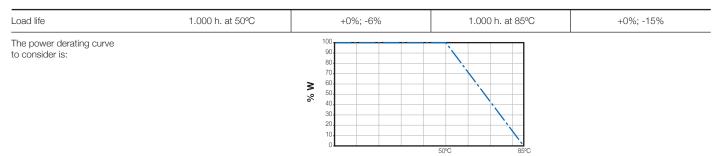
Power derating curve:



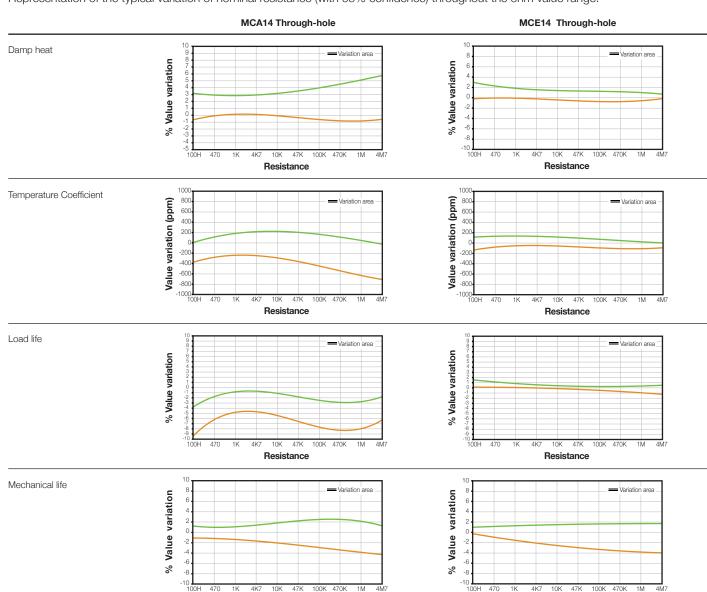


For temperatures out of range

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:



Resistance

Resistance

3 Rotary switches







ROTARY SWITCH - COM



Rotary switches are available in all different models already existing for the potentiometers: 6, 9 and 14mm in carbon and cermet technology. Please, refer to those sections to choose the external configuration of your switch.

ACP's Rotary switches are based on the design of the potentiometers: they have one input and two possible outputs. The commuting angle between outputs can be customized.

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. The switch has 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.

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

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

- Switching angle.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Pause effect (recommended for each possible circuit position).
- Self-extinguishable plastic parts, according to UL 94 V-0.

Applications

- Dimmers.
- Telecommunications (antenna control).

COM M HOW TO ORDER

ACP's switches (COM) follow the same configuration as the potentiometers, as shown in previous sections of this catalogue. The word COM needs to be added to the description. The cells 5, 6 and 7 (value, taper and tol) are left blank. If the switching angle is different from our standard, then it should be indicated.

From CA9: COMCA9MH2,5 2DT SNP PI WT-9005-BA (switch in configuration CA9MH2,5 with 2 detents, terminals with snap in, wiper at CCW position, and white shaft reference 9005 already inserted).

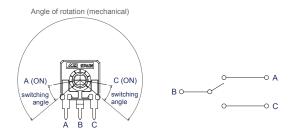
Standard features						Extra f	eatures						Assembl	ed acc	essory				
	Series	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Collector	Terminals	Housing	Rotor	Wiper position	Lin	Assembly	Ref#	Color	Flam.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16		17
CON	I CA9	М	H2,5		-	-	-			2DT	SNP			PI		WT	-9005	-BA	

From CA14: COMCA14PV15 AC45°±15° (switch in configuration CA14V15, switching angle at 45°).

Standard features						Extra f	Extra features						Assembled accessory						
Se	eries	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Collector	Terminals	Housing	Rotor V	liper position	Lin	Assembly	Ref #	Color	Flam.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16		17
COM C	CA14	Р	V15		-	-	-		AC45°±	15°									



The three terminals of the potentiometer are equivalent to one input (B) and two outputs (A and C), as shown in the figure. The middle terminal (B) corresponds to the internal wiper, which switches between positions. The switching angle can be customized. Unless otherwise requested, the housing will be neutral color, with the marking in black.



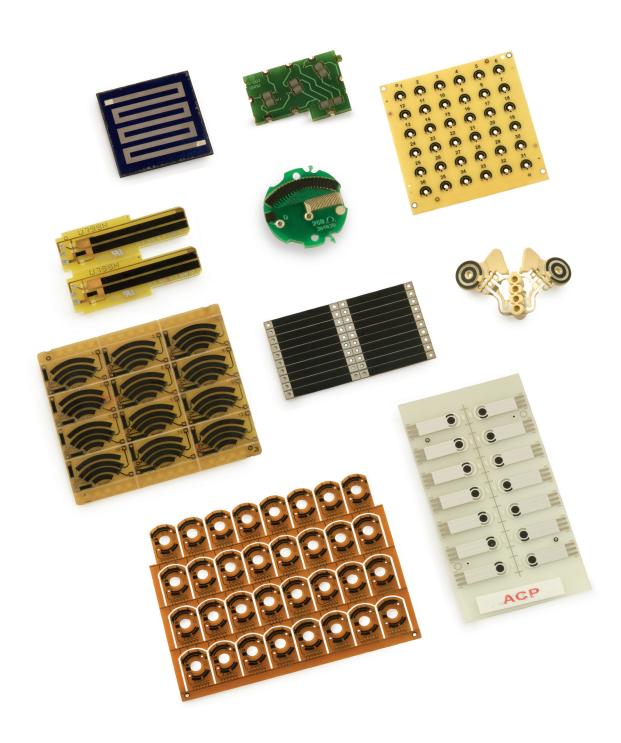
Electric				
Specifications	COM CA6	COM CA9 / MCA9 COM CA14 / MCA14	COM CE9 / MCE9 COM CE14 / MCE14	
Resistive element	Carbon	Carbon	Cermet	
Power ratio	15V / 12mA	24V / 12mA	24V / 12mA	
Resistance at ON position	≤5Ω	≤5Ω	≤5Ω	
Dielectric Strength	600V	1500V	1500V	
Insulation resistance	100ΜΩ	100GΩ	100GΩ	
Switching angle at ON position	20° ± 15°	30° ± 15°	30° ± 15°	
Operating temperature	-25°C +7	-40°C +90°C (+125°C)		

Please, note that these are standard features; other specifications are available on request.

Mechanical	Ţ.		
Specifications	6mm	9mm	14mm
Angle of rotation	235° ± 10°	240° ± 5°	265° ± 5°
Mechanical life	1.000	1.000	1.000
Wiper torque	< 2 Ncm	< 2 Ncm	< 2.5 Ncm
Max. stop torque	4 Ncm	5 Ncm (CA9, CE9) 25 Ncm (MCA9, MCE9)	10 Ncm (CA14, CE14) 15 Ncm (MCA14, MCE14)
Max. push/pull on rotor	9.8 N	40 N / 50 N	40 N / 50 N







Features

- Resistive element: Resistive blends from 10 to 1M Ohm/square allow for a wide range of resistive tracks and values.
- Tapers: Linear tapers with up to 1.8% independent linearity, step functions, logarithmic and antilog curves. Combination of potentiometer and on/off switches or symmetrical double track potentiometers.
- Tolerance: Laser trimming up to 1% of Rn.
- Minimum resistive track separation: Up to 0.3mm between adjacent
- Type of substrates: FR2, FR4, CEM1, CEM2, Polyester, Polyimide, Polyamide, Alumina.
- Mechanical life: The Mechanical Life performance depends on the interaction between the wiper and the resistive track contact surfaces. A balanced wear of both surfaces is key to guarantee the expected results. Several factors have an influence:
 - Wiper: Geometry, material, finishing, pressure, number of fingers, finger tip shape.
 - Inks: Type of ink, ink blend, materials contained and the process parameters when deposited and cured, geometry of the printed pad.
 - Speed of wiping slide cycle.
 - Climatic conditions: Working Temperature and Humidity. Thermal cycles: Temperature and humidity cycles.
 - Working environment.
 - Lubricants: They can help providing a good performance, however, they are not always needed.

A detailed and comprehensive understanding of the above parameters is fundamental in order to provide the adequate PCR track and substrate: We have solutions that range from 10.000 to 5.000.000 cycles under aggressive thermal and climate conditions.

THICK FILM SOLUTIONS @ PRINTED CIRCUIT RESISTORS

Thick Film Printed Circuit Resistors are screen printed layers of resistive, conductive and/or dielectric pastes deposited on different types of substrates, like FR, CEM, Alumina, Polyester, Polyimide, PA, Dielectric on Metal etc.

There are two basic technologies depending on the type of pastes applied: Carbon and Cermet, the latter needed on applications where high power dissipation is required or when resistor value stability at high temperatures is important.

Potentiometer Tracks is the type of Printed Circuit Resistors that ACP specializes in. This is one of our core competences and it is the heart of all our potentiometer families. Our know-how includes the expertise in the different technologies involved in the production process:

- Pastes and inks formulation and blending
- Screen printing in type C (class 10.000) clean room
- Curing or Sintering
- Laser trimming
- Automated testing

Design patterns and shapes are varied; every specific project has different geometrical requirements. We are able to process from single to multiple circuit panel configurations, with maximum panel dimensions of: 280mm - 180mm (Pattern 250mm x 150mm).

Let us know about your project and our engineers will propose the most suitable designs for each specific application. In many instances, mixed solutions where Potentiometer Tracks, Trimmed Fixed Resistors and Contact Switches are combined, make the most cost effective circuit design.

Aplications

Applications where Potentiometer Tracks can be applied can be classified in two major types: 1) Position Sensors and 2) Switches & Controls. Examples in different markets are listed below:

Automotive and Vehiche Markets

Position Sensors: Feedback Potentiometers on HVAC Actuators, Side Mirror Memory Actuators, Throttle Sensors, Head Lamp Levelling Actuators, Fuel Tank Senders, Start-Stop, Steering Wheel Angle Sensor, Drive by Wire, Break by Wire, Seat Positioning Actuators, Adaptive Front Lighting, etc.

Switches and Controls: Climate Control Switches (Fan Speed, Temperature Setting, Air Flow Distribution), Head Lamp Levelling Switch, Dash Board Light Dimmer, Seat Heating Controls, Haptic Control, Light Switch, Airbag Enable/ Disable Switch, etc.

Industrial and Consumer Markets

Position Sensors: Feedback Potentiometers on different types of Actuators (HVAC, Window Blinds, Valve Controls,)

Switches and Controls: Joystick Controls, Speed Control of Professional Power Tools, DIY tools, Garden and Lawn Electric Tools.

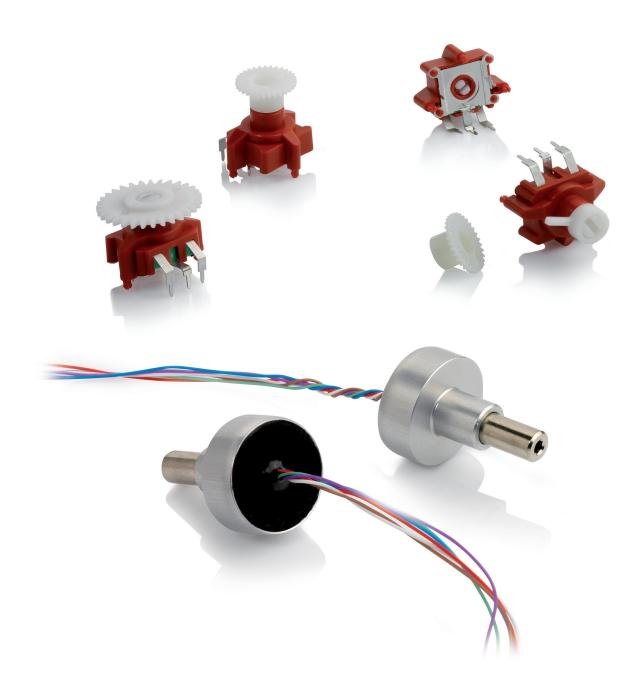
How to Order

Thick-Film solutions are customized. We kindly request a drawing with dimensions, electrical use, application, mechanical life and other significant data.

Please, send us your project specifications and we will send you our proposal.

5 Special potentiometers





METAL CASE **POTENTIOMETER**

Synchronized switch and potentiometer functions in a metal enclosure sealed with resin to secure IP 65 environmental protection.

Metal shaft with endless rotation.

Interface by means of wires.

More than 1 million turns mechanical life.

GEARED POSITION • **SENSORS**

Modified RS14 with special housing and pin layout.

Mechanical interface by means of different gears.

Up to 1.000.000 mechanical cycles.





Aragonesa de Componentes Pasivos